As filed with the Securities and Exchange Commission on April 16, 2021.

Registration No. 333-253599

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

AMENDMENT NO. 3
TO
FORM S-1

REGISTRATION STATEMENT
UNDER
THE SECURITIES ACT OF 1933

TRANSCODE THERAPEUTICS, INC.

(Exact name of Registrant as specified in its charter)

Delaware	**2834**	**81-1065054**
(State or other jurisdiction of incorporation or organization)	(Primary Standard Industrial Classification Code Number)	(I.R.S. Employer Identification No.)

6 Liberty Square, #2382
Boston, MA 02109
(857) 837-3099
(Address, including zip code and telephone number, including area code, of Registrant's principal executive offices)

R. Michael Dudley
Chief Executive Officer
TransCode Therapeutics, Inc.
6 Liberty Square, #2382
Boston, MA 02109
(857) 837-3099
(Name, address, including zip code, and telephone number, including area code, of agent for service)

Michael Bison, Esq.	***Copies to:***	**Stephen Older, Esq.**
Goodwin Procter LLP	**Thomas A. Fitzgerald**	**Rakesh Gopalan, Esq.**
100 Northern Avenue	**Chief Financial Officer**	**McGuireWoods LLP**
Boston, MA 02210	**TransCode Therapeutics, Inc.**	**1251 Avenue of the Americas,**
(617) 570-1000	**6 Liberty Square, #2382**	**20th Floor**
	Boston, MA 02109	**New York, NY 10020**
	(857) 837-3099	**(212) 548-2122**

Approximate date of commencement of proposed sale to the public: As soon as practicable after the effective date of this registration statement.

If any of the securities being registered on this Form are to be offered on a delayed or continuous basis pursuant to Rule 415 under the Securities Act of 1933 check the following box. ☒

If this Form is filed to register additional securities for an offering pursuant to Rule 462(b) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

If this Form is a post-effective amendment filed pursuant to Rule 462(c) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

If this Form is a post-effective amendment filed pursuant to Rule 462(d) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

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

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

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 7(a)(2)(B) of the Securities Act. ☐

CALCULATION OF REGISTRATION FEE

Title of Each Class of Securities to be Registered	**Proposed Maximum Aggregate Offering Price(1)**	**Amount of Registration Fee(2)**
Common Stock, par value $0.0001 per share	**$28,750,000.00**	**$3,137.00**
Representative Warrant(3)	**—**	**—**
Common Stock issuable upon exercise of Representative Warrant(4)	**$ 1,562,500.00**	**$ 171.00**
Total	**$30,312,500.00**	**$3,308.00(5)**

(1) Estimated solely for the purpose of calculating the registration fee pursuant to Rule 457(o) under the Securities Act. Includes the offering price of any additional shares that the underwriters have the option to purchase.
(2) Calculated pursuant to Rule 457(o) under the Securities Act based on an estimate of the proposed maximum aggregate offering price.
(3) No fee required pursuant to Rule 457(g).
(4) We have agreed to issue to the representative of the underwriters warrants to purchase the number of shares of our common stock, or the Representative Warrants, in the aggregate equal to five percent (5%) of the shares of our common stock to be issued and sold in this offering (excluding shares issuable upon exercise of the over-allotment option described herein). The Representative Warrants are exercisable for a price per share equal to 125% of the public offering price. As estimated solely for the purpose of calculating the registration fee pursuant to Rule 457(g), the proposed maximum aggregate offering price of the common stock underlying the Representative Warrants is based on (i) 5% of an estimated 2,777,778 shares to be sold in this offering (excluding shares issuable upon exercise of the over-allotment option), or 138,888 shares, and (ii) an estimated exercise price per share equal to $11.25, or 125% of an estimated public offering price to the public of $9.00 (138,888 x $11.25 = $1,562,500).
(5) Previously paid.

The Registrant hereby amends this Registration Statement on such date or dates as may be necessary to delay its effective date until the Registrant shall file a further amendment which specifically states that this Registration Statement shall thereafter become effective in accordance with Section 8(a) of the Securities Act of 1933, as amended, or until the Registration Statement shall become effective on such date as the Securities and Exchange Commission, acting pursuant to said Section 8(a), may determine.

The information in this preliminary prospectus is not complete and may be changed. We may not sell these securities until the registration statement filed with the Securities and Exchange Commission is effective. This preliminary prospectus is not an offer to sell these securities and it is not soliciting an offer to buy these securities in any state where the offer or sale is not permitted.

PRELIMINARY PROSPECTUS SUBJECT TO COMPLETION DATED APRIL 16, 2021

2,777,778 Shares
Common Stock

TRANSCODE THERAPEUTICS

TransCode Therapeutics, Inc.

This is a firm commitment initial public offering of common stock of TransCode Therapeutics, Inc. Prior to this offering, there has been no public market for our common stock. We expect the initial public offering price to be between $8.00 and $10.00 per share.

We have applied to list our common stock on the Nasdaq Capital Market under the symbol “RNAZ.”

We are an “emerging growth company,” as that term is used in the Jumpstart Our Business Startups Act of 2012, as amended, or JOBS Act, and, as such, we have elected to comply with certain reduced public company reporting requirements for this prospectus and future filings.

Investing in our common stock involves a high degree of risk. See “Risk Factors” beginning on page 10. Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or passed upon the accuracy or adequacy of this prospectus. Any representation to the contrary is a criminal offense.

	Per Share	Total
Initial public offering price	$	$
Underwriting discounts and commissions[(1)]	$	$
Proceeds to us, before expenses	$	$

(1) Underwriting discounts and commissions do not include a non-accountable expense allowance equal to 1.0% of the initial public offering price payable to the underwriters, the reimbursement of certain expenses of the underwriter we have agreed to pay and certain other compensation. See “Underwriting” for a description of, and additional information regarding, compensation payable to the underwriters.

We have granted a 45-day option to the representative of the underwriters to purchase up to an additional 416,666 shares of common stock solely to cover over-allotments, if any.

The underwriters expect to deliver the shares on or about 2021.

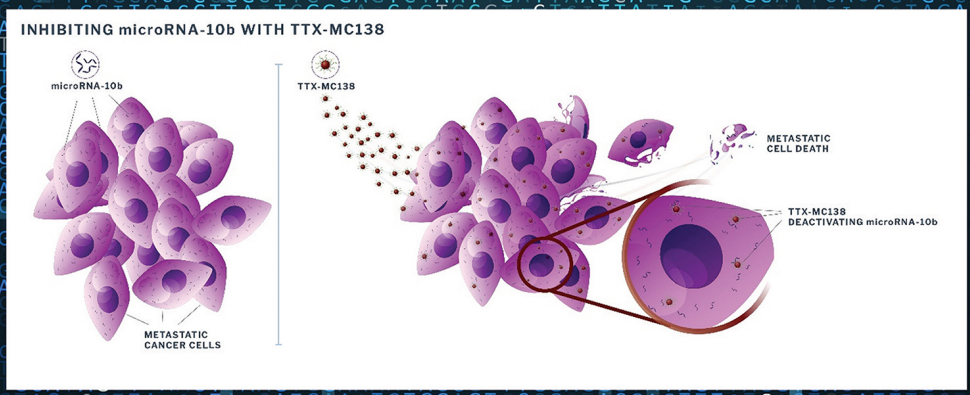
ThinkEquity

a division of Fordham Financial Management, Inc.

The date of this prospectus is , 2021

All of us have been affected by cancer. Our personal experience drives our urgency to make TransCode the leading RNA Oncology company, advancing new scientific discoveries to revolutionize the way cancer is treated to improve patient outcomes.

TRANSCODE THERAPEUTICS



Drug Candidate	Target	Disease Indication	Discovery	Preclinical	Phase 0	Phase 1	Phase 2	Phase 3	Key Anticipated Milestones
TTX-MC138	miR-10b	Metastatic Cancer							Tox study Q2 '21; Ph0 Q4 '21
		Glioblastoma (GBM)							Preclinical study 1H '21
TTX-siPDL1	PD-L1	Solid Tumors							Preclinical study 1H '21
TTX-siLin28b *	Lin28b	Solid Tumors							Preclinical Study 1H '21
TTX-RIGA	Multiple	Cancer Agnostic							Preclinical Studies 2H '21

* TransCode has signed an Exclusive Option Agreement with The General Hospital Corporation, d/b/a Massachusetts General Hospital, or MGH, for TTX-siLin28b. Under this Option, TransCode has the right to negotiate a license to this asset with MGH. TransCode's decision will depend on the results of a preclinical study it plans to conduct in the first half of 2021.

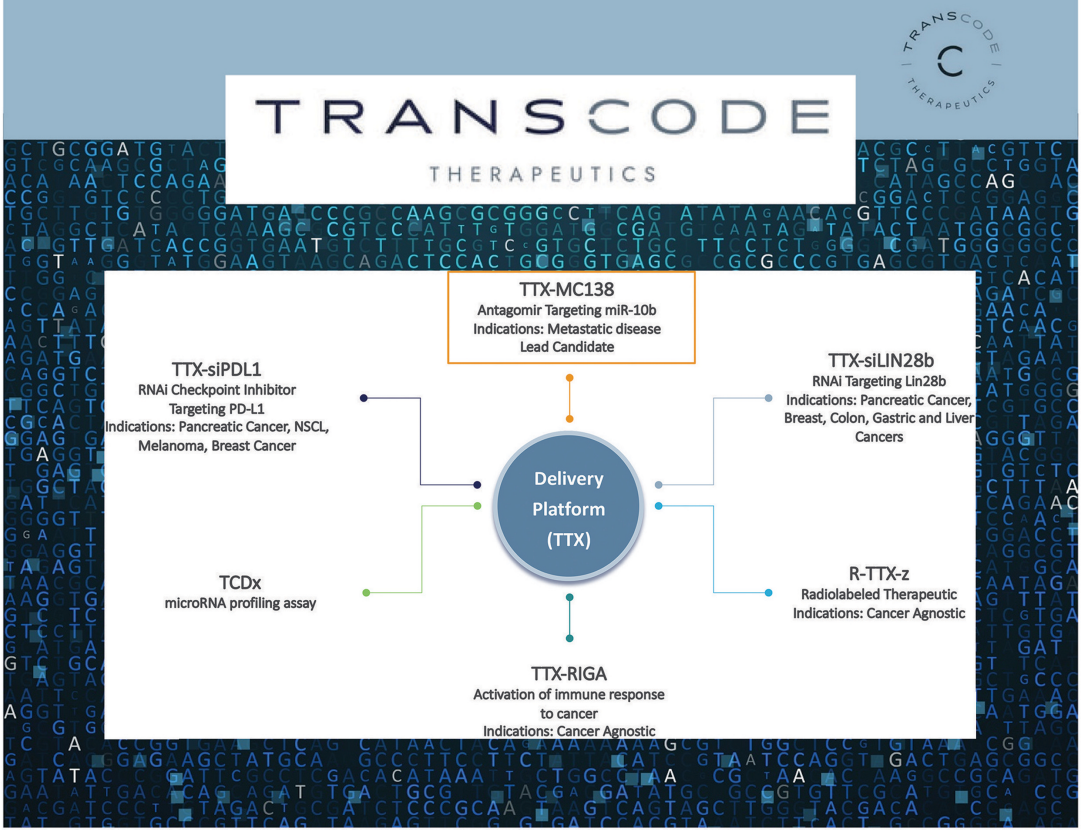


Table of Contents

PROSPECTUS SUMMARY	1
THE OFFERING	6
SUMMARY FINANCIAL DATA	8
RISK FACTORS	10
USE OF PROCEEDS	66
DIVIDEND POLICY	68
CAPITALIZATION	69
DILUTION	71
MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS	74
BUSINESS	89
MANAGEMENT	134
EXECUTIVE COMPENSATION	142
CERTAIN RELATIONSHIPS AND RELATED PARTY TRANSACTIONS	150
PRINCIPAL STOCKHOLDERS	151
DESCRIPTION OF CAPITAL STOCK	153
SHARES ELIGIBLE FOR FUTURE SALE	158
MATERIAL U.S. FEDERAL INCOME TAX CONSIDERATIONS TO NON-U.S. HOLDERS	160
UNDERWRITING	164
LEGAL MATTERS	170
EXPERTS	170
WHERE YOU CAN OBTAIN MORE INFORMATION	171

Neither we nor the underwriters have authorized anyone to provide you with information other than that contained in this prospectus or any free writing prospectus prepared by or on our behalf or to which we have referred you. We and the underwriters take no responsibility for, and can provide no assurance as to the reliability of, any other information that others may give you. We and the underwriters are offering to sell, and seeking offers to buy, common stock only in jurisdictions where offers and sales are permitted. The information contained in this prospectus is accurate only as of the date on the front cover page of this prospectus, or other earlier date stated in this prospectus, regardless of the time of delivery of this prospectus or of any sale of our common stock. Our business, financial condition, results of operations and future prospects may have changed since that date.

No action is being taken in any jurisdiction outside the United States to permit a public offering of our common stock or possession or distribution of this prospectus in that jurisdiction. Persons who come into possession of this prospectus in jurisdictions outside the United States are required to inform themselves about and to observe any restrictions as to this offering and the distribution of this prospectus applicable to that jurisdiction.

This prospectus may contain trademarks, service marks and trade names of third parties which are the property of their respective owners. Our use or display of third parties' trademarks, service marks, trade names or products in this prospectus is not intended to, and does not imply a relationship with, or endorsement or sponsorship by us. Solely for convenience, the trademarks, service marks and trade names referred to in this prospectus may appear without the ®, TM or SM symbols, but the omission of such references is not intended to indicate, in any way, that we will not assert, to the fullest extent under applicable law, our rights or the right of the applicable owner of these trademarks, service marks and trade names.

Until and including , 2021 (25 days after the date of this prospectus), all dealers that buy, sell or trade our common stock, whether or not participating in this offering, may be required to deliver a prospectus. This delivery requirement is in addition to the obligation of dealers to deliver a prospectus when acting as underwriters and with respect to their unsold allotments or subscriptions.

PROSPECTUS SUMMARY

This summary highlights information contained elsewhere in this prospectus. This summary provides an overview of selected information and does not contain all of the information you should consider before investing in our securities. You should read the entire prospectus carefully, especially the "*Risk Factors*," "*Management's Discussion and Analysis of Financial Condition and Results of Operations*" and our financial statements and the accompanying notes to those statements included elsewhere in this prospectus before making an investment decision. Unless the context requires otherwise, references to the "Company," "TransCode" "we," "us," and "our" refer to TransCode Therapeutics, Inc., a Delaware corporation.

Overview

TransCode Therapeutics is an emerging RNA oncology company, created on the belief that cancer can be defeated through the intelligent design and effective delivery of RNA therapeutics. We have created a platform of drug candidates designed to target a variety of tumor types with the objective of significantly improving patient outcomes. Our lead therapeutic candidate, TTX-MC138, is focused on treating metastatic cancer, which causes approximately 90% of all cancer deaths representing over nine million deaths per year worldwide. We believe that TTX-MC138 has the potential to produce regression without recurrence in a range of cancers, including breast, pancreatic, ovarian and colon cancer, glioblastomas and others. Our drug candidates, TTX-siPDL1 and TTX-siLIN28b, focus on the treatment of tumors by targeting PD-L1 and Lin28b, respectively.

For decades, RNA has been a topic of investigation by the scientific community as a potentially attractive therapeutic modality because it can target any gene and it lends itself to rational and straightforward drug design. RNA-based therapeutics are highly selective to their targets with the potential to unleash a broad array of previously undruggable targets in the human genome. To date, research into RNA efficacy has been limited due to three delivery-related challenges: protecting the RNA from being dismantled by the immune system; maintaining stability so the molecule has time to do its job; and penetrating the targeted organs and cells. We believe these challenges have led researchers to focus on other approaches to cancer therapeutics. Our strategy seeks to overcome these delivery challenges by repurposing a particle used extensively in humans for imaging purposes to deliver synthetic RNA molecules (called oligonucleotides) to cancer cells.

We anticipate submitting an exploratory investigational new drug application, or eIND, in the second half of 2021 to support initiation of a First-in-Human (FIH) clinical study with TTX-MC138. This study is intended to demonstrate delivery of our lead therapeutic candidate inside metastatic tumor cells, as well as engagement of the microRNA-10b target, a well-validated biomarker linked to metastatic cancer. We believe that demonstrating our ability to overcome the challenge of RNA delivery to genetic targets outside the liver would represent a major step forward in unlocking therapeutic access to genetic targets involved in a range of cancers.

Product Candidate

Our scientific founders developed the initial TransCode therapeutic candidate at The General Hospital Corporation, d/b/a Massachusetts General Hospital, or MGH, to target microRNA-10b. In contrast, most anti-cancer therapies target primary tumors and do not address metastatic disease specifically. MicroRNA-10b, or miR-10b, has been shown to be the master regulator of metastatic disease in multiple tumor types. Effective therapeutics have not been developed targeting microRNA-10b because of challenges in delivering therapeutics to this target in tumors despite microRNA-10b's strong association with cancer metastasis as documented in over 200 peer-reviewed scientific publications over the last ten years.

TTX-MC138 comprises proprietary iron-oxide nanoparticles and oligonucleotides that specifically target microRNA-10b. The nanoparticles serve as the vehicle to deliver oligonucleotides to metastatic cancer cells. The magnetic properties of these nanoparticles allow for monitoring of their delivery using non-invasive imaging, which we believe adds value for clinical implementation of this therapeutic approach.

Our scientific co-founders conducted a variety of preclinical animal studies involving human metastatic breast cancer models. In these studies, TTX-MC138 was successfully delivered to metastatic lesions in the lymph nodes, lungs, and bones as shown by non-invasive imaging performed 24 hours after

injection. In five separate studies comprising over 125 mice, TTX-MC138 was injected into mice in which metastatic breast cancer tumors had been implanted. These mice models included: the rodent 4T1-luc2 cell line, which is a very aggressive model of stage IV metastatic breast cancer, the human MDA-MB-231-luc-D3H2LN cell line, which is a stage II/III cancer model, and the human MDA-MB-231-BrM2-831 cell line, which is a model of breast cancer metastatic to the brain. Tumors in mice implanted with MDA-MB231 cells typically progress from localized disease to lymph node metastases within 21 days of implantation. Tumors in mice implanted with 4T1-luc2 cells typically progress to distant sites in the animals within 10 days of implantation.

To test TTX-MC138 in the model of lymph node metastatic breast cancer, mice had their primary tumors surgically removed four to five weeks after tumor inoculation, following confirmation of lymph node metastases via imaging. This was done to better simulate a clinical scenario with humans, since the current standard of care involves surgical removal of the primary tumor in patients with lymph node metastatic breast cancer. Treatment with TTX-MC138 was then initiated during the week of tumor removal. Because tumors in mice replicate more rapidly than is typical in humans, we combined low-dose doxorubicin with the TTX-MC138 because doxorubicin slows metastatic cell replication specific to these tumor models. Doing so allowed TTX-MC138 to more efficiently reach and inhibit the targeted RNA (miR-10b) inside the tumor cells.

After four weeks of therapy, mice treated with TTX-MC138 showed complete regression of lymph node metastases. By contrast, in the control groups, there was metastatic progression (Within-Subjects ANOVA: $p < 0.05$). Treatment was discontinued once complete metastatic regression was observed. By the end of the study at 12 weeks, no recurrence of disease was observed and there was complete regression without recurrence in 100% of treated subjects having this cancer model.

In similar studies involving mice implanted with 4T1-luc2 breast tumors, we observed regression of distant metastases by week six, at which point treatment was stopped (Within-Subjects ANOVA: $p < 0.05$). Despite stopping treatment, the animals remained metastasis-free and by the end of the study, at eight weeks, no recurrence of disease had been observed, as determined by bioluminescence optical imaging. There was evidence of complete regression without recurrence in 65% of treated subjects while 35% progressed due, we believe, to insufficient inhibition of miR-10b in this group. We believe this was due to the high cell replication rate of the tumor model, which we do not expect to be the case in humans with metastatic disease, whose replication rates are dramatically lower than in mouse models.

Concurrent with the FIH study with our lead therapeutic candidate, we expect to conduct additional IND enabling studies to support an IND for a Phase I clinical trial with TTX-MC138. We expect to file this Phase I IND in the second half of 2022.

Modular Design Toolbox

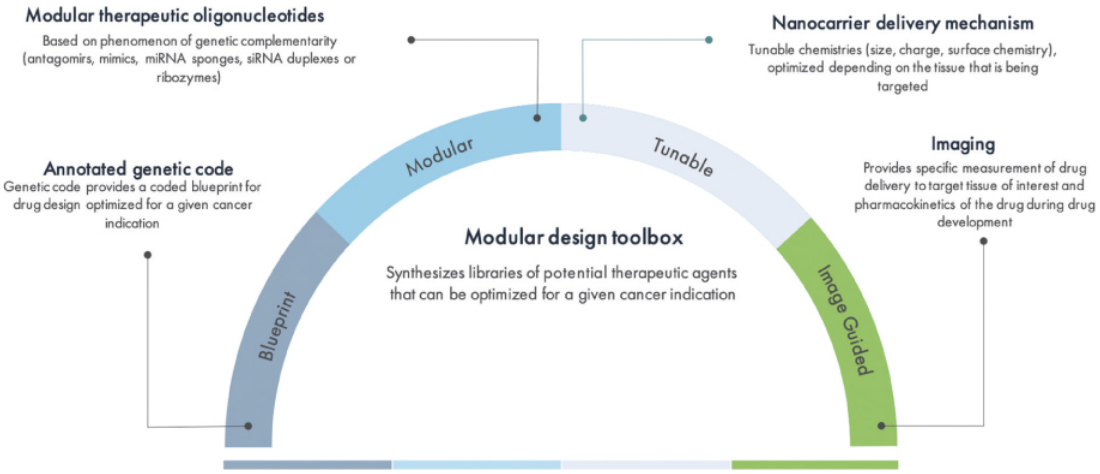
We employ a modular drug design approach to develop product candidates that we believe can efficiently deliver therapeutics to genetic targets. This approach is based on four complementary design elements that together address the challenges of RNA drug development in oncology:

- **Modular Design for Therapeutic Development —** Our discovery platform consists of a modular ‘toolbox’ for developing therapeutic candidates designed to attack specific disease-causing RNA targets based on the phenomenon of genetic complementarity. These therapeutics incorporate synthetic RNA/DNA molecules called oligonucleotides (oligos), that can be designed as antagomirs, mimics, miRNA sponges, siRNA duplexes, ribozymes, and others depending on the desired therapeutic strategy. In addition to the varied oligo design approach, we can also synthesize nanocarriers with tunable chemistry properties. Combined, the modularity and tunability of these oligonucleotides and nanocarrier components allow us to synthesize libraries of potential therapeutic agents designed for a given indication or a given patient in terms of therapeutic oligonucleotide design, size, surface coating and charge, hydrophilicity and hydrophobicity, and antigen-targeting through incorporation of targeting peptides.
- **Genetic Code —** Our approach to drug development takes advantage of our rapidly expanding knowledge about the human genome and the annotation of the genome — the knowledge about what different genes are responsible for especially in cancer. Armed with this knowledge, we can take

advantage of the coded nature of the genome to design specific oligos that correspond to genetic targets of interest. Once we determine the code of the cancer target, we can develop therapeutic candidates using specific oligos that are harmonized to that target and potentially rewrite the story on cancer. This is what TransCode means — to change the code.

- **Nanocarrier Delivery Mechanism** — Our strategy seeks to leverage a nanoparticle that has been extensively used in humans for imaging by repurposing it to deliver oligonucleotides to cancer cells. The nanocarrier is tunable to pre-designed specifications to deliver therapeutic oligonucleotides to an RNA target in tumors and metastases without compromising its integrity. These nanocarriers differentiate us from competitive delivery approaches which rely on lipid particles or chemical structures, such as GalNAc. Competitive delivery approaches effectively target sites in the liver but not sites in tumors and metastases. Our nanocarrier is derived from and is chemically similar to nanoparticles extensively used in imaging (Feridex, AdvancedMagnetics) or for treating iron deficiency anemia (Feraheme, AdvancedMagnetics).
- **Image Guided** — Because our product candidates are innately detectable using non-invasive imaging, we can monitor their delivery to the tissue of interest and measure their bioavailability. The ability to monitor delivery using Magnetic Resonance Imaging, or MRI, can be instrumental to assessing and controlling the amount of oligonucleotide that reaches the targeted tissues. MRI use during the design phase of the product candidate could guide drug design, delivery schedule, route, and dose and could suggest alternatives should treatment with the therapeutic candidate fail in a given patient. This is critical during drug development because it should allow us to optimize drug design to maximize therapeutic effect.

The following chart summarizes our modular design approach:



Our Team

At TransCode, we are driven to change how cancer is treated both as a therapeutic modality and in terms of improving patient outcomes. We believe in the potential of RNA therapeutics to offer patients complete regression of their disease without recurrence rather than the current norm of giving patients additional months of survival. We are led by an experienced team of dedicated scientists and experts with decades of experience in the foundational areas of RNA and drug development, including RNA drug development using antisense oligonucleotide, or ASO, and silencing RNA approaches. Our co-founder and CEO, Robert Michael Dudley, has over 40 years of executive leadership experience in the fields of medical device, diagnostics and therapeutics. Dr. Zdravka Medarova, our co-founder and Vice President of Drug Discovery, is a geneticist and cancer biologist by training. She is an internationally recognized leader in the field of non-coding RNAs for cancer therapy and one of the inventors of TransCode's technology. She developed the core TTX delivery platform and validated many of the therapeutic targets. Dr. Anna Moore, our third co-founder, is internationally known for her groundbreaking research on targeted imaging and image-guided therapy. Thomas A. Fitzgerald, our CFO, has over 30 years of accomplishments as a

CFO and an investment banker for companies from emerging growth to turnarounds to Fortune 500 in the life sciences, technology, financial and industrial sectors. Dr. Peter Liu, our Chief Scientist, has over 20 years of research and development, experience and leadership in the biopharma industry and has in-depth knowledge and expertise in chemistry, oligonucleotide biochemistry, and assay development. Overall, the management team has years of experience and expertise in areas of healthcare, business development and management, finance, clinical operations and project management as well as mergers and acquisitions, transactions. In addition, our advisory team has years of experience and expertise in chemistry manufacturing controls, or CMC, scaleup and commercialization of oligonucleotide and nanoparticle based therapeutics as well as expertise in regulatory affairs, business strategy, legal, and clinical trial design.

Corporate Information

We were incorporated in the State of Delaware in January 2016. The address of our principal executive office is 6 Liberty Square, #2382, Boston, Massachusetts 02109; our telephone number is (857)-837-3099. Our website is www.transcodetherapeutics.com. Information contained in, or that can be accessed through, our website is not incorporated by reference into this prospectus, and you should not consider information on our website to be part of this prospectus.

SUMMARY OF RISK FACTORS

Our business is subject to numerous risks and uncertainties, including those highlighted in the section titled “Risk Factors” immediately following this prospectus summary. These risks include the following, any of which could have a material adverse effect on our business, financial condition or results of operations, and our stock price:

- 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.
- Even if we consummate this offering, we will need to raise substantial additional funding. If we are unable to raise capital when needed or on attractive terms, we would be forced to delay, scale back or discontinue some of our product candidate development programs or commercialization efforts.
- Our independent public accounting firm has expressed substantial doubt about our ability to continue as a going concern.
- 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 or generating product revenues.
- Clinical development involves a lengthy, complex and expensive process, with an uncertain outcome, and the results of preclinical studies and early-stage clinical trials of our product candidates may not be predictive of the results of later-stage clinical trials.
- We may incur additional costs or experience delays in completing, or ultimately be unable to complete, the development and commercialization of TTX-MC138 or any of our other product candidates in development.
- If we encounter difficulties enrolling patients in our clinical trials, our clinical development activities could be delayed or otherwise adversely affected.
- Ongoing healthcare legislative and regulatory reform measures may adversely affect us.
- We expect to rely on third-party manufacturing and supply vendors, and our supply of research and development, preclinical and clinical development materials may be limited or interrupted or may not be of satisfactory quantity or quality.
- To market and distribute any product candidates that receive marketing approval, we will need to partner with others, which attempts may not succeed, and even if successful, may not be profitable for us, or we may have to develop our own capabilities which we have no experience doing and which could be costly, time consuming and unsuccessful.
- Unstable market and economic conditions may have serious adverse consequences on us and our stock price.

- If we are not able to obtain and enforce patent and other intellectual property protection for our technologies, development and commercialization of our product candidates may be adversely affected and our business materially harmed. If we become engaged in patent litigation, it would be costly and time consuming which may also adversely affect other aspects of our business.

IMPLICATIONS OF BEING AN EMERGING GROWTH COMPANY AND A SMALLER REPORTING COMPANY

We qualify as an "emerging growth company" as defined in the Jumpstart Our Business Startups Act of 2012, as amended, or the JOBS Act. As an emerging growth company, we may take advantage of specified reduced disclosure and other requirements that are otherwise applicable generally to public companies. These provisions include those that allow us to:

- provide only two years of audited financial statements in addition to any required unaudited interim financial statements with correspondingly reduced "Management's Discussion and Analysis of Financial Condition and Results of Operations" disclosure;
- make reduced disclosure about our executive compensation arrangements;
- hold no non-binding advisory votes on executive compensation or golden parachute arrangements; and
- exempt us from the auditor attestation requirement in the assessment of our internal control over financial reporting.

We may take advantage of these exemptions for up to five years or such earlier time that we are no longer an emerging growth company. We would cease to be an emerging growth company on the date that is the earliest of (i) the last day of the fiscal year in which we have total annual gross revenues of $1.07 billion or more; (ii) the last day of our fiscal year following the fifth anniversary of the date of the completion of this offering; (iii) the date on which we have issued more than $1 billion in nonconvertible debt during the previous three years; or (iv) the date on which we are deemed to be a large accelerated filer under the rules of the SEC. We may choose to take advantage of some but not all of these exemptions. We have taken advantage of reduced reporting requirements in this prospectus. Accordingly, the information contained herein may be different from the information you receive from other public companies in which you hold stock. Additionally, the JOBS Act provides that an emerging growth company can take advantage of an extended transition period for complying with new or revised accounting standards. This allows an emerging growth company to delay the adoption of certain accounting standards until those standards would otherwise apply to private companies. We have elected to avail ourselves of this exemption and, therefore, while we are an emerging growth company, and we will not be subject to new or revised accounting standards at the same time that they become applicable to other public companies that are not emerging growth companies.

We are also a "smaller reporting company" as defined in the Exchange Act. We may continue to be a smaller reporting company even after we are no longer an emerging growth company. We may take advantage of certain of the scaled disclosures available to smaller reporting companies until the fiscal year following the determination that our voting and non-voting common stock held by non-affiliates is more than $250 million measured on the last business day of our second fiscal quarter, or our annual revenues are less than $100 million during the most recently completed fiscal year and our voting and non-voting common stock held by non-affiliates is more than $700 million measured on the last business day of our second fiscal quarter.

THE OFFERING

Common Stock offered by us	2,777,778 shares of our common stock (3,194,444 shares if the underwriters exercise their over-allotment option in full).
Common Stock to be outstanding after this offering	8,485,084 shares of common stock (8,901,750 shares if the underwriters exercises their over-allotment option in full)[(1)].
Over-Allotment Option	The underwriters have an option for a period of 45 days to purchase up to 416,666 additional shares of our common stock to cover over-allotments, if any.
Use of Proceeds	We intend to use the net proceeds of this offering to fund (i) clinical studies and related regulatory and development work for TTX-MC138, our lead drug candidate, (ii) strategic expansion of our drug candidate portfolio through internal research or the acquisition or in-licensing of intellectual property assets, and (iii) working capital and for general corporate purposes. See "*Use of Proceeds.*"
Lock-up Agreements	We, all of our directors and officers and substantially all of our stockholders have agreed with the underwriters, subject to certain exceptions, not to sell, transfer or dispose of, directly or indirectly, any of our common stock or securities convertible into or exercisable or exchangeable for our common stock for a period of six months (12 months for directors and officers) after the date of the final closing of this offering. See "*Shares Eligible for Future Sale*" and "*Underwriting*" for more information.
Representative's Warrants	The registration statement of which this prospectus is a part also registers for sale warrants to purchase 138,888 shares of our common stock which we will issue to the representative of the underwriters as a portion of the underwriting compensation payable to the underwriters in connection with this offering. The warrants will be exercisable for a four-and-one-half year period commencing 180 days following the effective date of the registration statement of which this prospectus is a part at an exercise price equal to 125% of the initial public offering price of the common stock. Please see "*Underwriting — Representative's Warrants*" for a description of these warrants.
Risk Factors	Investing in our securities involves a high degree of risk. See "*Risk Factors*" beginning on page 10.
Proposed Trading Symbol	We have applied to list our common stock on the Nasdaq Capital Market under the symbol "RNAZ".

(1) The number of shares of common stock to be outstanding after the offering is based on 5,707,306 shares of common stock outstanding as of December 31, 2020, after giving effect to the conversion of all outstanding shares of our convertible promissory notes into 1,058,475 shares of our common stock immediately prior to the closing of this offering, and the exercise of warrants to purchase 12,615 shares of our common stock immediately prior to the closing of this offering, and excludes, as of that date, the following:

- 1,792,672 shares of common stock issuable upon exercise of outstanding stock options at a weighted average exercise price of $0.32 per share;
- 1,240,115 shares of common stock reserved under our existing 2020 Stock Option and Incentive Plan, or the 2020 Plan, which Plan will terminate upon completion of this offering;

- 2,500,000 shares of common stock to be reserved for future issuance under our 2021 Stock Option and Equity Incentive Plan, or the 2021 Plan, to be effective on the day immediately prior to the effectiveness of the registration statement of which this prospectus forms a part; and
- 150,000 shares of common stock to be reserved for future issuance under our 2021 Employee Stock Purchase Plan, or our 2021 ESPP, to be effective on the day immediately prior to the effectiveness of the registration statement of which this prospectus forms a part.

Except as otherwise indicated herein, all information in this prospectus assumes the following:

- a 1-for-1.6486484 reverse stock split of our common stock effected March 22, 2021;
- no exercise by the underwriter of its over-allotment option to purchase additional shares;
- no exercise of the representative's warrants to be issued upon consummation of this offering at an exercise price equal to 125% of the initial offering price of the common stock; and
- the filing and effectiveness of our amended and restated certificate of incorporation and the effectiveness of our amended and restated bylaws, which will occur immediately prior to the completion of this offering.

SUMMARY FINANCIAL DATA

You should read the following summary financial data together with "Management's Discussion and Analysis of Financial Condition and Results of Operations" and our financial statements and related notes included elsewhere in this prospectus. The following summary statement of operations data for the years ended December 31, 2020 and 2019, and the balance sheet data at December 31, 2020 and 2019, are derived from our audited financial statements that are included elsewhere in this prospectus. These summary financial data are not intended to replace our financial statements and related notes and are qualified in their entirety by the financial statements and related notes included elsewhere in this prospectus. Our historical results are not necessarily indicative of our results in any future period and our results for any interim period are not necessarily indicative of results that should be expected for any full year.

	Years Ended December 31,	
	2020	2019
Statement of Operations Data		
Operating expenses		
Research and development	$ 284,459	$ 226,309
General and administrative	442,145	230,556
Total operating expenses	726,604	456,865
Operating loss	(726,604)	(456,865)
Other income (expense)		
Change in fair value of derivative liabilities	(1,208,000)	4,000
Change in fair value of warranty liability	(14,852)	2,584
Interest expense	(394,573)	(156,965)
Interest income	136	34
Total other income (expense)	(1,617,289)	(150,347)
Loss before income taxes	(2,343,893)	(607,212)
Income tax expense (benefit)	—	—
Net loss	$(2,343,893)	$ (607,212)
Basic and diluted loss per common share	$ (0.51)	$ (0.13)
Weighted average number of common shares outstanding, basic and diluted[(1)]	4,636,216	4,636,216
Pro forma net loss per common share – basic and diluted (unaudited)[(2)]	$ (0.32)	$ (0.09)
Pro forma weighted average common shares outstanding (unaudited)[(2)]	6,040,735	5,126,193

(1) See note 10 to our audited financial statements appearing at the end of this prospectus for further details on the calculation of basic and diluted net loss per common share.

(2) Reflects (i) the automatic conversion of all outstanding convertible promissory notes plus accrued interest as of December 31, 2020, into 1,038,309 shares of our common stock, (ii) exercise of all warrants outstanding prior to this offering (assumed to be 12,385 shares), (iii) elimination of interest expense related to convertible promissory notes and (iv) exercise of 353,824 stock options vested at December 31, 2020.

	December 31, 2020		
	Actual	Pro Forma[3]	Pro Forma As Adjusted[4]
Balance Sheet Data			
Current assets	$ 831,215	$ 831,215	$22,856,217
Deferred offering costs	224,153	224,153	—
Total assets	1,055,368	1,055,368	22,856,217
Current liabilities	404,862	404,862	404,862
Convertible promissory notes, net of unamortized debt issuance costs and debt discount	2,086,675	—	—
Derivative liabilities	1,751,000	—	—
Total liabilities	4,463,600	404,862	404,862
Total stockholders' equity (deficit)	(3,408,232)	650,506	22,451,355

(3) Reflects (i) the automatic conversion of all outstanding convertible promissory notes plus accrued interest as of April 30, 2021, the expected closing date of this offering, into 1,058,475 shares of our common stock, and (ii) exercise of all warrants outstanding prior to this offering (assumed to be 12,615 shares).

(4) Reflects the effect of our issuance and sale of 2,777,778 shares of our common stock in this offering at an assumed initial public offering price of $9.00 per share, which is the midpoint of the price range set forth on the cover page of this prospectus, after deducting estimated underwriting discounts and commissions, estimated offering expenses payable by us, and deferred offering costs.

The pro forma as adjusted information is illustrative only, and will depend on the actual initial public offering price and other terms of this offering determined at pricing. Each $1.00 increase or decrease in the assumed initial public offering price of $9.00 per share, the midpoint of the price range set forth on the cover page of this prospectus, would increase or decrease, as applicable, the pro forma as adjusted amount of each of cash and cash equivalents, working capital, total assets and stockholders' equity by approximately $2.6 million, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. We may also increase or decrease the number of shares we are offering. Each increase or decrease of one million in the number of shares we are offering would increase or decrease, as applicable, the pro forma as adjusted amount of each of cash and cash equivalents, working capital, total assets and stockholders' equity by approximately $8.3 million, assuming no change in the assumed initial public offering price per share, the midpoint of the price range set forth on the cover page of this prospectus after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

RISK FACTORS

Investing in our common stock involves a high degree of risk. You should carefully consider the risks described below, as well as the other information in this prospectus, including our financial statements and the related notes thereto and the section of this prospectus titled "Management's Discussion and Analysis of Financial Condition and Results of Operations" before you make an investment decision. We have listed below (not necessarily in order of importance or probability of occurrence) what we believe to be the most significant risk factors applicable to us, but they do not constitute all of the risks that may be applicable to us. The occurrence of any of the events or developments described below could harm our business, financial condition, results of operations and prospects. As a result, the market price of our common stock could decline, and you may lose all or part of your investment in our common stock.

Risks related to our financial position and need for additional capital

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 oncology 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. Our lead product candidate, TTX-MC138, is currently in the early stages and we expect to submit an IND for TTX-MC138 in the second half of 2021, and if permitted to proceed, to initiate a Phase 0 trial in patients with stage IV breast cancer shortly thereafter. We have no products licensed for commercial sale and have not generated any revenue from product sales or otherwise 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 the issuance of convertible promissory notes.

We have incurred significant net losses in each period since inception. For the years ended December 31, 2020 and 2019, our net losses were $2,343,893 and $607,212, respectively. As of December 31, 2020, our total stockholders' deficit was $3,408,232. We expect to continue to incur significant losses for the foreseeable future, and we expect these losses to increase substantially if and as we:

- conduct preclinical studies and clinical trials for our current and future product candidates;
- continue our research and development efforts and submit INDs for future product candidates;
- seek marketing approvals for any product candidates that successfully complete clinical trials;
- build infrastructure to support sales and marketing for any approved product candidates;
- scale up external manufacturing and distribution capabilities for clinical and, if approved, commercial supply of our product candidates;
- expand, maintain and attempt to protect our intellectual property portfolio;
- hire additional clinical, regulatory, scientific and other personnel; and
- operate as a public company.

Because of the numerous risks and uncertainties associated with biopharmaceutical 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 eventually commercializing one or more of our product candidates, we will continue to incur substantial research and development and other expenditures to develop, seek approval for, and market product candidates. We may never succeed in these activities and, even if we succeed in commercializing one or more of our current product candidates and any future product candidates, we may never generate revenues that are significant or large enough to achieve profitability. In addition, we may encounter unforeseen expenses, difficulties, complications, delays and other known and unknown challenges 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 stockholders' equity (deficit).

We have never generated any revenue from product sales 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 product sales. We have no products approved for commercial sale, and do not anticipate generating any revenue from product sales until after we have received marketing approval for the commercial sale of a product candidate, if ever. Our ability to generate revenue and achieve profitability depends significantly on our success in achieving a number of goals, including:

- initiating and completing research regarding, and preclinical and clinical development of, TTX-MC138 and any future product candidates;
- developing a sustainable and scalable manufacturing process for TTX-MC138 or our other product candidates and any future product candidates, including establishing and maintaining commercially viable supply and manufacturing relationships with third parties;
- launching and commercializing TTX-MC138, our other product candidates and any future product candidates for which we obtain marketing approvals, either directly or with a collaborator or distributor;
- obtaining market acceptance of TTX-MC138, our other product candidates and any future product candidates as viable treatment options;
- addressing any competing technological and market developments;
- identifying, assessing, acquiring and developing new product candidates;
- negotiating favorable terms in any collaboration, licensing, or other arrangements into which we may enter;
- obtaining, maintaining, attempting protection of, and expanding our portfolio of intellectual property rights, including patents, trade secrets, and know-how; and
- attracting, hiring, and retaining qualified personnel.

Even if our current product candidates or any future product candidates that we develop are approved for commercial sale, we anticipate incurring significant costs associated with commercializing any such product candidate. Our expenses could increase beyond expectations if we are required by the FDA or comparable foreign regulatory authorities to change our manufacturing processes or assays, or to perform clinical, nonclinical, or other types of studies in addition to those that we currently anticipate.

If we are successful in the future in obtaining regulatory approvals to market TTX-MC138 or any future product candidates, our revenue will be dependent, in part, upon the size of the markets in the territories for which we gain marketing approval, the price for the product we obtain, the ability to get reimbursement at any price and whether we own the commercial rights for that territory. If the number of addressable patients is not as significant as we estimate, the indication approved by regulatory authorities is narrower than we expect, the labels for our current product candidates and any future product candidates contain significant safety warnings, regulatory authorities impose burdensome or restrictive distribution requirements, or the reasonably accepted patient population for treatment is narrowed by competition, physician choice or treatment guidelines, we may not generate significant revenue from sales of such products, even if approved. If we are not able to generate sufficient revenue from the sale of any approved products, we could be prevented from or significantly delayed in achieving profitability.

Even if we achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis. Our failure to become and remain profitable would depress the value of our company and could impair our ability to raise capital, expand our business, maintain our development efforts, obtain product approvals, diversify our product offerings or continue our operations. A decline in the value of our company could also cause you to lose all or part of your investment.

Even if we consummate this offering, we will need to raise substantial additional funding. If we are unable to raise capital when needed, we would be forced to delay, scale back or discontinue some of our product candidate development programs or commercialization efforts.

The development of pharmaceutical drugs is capital intensive. We are currently advancing TTX-MC138 through preclinical development. Our current cash resources are insufficient to fund our planned

operations or development plans. If we raise less than anticipated in this offering, we may only be able to complete our proposed first-in-human, or FIH, studies in a small subset of patients and in only one tumor type. We may not have accurately anticipated how much we will accomplish with the funds from this offering. We may require additional funds to achieve even these more limited objectives which, if achieved, will still require additional funds to advance further. If we are capital constrained, we may not be able to meet our obligations. If we are unable to meet our obligations, or we experience a disruption in our cash flows, it could limit or halt our ability to continue to develop our product candidates or to even continue operations, either of which would have a material adverse effect on us.

We expect our expenses to increase in connection with our ongoing activities, particularly as we continue the research and development of, advance the preclinical and clinical activities of, and seek marketing approval for, our current or future product candidates. In addition, if we obtain marketing approval for any of our current or future product candidates, we expect to incur significant commercialization expenses related to sales, marketing, product manufacturing and distribution to the extent that such sales, marketing, product manufacturing and distribution are not the responsibility of our collaborators. We may also need to raise additional funds sooner if we choose to pursue additional indications and/or geographies for our current or future product candidates or otherwise expand more rapidly than we presently anticipate. Furthermore, upon the closing of this offering, we expect to incur additional costs associated with operating as a public company. If we are unable to raise capital when needed, we would be forced to delay, scale back or discontinue the development and commercialization of one or more of our product candidates or delay our pursuit of potential in-licenses or acquisitions.

We expect that the net proceeds from this offering, together with our existing cash and cash equivalents, will be sufficient to fund our operations through September 2022. Our future capital requirements will depend on and could increase significantly as a result of many factors, including:

- the scope, progress, results and costs of drug discovery, preclinical development, laboratory testing and clinical trials for our current or future product candidates;
- the potential additional expenses attributable to adjusting our development plans (including any supply-related matters) to the COVID-19 pandemic;
- the scope, prioritization and number of our research and development programs;
- the costs, timing and outcome of regulatory review of our current or future product candidates;
- our ability to establish and maintain collaborations on favorable terms, if at all;
- the achievement of milestones or occurrence of other developments that trigger payments under any additional collaboration agreements we obtain;
- the extent to which we are obligated to reimburse, or are entitled to reimbursement of, clinical trial costs under future collaboration agreements, if any;
- the costs of preparing, filing and prosecuting patent applications, maintaining and enforcing our intellectual property rights and defending intellectual property-related claims;
- the extent to which we acquire or in-license other current or future product candidates and technologies;
- the costs of securing manufacturing arrangements for commercial production; and
- the costs of establishing or contracting for sales and marketing capabilities if we obtain regulatory approvals to market our current or future product candidates.

Identifying potential current or future product candidates and conducting preclinical testing and clinical trials is a time-consuming, expensive and uncertain process that takes years to complete, and we may never generate the necessary data or results required to obtain marketing approval and achieve drug sales. In addition, our current or future product candidates, if approved, may not achieve commercial success. Our commercial revenues, if any, will be derived from sales of drugs that we do not expect to be commercially available for many years, if ever. Accordingly, we will need to continue to rely on additional funding to achieve our business objectives.

Any additional fundraising efforts may divert our management from their day-to-day activities, which may adversely affect our ability to develop and commercialize our current or future product candidates. Disruptions in the financial markets in general, and more recently due to the COVID-19 pandemic, have made equity and debt financing more difficult to obtain and may have a material adverse effect on our ability to meet our fundraising needs. We cannot guarantee that future financing will be available in sufficient amounts or on terms favorable to us, if at all. Moreover, the terms of any financing may adversely affect the holdings or the rights of our stockholders and the issuance of additional securities, whether equity or debt, by us, or the possibility of such issuance, may cause the market price of our shares to decline. The sale of additional equity or convertible securities would dilute all of our stockholders. The incurrence of indebtedness would result in increased fixed payment obligations and we may be required to agree to certain restrictive covenants, such as limitations on our ability to incur additional debt, limitations on our ability to acquire, sell or license intellectual property rights and other operating restrictions that could adversely impact our ability to conduct our business. We could also be required to seek funds through arrangements with collaborators or otherwise at an earlier stage than otherwise would be desirable and we may be required to relinquish rights to some of our technologies or current or future product candidates or otherwise agree to terms unfavorable to us, any of which may have a material adverse effect on our business, operating results and prospects.

If we are unable to obtain funding on a timely basis, we may be required to significantly delay, scale back or discontinue one or more of our research or development programs or the commercialization of any product candidates or be unable to expand our operations or otherwise capitalize on our business opportunities, as desired, which could materially affect our business, financial condition and results of operations.

The amount of our future losses is uncertain, and our quarterly operating results may fluctuate significantly or may fall below the expectations of investors or securities analysts, each of which may cause our stock price to fluctuate or decline.

Our quarterly and annual operating results may fluctuate significantly in the future due to a variety of factors, many of which are outside of our control and may be difficult to predict, including the following:

- the timing and success or failure of clinical trials for our product candidates or competing product candidates, or any other change in the competitive landscape of our industry, including consolidation among our competitors or partners;
- our ability to successfully recruit and retain subjects for clinical trials, and any delays caused by difficulties in such efforts;
- our ability to obtain marketing approval for our product candidates, and the timing and scope of any such approvals we may receive;
- the timing and cost of, and level of investment in, research and development activities relating to our product candidates, which may change from time to time;
- the cost of manufacturing our product candidates, which may vary depending on the quantity of production and the terms of our agreements with manufacturers;
- our ability to attract, hire and retain qualified personnel;
- expenditures that we will or may incur to develop additional product candidates;
- the level of demand for our product candidates should they receive approval, which may vary significantly;
- the risk/benefit profile, cost and reimbursement policies with respect to our product candidates, if approved, and existing and potential future therapeutics that compete with our product candidates;
- general market conditions or extraordinary external events, such as a recession or the COVID-19 pandemic;
- the changing and volatile U.S. and global economic environments; and
- future accounting pronouncements or changes in our accounting policies.

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

Our independent public accounting firm has expressed substantial doubt about our ability to continue as a going concern.

Our recurring losses from operations and negative cash flow raise substantial doubt about our ability to continue as a going concern. As a result, our independent registered public accounting firm included an explanatory paragraph in its report on our financial statements for the years ended December 31, 2020 and 2019, with respect to this uncertainty. Our ability to continue as a going concern will require us to obtain additional funding. We believe that the net proceeds from this offering and our existing cash will be sufficient to fund our current operating plans through September 2022. We have based these estimates, however, on assumptions that may prove to be wrong, and we could spend our available financial resources much faster than we currently expect and need to raise additional funds sooner than we anticipate. If we are unable to raise capital when needed, we would be forced to delay, reduce or eliminate our research and development programs and commercialization efforts.

Risks related to research and development and the biopharmaceutical industry

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 preclinical-stage oncology company with a limited operating history. We commenced operations in 2016, and our operations to date have been limited to organizing and staffing our company, business planning, raising capital, conducting limited discovery and research activities, filing patent applications, identifying potential product candidates, undertaking preclinical studies and preparing for clinical trials, and establishing arrangements with third parties for the manufacture of initial quantities of our product candidates and component materials. Our lead product candidate, TTX-MC138, is currently in the early stages of development. We have not yet demonstrated our ability to successfully 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.

Investment in oncology product development 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 unable to predict the full range of risks that may emerge, and we cannot guarantee that we will meet or achieve the clinical or commercial results we expect. The future of our business depends on us successfully developing, obtaining marketing approval for, and marketing profitably our product candidates. This requires many complex scientific activities, successful pursuit of regulatory approvals, appropriate market assessments, the strategic management of intellectual property and financial resources and effective management of many other aspects of our business. Products for which we receive regulatory approval must demonstrate safety and efficacy. Competitively, the products must improve patient outcomes, deliver benefits to intended customers, maintain an affordable price, and be superior to competitive products. To be successful, we must also be effective in driving awareness of our therapeutics to achieve market adoption for our approved products and to be profitable. The risks of missteps, setbacks, errors and failings with respect to any aspect of managing our business are an inherent part of attempted innovation in the life sciences industry. We may encounter unforeseen expenses, difficulties, complications, delays and other unknown factors that may materially and adversely affect our business.

In addition, as an early-stage 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.

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 or generating product revenues.

Our product candidates are development-stage technologies which require more, complex future development as well as regulatory approval prior to commercialization. It is impossible to fully mitigate the risks associated with bringing forward new technology and developing product candidates. These product candidates may fail at any point in development or in clinical trials. Therefore, there is no assurance that any of our product candidates will be successfully developed, be approved or cleared for sale by regulators, be accepted in the market or be profitable. Any delay or setback in the development of a product-candidate could materially adversely affect us.

We may not be successful in our efforts to identify or discover additional product candidates or we may expend our limited resources to pursue a particular product candidate or indication and fail to capitalize on product candidates or indications that may be more profitable or for which there is a greater likelihood of success.

In addition to development risks, we also face the risk that existing or evolving drug regulations may create barriers to licensure that we are unable to overcome, making it impossible for us to license any product we develop. Our product candidates may fail in clinical trials. We may never achieve the product claims necessary to successfully launch any products commercially.

We may not succeed in changing the practice of medicine such that our products are adopted as we anticipate. The data we generate in our clinical programs may not be viewed by physicians as strong enough for them to use and by third-party payers as effective enough for them to reimburse the cost of our products. Further, changes in the practice of medicine may render our approved products obsolete.

We also face the risk of:

- competitors introducing technologies which render our development efforts or approved products obsolete;
- data from our clinical trials not being strong enough to support product approval or the marketing claims needed for market success and to achieve our financial projections; and
- being unable to manufacture or supply, or have manufactured or supplied on our behalf, approved products cost-effectively.

Our business is highly dependent on the success of TTX-MC138, our lead candidate which is at the early stages of development. All of our product candidates may require significant additional preclinical and clinical development before we may be able to seek regulatory approval for and launch a product commercially.

We currently have no products that are approved for commercial sale and may never be able to develop marketable products. We are very early in our development efforts, and only one of our product candidates, TTX-MC138, is in preclinical development and has yet to be tested on humans. If we are unable to successfully develop, obtain regulatory approval for and commercialize TTX-MC138, or experience significant delays in doing so, our business will be materially harmed. Advancing TTX-MC138 will require substantial investment before we can seek regulatory approval and potentially launch commercial sales. Further development of TTX-MC138 will require production scaleup, clinical studies, regulatory review and approval in the U.S. and in other jurisdictions, development of sufficient commercial manufacturing capacity, and significant marketing efforts before we can generate any revenue from product sales, if approved.

In developing TTX-MC138, among other risks, we may not be successful in synthesizing or producing the components of our proprietary formulation, or there may be toxicology issues from key components of our formulation that we have not anticipated. We have not tested TTX-MC138 using the current synthesis protocol, production processes, equipment and materials in larger quantities that would be necessary to meet clinical trial treatment demands for all anticipated patients.

We may experience setbacks that could delay or prevent regulatory approval of, or our ability to commercialize, our product candidates, including:

- negative or inconclusive results from our preclinical studies or clinical trials or positive results from the clinical trials of others for competing product candidates similar to ours leading to their approval, and evolving to a decision or requirement to conduct additional preclinical testing or clinical trials or abandon a program;
- product-related side effects experienced by patients or subjects in our clinical trials or by individuals using drugs or therapeutics that we, the FDA, other regulators or others view as relevant to the development of our product candidates;
- delays in submitting IND applications or comparable foreign applications or delays or failure in obtaining the necessary approvals from regulators to commence a clinical trial, or a suspension or termination of a clinical trial once commenced;
- conditions imposed by the FDA or comparable foreign authorities regarding the scope or design of our clinical trials, including our clinical endpoints;
- delays in enrolling subjects in clinical trials, including due to the COVID-19 pandemic;
- high drop-out rates of subjects from clinical trials;
- inadequate supply or quality of product candidates or other materials necessary for the conduct of our clinical trials;
- greater than anticipated clinical trial costs;
- inability to compete with other therapies;
- poor efficacy of our product candidates during clinical trials;
- trial results taking longer than anticipated;
- trials being subjected to fraud or data capture failure or other technical mishaps leading to the invalidation of our trials in whole or in part;
- unfavorable FDA or other regulatory agency inspection and review of a clinical trial site;
- failure of our third-party contractors or investigators to comply with regulatory requirements or otherwise meet their contractual obligations in a timely manner, or at all;
- delays related to the impact of the spread of the COVID-19 pandemic, including the impact of COVID-19 on the FDA's ability to continue its normal operations;
- delays and changes in regulatory requirements, policy and guidelines, including the imposition of additional regulatory oversight around clinical development generally or with respect to our technology in particular; or
- varying interpretations of data by the FDA and similar foreign regulatory agencies.

We do not have complete control over many of these factors, including certain aspects of clinical development and the regulatory submission process, potential threats to our intellectual property rights and our manufacturing, marketing, distribution and sales efforts or that of any future collaborator.

Clinical development involves a lengthy, complex and expensive process, with an uncertain outcome, and the results of preclinical studies and early-stage clinical trials of our product candidates may not be predictive of the results of later-stage clinical trials.

To obtain the requisite regulatory approvals to commercialize any product candidates, we must demonstrate through extensive preclinical studies and clinical trials that our product candidates are safe and

effective in humans. Clinical testing is expensive and can take many years to complete, and its outcome is inherently uncertain. In particular, the general approach for FDA approval of a new drug is dispositive data from two well-controlled, Phase 3 clinical trials of the relevant drug in the relevant patient population. Phase 3 clinical trials typically involve hundreds of patients, have significant costs and take years to complete. A product candidate can fail at any stage of testing, even after observing promising signals of activity in earlier preclinical studies or clinical trials. 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. In addition, initial success in clinical trials may not be indicative of results obtained when such trials are completed. There is typically an extremely high rate of attrition from the failure of product candidates proceeding through clinical trials. Product candidates in later stages of clinical trials may fail to show the desired safety and efficacy profile despite having progressed through preclinical studies and initial clinical trials. A number of companies in the biotechnology and biopharmaceutical industries have suffered significant setbacks in advanced clinical trials due to lack of efficacy or unacceptable safety issues, notwithstanding promising results in earlier trials. Most product candidates that commence clinical trials are never approved as therapeutic products, and there can be no assurance that any of our future clinical trials will ultimately be successful or support further clinical development of TTX-MC138 or any of our other product candidates. Product candidates that appear promising in the early phases of development may fail to reach the market for several reasons, including:

- preclinical studies or clinical trials may show the product candidates to be less effective than expected (e.g., a clinical trial could fail to meet its primary endpoint(s)) or to have unacceptable side effects or toxicities;
- failure to establish clinical endpoints that applicable regulatory authorities would consider clinically meaningful;
- failure to receive the necessary regulatory approvals;
- manufacturing costs, formulation issues, pricing or reimbursement issues, or other factors that make a product candidate uneconomical; and
- the proprietary rights of others and their competing products and technologies that may prevent one of our product candidates from being commercialized.

In addition, differences in trial design between early-stage clinical trials and later-stage clinical trials make it difficult to extrapolate the results of earlier clinical trials to later clinical trials. Moreover, clinical data are often susceptible to varying interpretations and analyses, and many companies that have believed their product candidates performed satisfactorily in clinical trials have nonetheless failed to obtain marketing approval of their products.

Additionally, we expect that some of our trials will be open-label studies, where both the patient and investigator know whether the patient is receiving the investigational product candidate as a monotherapy or in combination with an existing approved drug. Most typically, open-label clinical trials test only the investigational product candidate and sometimes do so at different dose levels. Open-label clinical trials are subject to various limitations that may exaggerate any therapeutic effect as patients in open-label clinical trials are aware when they are receiving treatment. In addition, open-label clinical trials may be subject to an “investigator bias” where those assessing and reviewing the physiological outcomes of the clinical trials are aware of which patients have received treatment and may interpret the information of the treated group more favorably given this knowledge. Therefore, it is possible that positive results observed in open-label trials will not be replicated in later placebo-controlled trials.

In addition, the standards that the FDA and comparable foreign regulatory authorities use when regulating our product candidates require judgment and can change, which makes it difficult to predict with certainty how they will be applied. Although we are initially focusing our efforts on development of small-molecule drug products, we may in the future pursue development of biological products, which could make us subject to additional regulatory requirements. Any analysis we perform of data from preclinical and clinical activities is subject to confirmation and interpretation by regulatory authorities, which could delay, limit or prevent regulatory approval. We may also encounter unexpected delays or increased costs due to new government regulations. Examples of such regulations include future legislation or administrative action,

or changes in FDA policy during the period of product development and FDA regulatory review. We cannot predict whether legislative changes will be enacted, or whether FDA or foreign regulations, guidance or interpretations will be changed, or what the impact of such changes, if any, may be. The FDA may also require a panel of experts, referred to as an Advisory Committee, to deliberate on the adequacy of the safety and efficacy data to support approval. The opinion of the Advisory Committee, although not binding, may have a significant impact on our ability to obtain approval of any product candidates that we develop.

We may seek to conduct clinical trials in foreign countries, as well as in the United States. If we continue to seek to conduct clinical trials in foreign countries or pursue marketing approvals in foreign jurisdictions, we must comply with numerous foreign regulatory requirements governing, among other things, the conduct of clinical trials, manufacturing and marketing authorization, pricing and third-party reimbursement. The foreign regulatory approval process varies among countries and may include all of the risks associated with FDA approval described above as well as risks attributable to the satisfaction of local regulations in foreign jurisdictions. Moreover, the time required to obtain approval from foreign regulatory agencies may differ from that required to obtain FDA approval. Approval by the FDA does not ensure approval by regulatory authorities outside the United States and vice versa.

Successful completion of clinical trials is a prerequisite to submitting a marketing application to the FDA and similar marketing applications to comparable foreign regulatory authorities, for each product candidate and, consequently, the ultimate approval and commercial marketing of any product candidates. We may experience negative or inconclusive results, which may result in our deciding, or our being required by regulators, to conduct additional clinical studies or trials or abandon some or all of our product development programs, which could have a material adverse effect on our business.

Due to our limited resources and access to capital, we must make decisions on the allocation of resources to certain programs and product candidates; these decisions may prove to be wrong and may adversely affect our business.

We have limited financial and human resources and intend to initially focus on research programs and product candidates for a limited set of indications. As a result, we may forgo or delay pursuit of opportunities with other product candidates or for other indications that later prove to have greater commercial potential or a greater likelihood of success. In addition, we may seek to accelerate our development timelines, including by initiating certain clinical trials of our product candidates before earlier-stage studies have been completed. This approach may cause us to commit significant resources to prepare for and conduct later-stage trials for one or more product candidates that subsequently fail earlier-stage clinical testing. Therefore, our resource allocation decisions may cause us to fail to capitalize on viable commercial products or profitable market opportunities or expend resources on product candidates that are not viable.

There can be no assurance that we will ever be able to identify additional therapeutic opportunities for our product candidates or to develop suitable potential product candidates through internal research programs, which could materially adversely affect our future growth and prospects. We may focus our efforts and resources on potential product candidates or other potential programs that ultimately prove to be unsuccessful.

We may incur additional costs or experience delays in completing, or ultimately be unable to complete, the development and commercialization of TTX-MC138 or any of our other product candidates in development.

Clinical trials are required to apply for regulatory approval to market TTX-MC138 or any of our other product candidates. Clinical trials are expensive, difficult to design and implement, can take many years to complete and are uncertain as to outcome. We do not know whether any clinical trials we begin will continue as planned, will need to be restructured or will be completed on schedule or at all. Significant clinical trial delays also could allow competitors to bring products to market before we do and could impair our ability to successfully commercialize our product candidates, any of which could materially harm our business.

We also may experience numerous unforeseen events during, or as a result of, any future clinical trials that could delay or prevent our ability to receive marketing approval for, or to commercialize, TTX-MC138 or any of our other product candidates in development, including:

- regulators or institutional review boards, or IRBs, or ethics committees may not authorize us or our investigators to commence a clinical trial or conduct a clinical trial at a prospective trial site;

- the FDA or other comparable regulatory authorities may disagree with our clinical trial design, including with respect to dosing levels administered in our planned clinical trials, which may delay or prevent us from initiating our clinical trials with our originally intended trial design;
- we may experience delays in reaching, or fail to reach, agreement on acceptable terms with prospective trial sites and prospective contract research organizations, or CROs, which can be subject to extensive negotiation and may vary significantly among different CROs and trial sites;
- the number of subjects required for clinical trials of any product candidates may be larger than we anticipate, or subjects may drop out of these clinical trials or fail to return for post-treatment follow-up at a higher rate than we anticipate;
- our third-party contractors may fail to comply with regulatory requirements or meet their contractual obligations to us in a timely manner, or at all, or may deviate from the clinical trial protocol or drop out of the trial, which may require that we add new clinical trial sites or investigators;
- due to the impact of the COVID-19 pandemic, we have experienced delays in our preclinical development, including access to our lab and access to our animal facility, and may continue to experience delays and interruptions to our preclinical studies and clinical trials, we may experience delays or interruptions to our manufacturing supply chain, or we could suffer delays in reaching, or we may fail to reach, agreement on acceptable terms with third-party service providers on whom we rely;
- delays and interruptions to our clinical trials could extend the duration of the trials and increase the overall costs to finish the trials as our fixed costs are not substantially reduced during delays;
- we may elect to, or regulators, IRBs, Data Safety Monitoring Boards, or DSMBs, or ethics committees may require that we or our investigators, suspend or terminate clinical research or trials for various reasons, including noncompliance with regulatory requirements or a finding that the participants are being exposed to unacceptable health risks;
- we may not have the financial resources available to begin and complete the planned trials, or the cost of clinical trials of any product candidates may be greater than we anticipate;
- the supply or quality of our product candidates or other materials necessary to conduct clinical trials of our product candidates may be insufficient or inadequate to initiate or complete a given clinical trial; and
- the FDA or other comparable foreign regulatory authorities may require us to submit additional data such as long-term toxicology studies, or impose other requirements before permitting us to initiate a clinical trial.

Our product development costs will increase if we experience delays in clinical testing or in obtaining marketing approvals. We do not know whether any of our clinical trials will begin as planned, will need to be restructured or will be completed on schedule, or at all. If we do not achieve our product development goals in the time frames we announce and expect, the approval and commercialization of our product candidates may be delayed or prevented entirely. Significant clinical trial delays also could shorten any periods during which we may have the exclusive right to commercialize our product candidates and may allow our competitors to bring products to market before we do, potentially impairing our ability to successfully commercialize our product candidates and harming our business and results of operations. Any delays in our clinical development programs may harm our business, financial condition and results of operations significantly.

Changes in methods of product candidate manufacturing or formulation may result in additional costs or delay.

As product candidates progress through preclinical to late-stage clinical trials to marketing approval and commercialization, various aspects of the development program, such as manufacturing methods and the product's formulation, may be altered along the way in an effort to optimize yield, manufacturing batch size, minimize costs and achieve consistent quality and results. These changes carry the risk that they will not achieve their intended objectives. Any of these changes could cause our product candidates to perform differently and affect the results of planned clinical trials or other future clinical trials conducted with the

altered materials. This could delay completion of clinical trials, require the conduct of bridging clinical trials or the repetition of one or more clinical trials, increase clinical trial costs, delay approval of our product candidates and jeopardize our ability to commercialize our product candidates and generate revenue.

In addition, there are risks associated with process development and large-scale manufacturing for clinical trials or commercial scale including, among others, cost overruns, potential problems with process scale-up, process reproducibility, stability issues, compliance with current good manufacturing practice, or cGMP, requirements, lot consistency and timely availability of raw materials. Even if we obtain marketing approval for any of our product candidates, there is no assurance that our third-party manufacturers will be able to manufacture the approved product to specifications acceptable to the FDA or other comparable foreign regulatory authorities, to produce it in sufficient quantities to meet the requirements for the potential commercial launch of the product or to meet potential future demand. If our contract manufacturers are unable to produce sufficient quantities for clinical trials or for commercialization, our development and commercialization efforts would be impaired, which would have an adverse effect on our business, financial condition, results of operations and growth prospects.

We may not be successful in our efforts to identify or discover additional product candidates in the future.

Our research programs may initially show promise in identifying potential product candidates, yet fail to yield product candidates for clinical development for a number of reasons, including:

- our inability to design such product candidates with the pharmacological properties that we desire or attractive pharmacokinetics;
- our inability to design and develop a suitable manufacturing process; or
- potential product candidates may, on further study, be shown to have harmful side effects or other characteristics that indicate that they are unlikely to be medicines that will receive marketing approval and achieve market acceptance.

Research programs to identify new product candidates require substantial technical, financial and human resources. If we are unable to identify suitable compounds for preclinical and clinical development, we will not be able to obtain product revenue in future periods, which likely would result in significant harm to our financial position and adversely impact our stock price.

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

We face an inherent risk of product liability once we begin testing TTX-MC138 and any of our other product candidates in clinical trials 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 trials, 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 a successful defense of these claims would require significant financial and management resources. Regardless of the merits or eventual outcome, liability claims may result in:

- inability to bring a product candidate to the market;
- decreased demand for our products;
- injury to our reputation;
- withdrawal of clinical trial participants and inability to continue clinical trials;
- initiation of investigations by regulators;
- fines, injunctions or criminal penalties;
- costs to defend the related litigation;

- diversion of management's time and our resources;
- substantial monetary awards to trial participants;
- 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, if approved; and
- decline in our share price.

Our inability to obtain sufficient product liability insurance at an acceptable cost to protect against potential product liability claims could prevent or inhibit the commercialization of products we develop. We will need to obtain insurance for clinical trials as TTX-MC138, and any of our other product candidates begin clinical development. However, we may be unable to obtain, or may obtain on unfavorable terms, clinical trial insurance in amounts adequate to cover any liabilities from any of our clinical trials. Our insurance policies may 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.

Risks related to our business and industry

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

Social media is increasingly being used to communicate about our clinical development programs and the diseases our therapeutics are being developed to treat, and we intend to utilize appropriate social media in connection with our commercialization efforts following approval of our product candidates, if any. Social media practices in the biotechnology and biopharmaceutical industries continue to evolve and regulations and regulatory guidance relating to such use are evolving and not always clear. This evolution creates uncertainty and risk of noncompliance with regulations applicable to our business, resulting in potential regulatory actions against us, along with the potential for litigation related to off-label marketing or other prohibited activities and heightened scrutiny by the FDA, the SEC and other regulators. For example, patients may use social media channels to comment on their experience in an ongoing blinded clinical trial or to report an alleged adverse event. If such disclosures occur, there is a risk that trial enrollment may be adversely impacted, that we may fail to monitor and comply with applicable adverse event reporting obligations or that we may not be able to defend our business or the public's legitimate interests in the face of the political and market pressures generated by social media due to restrictions on what we may say about our product candidates. There is also a risk of inappropriate disclosure of sensitive information or negative or inaccurate posts or comments about us on any social networking website. In addition, we may encounter attacks on social media regarding our company, management, product candidates or products. If any of these events were to occur or we otherwise fail to comply with applicable regulations, we could incur liability, face regulatory actions or incur other harm to our business.

Quality problems could delay or prevent delivery of our products to the market.

Quality is important due to (i) the serious and costly consequences of process or product failure and (ii) it being one required element of the regulatory approval process. Receiving quality certifications is critical to the development and marketing success of our technologies. If we fail to meet existing or future quality standards, development or commercialization of our technologies could be materially and adversely affected.

We are required to comply with the FDA Quality Systems Regulations to manufacture devices, including in vitro diagnostics, anywhere in the world for sale in the United States.

Also, the International Standards Organization, or ISO, sets quality standards for medical devices, including diagnostics, that are widely accepted and applied around the world, including in the U.S. We are also subject to ISO 13485 and ISO 9000 standards. ISO 13485 is the most commonly applied standard whereby medical products companies demonstrate that their products meet quality system requirements established for Europe, Canada, Japan, Australia and other countries. The requirements of ISO 13485 cover process control, design control, retention of records, accountability, traceability, customer feedback, and other areas. We will be required to be certified under ISO 13485 to sell any approved device in Europe and other international markets. Implementing ISO 13485 is voluntary for manufacturers selling in the United States.

We will need to implement a quality system designed to meet the requirement to sell our diagnostics, if approved, in both the U.S. and Europe. We cannot guarantee that our development standards, processes and procedures will meet applicable requirements for regulatory approval in any jurisdiction or that they will mitigate all of the risks associated with the development and commercialization of our product-candidates. Even if we receive quality certifications, we could subsequently lose them or be required to take corrective actions if we do not continue to meet, implement and follow the requirements under the applicable standards. If we fail to meet quality requirements applicable to our diagnostic product-candidates and approved products, if any, it could have a material adverse effect on us.

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 number of qualified clinical trial investigators and sites is limited. We expect to conduct some of our clinical trials at the same clinical trial sites that some of our competitors use. This could reduce the number of patients available for our clinical trials at such clinical trial site. Clinical trials of other companies may be in similar therapeutic areas as ours. This competition will reduce the number and types of patients and qualified clinical investigators available to us because some patients who might have opted to enroll in our trials may instead opt to enroll in a trial being conducted by a competitor or clinical trial sites may not allow us to conduct our clinical trial at such site if competing trials are already being conducted there.

We may also encounter difficulties finding a clinical trial site at which to conduct our trials. Because our therapeutics 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 checkpoint inhibitors, chemotherapy, radiation and monoclonal antibodies, rather than enroll patients in any of our clinical trials.

Delays in patient enrollment may result in increased costs or may affect the timing or outcome of our planned clinical trials, which could prevent completion of these clinical trials and adversely affect our ability to advance the development of our therapeutic or any other future versions of it.

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

Since the number of patients that we plan to dose in our planned Phase 0 and Phase 1 clinical trials of TTX-MC138 is relatively small, the results from such clinical trials, 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.

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

Undesirable side effects or death caused by any of our product candidates could cause us, IRBs, our CROs, the FDA or other regulatory authorities to interrupt, delay or discontinue clinical trials and could result in the denial of regulatory approval for our product candidates. This, in turn, could prevent us from commercializing our product candidates and generating revenues from their sale.

Also, any of these events could prevent us from achieving or maintaining market acceptance of the affected product or could substantially increase the costs and expenses of commercializing the product, which in turn could delay or prevent us from becoming profitable.

Sales of our products may involve a lengthy sales cycle.

Many factors are expected to influence the sales cycle for our approved products. These factors include the future state of the market, the perceived value of our product candidates, the evolution of competing technologies, insurance coverage or prior authorization requirements and changes in medical practices. Any of these may adversely affect our sales cycles and the rate of market acceptance of our approved products.

Risks related to regulatory approval, healthcare regulations and ongoing regulatory compliance

We are very early in our development efforts. All of our product candidates are still in preclinical development. If we are unable to advance our product candidates to clinical development, obtain regulatory approval and ultimately commercialize our product candidates or experience significant delays in doing so, our business will be materially harmed.

We have very limited experience in conducting and managing the clinical trials necessary to obtain regulatory approvals, including approval by the FDA, and, as a company, we have no experience in obtaining approval of any product-candidate. The time required to obtain FDA and other approvals is unpredictable but typically takes one or more years following completion of clinical trials, depending upon the type, complexity and novelty of the product-candidate. We may encounter delays or rejections during any stage of the regulatory review and approval process based upon the failure of clinical or laboratory data to demonstrate compliance with, or upon the failure of a product-candidate to meet, FDA requirements for safety, efficacy and quality.

The standards that the FDA and its foreign counterparts use when regulating us are not always applied predictably or uniformly and can change. Because the drugs we are developing may represent a new class of drug, the FDA and its foreign counterparts have not yet established any definitive policies, practices or guidelines in relation to these drugs. The lack of policies, practices or guidelines may hinder or slow review by the FDA of regulatory filings that we may submit. Moreover, the FDA may respond to these submissions by defining requirements we may not have anticipated. Such responses could lead to significant delays in and added costs for the clinical development of our product candidates.

Any analysis of data from preclinical and clinical activities that we perform is subject to confirmation and interpretation by regulatory authorities, which could delay, limit or prevent regulatory approval. We may also encounter unexpected delays or increased costs due to new government regulations, for example, from future legislation or administrative action, or from changes in FDA policy during the period of product development, clinical trials and FDA regulatory review. It is impossible to predict whether legislative changes will be enacted, or whether FDA or foreign regulations, guidance or interpretations will be changed, or what the impact of such changes, if any, may be.

In addition, the FDA may delay, limit, or deny approval of a product-candidate for many reasons, including:

- disagreement with the design or implementation of clinical trials;
- we may be unable to demonstrate to the satisfaction of the FDA that a product-candidate is safe and effective for any indication;
- we may be unable to demonstrate that a product-candidate’s clinical and other benefits outweigh its safety risks;
- the FDA may disagree with our interpretation of data from preclinical studies or clinical trials;
- the results of our clinical trials may not demonstrate the safety or efficacy required by the FDA for approval; or

- the FDA may find deficiencies in our manufacturing processes or facilities; and the FDA's approval policies or regulations may significantly change in a manner rendering our clinical data insufficient for approval.

After submission of an NDA, the FDA may refuse to review the application, deny approval of the application, require additional testing or data or, if the NDA is filed and later approved, require post-marketing testing and surveillance to monitor the safety or efficacy of a product. Under the Prescription Drug User Fee Act, or PDUFA, the FDA has agreed to certain performance goals in the review of NDAs. The FDA's timelines are flexible and subject to change based on workload and other potential review issues which may delay FDA's review of an NDA. For example, as of June 23, 2020, the FDA noted it is continuing to ensure timely reviews of applications for medical products during the COVID-19 pandemic in line with its user fee performance goals. On July 16, 2020, FDA noted that it is continuing to expedite oncology product development with its staff teleworking full-time. However, FDA may not be able to continue its current pace and review timelines could be extended. Further, the terms of approval of any NDA, including the product labeling, may be more restrictive than we desire which could affect the marketability of our products.

Even if we comply with all FDA regulatory requirements, we may not obtain regulatory approval for any of our product-candidates. If we fail to obtain regulatory approval for any of our product-candidates, we will have no commercialized products for sale and therefore have no ability to general significant, if any, revenue.

Any delay or failure in obtaining required approvals could have a material adverse effect on our ability to generate revenues from the particular product candidate for which we are seeking approval. Furthermore, any regulatory approval to market a product may be subject to limitations on the approved uses for which we may market the product or the labeling or other restrictions. In addition, the FDA has the authority to require a Risk Evaluation and Mitigation Strategy, or REMS, plan as part of or after approval, which may impose further requirements or restrictions on the distribution or use of an approved product, such as limiting prescribing to certain physicians or medical centers that have undergone specialized training, limiting treatment to patients who meet certain safe-use criteria and requiring treated patients to enroll in a registry. These limitations and restrictions may limit the size of the market for the product and affect reimbursement by third-party payors.

We are also subject to numerous foreign regulatory requirements governing, among other things, the conduct of clinical trials, manufacturing and marketing authorization, pricing and third-party reimbursement. The foreign regulatory approval process varies among countries and may include all of the risks associated with FDA approval described above as well as risks attributable to the satisfaction of local regulations in foreign jurisdictions. Moreover, the time required to obtain approval may differ from that required to obtain FDA approval. Approval by the FDA does not ensure approval by regulatory authorities outside the United States and vice versa.

If we or any collaborators, manufacturers or service providers fail to comply with applicable federal, state or foreign laws or regulations, we could be subject to enforcement actions, which could affect our ability to develop, market and sell our products successfully and could harm our reputation and lead to reduced acceptance of our products by the market. Enforcement actions can include, among others:

- adverse regulatory inspection findings;
- warning letters;
- voluntary or mandatory product recalls or public notification or medical product safety alerts to healthcare professionals;
- restrictions on, or prohibitions against, marketing our products;
- restrictions on, or prohibitions against, importation or exportation of our products;
- suspension of review or refusal to approve pending applications or supplements to approved applications;
- exclusion from participation in government-funded healthcare programs;

- exclusion from eligibility for the award of government contracts for our products;
- suspension or withdrawal of product approvals;
- product seizures;
- injunctions; and
- civil and criminal penalties and fines.

In addition, if any of our products cause serious or unexpected side effects or are associated with other safety risks after receiving marketing approval, a number of potential significant negative consequences could result, including:

- regulatory authorities may withdraw their approval of the product;
- we may be required to recall the product, change the way it is administered, conduct additional clinical trials or change the labeling of the product;
- the product may be rendered less competitive and sales may decrease;
- litigation or class action lawsuits;
- our reputation may suffer generally both among clinicians and patients; or
- regulatory authorities may require certain labeling statements, such as warnings or contraindications or limitations on the indications for use or impose restrictions on distribution in the form of a REMS in connection with approval, if any.

We may voluntarily suspend or terminate our clinical trials if at any time we believe that they present an unacceptable risk to participants or if preliminary data demonstrate that our products are unlikely to receive regulatory approval or unlikely to be successfully commercialized.

A variety of factors, including 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 employees and stop critical activities. Separately, in response to the COVID-19 pandemic, on March 10, 2020, the FDA announced its intention to temporarily postpone most inspections of foreign manufacturing facilities and products. On March 18, 2020, the FDA announced its intention to temporarily postpone routine surveillance inspections of domestic manufacturing facilities and provided guidance regarding the conduct of clinical trials, which has since been further updated. As of June 23, 2020, the FDA noted it was continuing to ensure timely reviews of applications for medical products during the COVID-19 pandemic in line with its user fee performance goals and conducting mission critical domestic and foreign inspections to ensure compliance of manufacturing facilities with FDA quality standards. As of July 2020, utilizing a rating system to assist in determining when and where it is safest to conduct such inspections based on data about the virus' trajectory in a given state and locality and the rules and guidelines that are put in place by state and local governments, the FDA is either continuing to, on a case-by-case basis, conduct only mission critical inspections, or, where possible to do so safely, resuming prioritized domestic inspections, which generally include pre-approval inspections.

Foreign pre-approval inspections that are not deemed mission-critical remain postponed, while those deemed mission-critical will be considered for inspection on a case-by-case basis. The FDA will use similar data to inform resumption of prioritized operations abroad as it becomes feasible and advisable to do so. The FDA may not be able to maintain this pace, and delays or setbacks are possible in the future. Should the FDA determine that an inspection is necessary for approval and an inspection cannot be completed during the review cycle due to restrictions on travel, the FDA has stated that it generally intends to issue a complete response letter. Further, if there is inadequate information to make a determination on the acceptability of a facility, the FDA may defer action on the application until an inspection can be completed. Additionally, regulatory authorities outside the United States may adopt similar restrictions or other policy measures in response to the COVID-19 pandemic. If a prolonged government shutdown occurs, or if global health concerns continue to prevent the FDA or other regulatory authorities from conducting their regular inspections, reviews, or other regulatory activities, 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, upon completion of this offering and 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.

Even if we receive regulatory approval of TTX-MC138 or any of our other product candidates, we will be subject to ongoing regulatory requirements and continued regulatory review, which may result in significant additional expense. 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 TTX-MC138 or another product-candidate may require post-marketing surveillance to monitor the safety and efficacy of the product and may require us to conduct post-approval clinical studies. The FDA may also require a REMS in order to approve 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 can include submissions of safety and other post-marketing information and reports, registration, as well as continued compliance with cGMPs and cGCPs for any clinical trials that we conduct post-approval. Compliance with ongoing and changing requirements takes substantial resources and, should we be unable to remain in compliance, our business could be materially and adversely affected.

In addition, if we pursue, and ultimately obtain, accelerated approval of TTX-MC138 based on a surrogate endpoint, the FDA would require us to conduct a confirmatory trial to verify the predicted clinical benefit as well as additional safety studies. The results from the confirmatory trial may not support the clinical benefit, which would result in the approval being withdrawn.

Manufacturers and their facilities are required to comply with extensive FDA and comparable foreign regulatory authority requirements, including ensuring that quality control and manufacturing procedures conform to cGMP regulations. As such, we and our contract manufacturers will be subject to continual review and inspections to assess compliance with cGMP and adherence to commitments made in any marketing application, and previous responses to inspection observations. Accordingly, we and others with whom we work must continue to expend time, money, and effort in all areas of regulatory compliance, including manufacturing, production and quality control.

Any regulatory approvals that we receive for our product candidates may be subject to limitations on the approved indicated uses for which the product may be marketed or to the conditions of approval, or contain requirements for potentially costly post-marketing testing, including Phase 4 clinical trials and surveillance to monitor the safety and efficacy of the product candidate. The FDA may also require a REMS as a condition of approval of our product candidates, which could entail requirements for long-term patient follow-up, 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, we will have to comply with requirements including submissions of safety and other post-marketing information and reports and registration.

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 revisions to the approved labeling to add new safety information; imposition of post-market studies or clinical trials to assess new safety risks; or imposition of distribution restrictions or other restrictions under a REMS program. Other potential consequences include, among other things:

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

Products may be promoted only for the approved indications and in accordance with the provisions of the approved label. However, companies may share truthful and not misleading information that is not inconsistent with the labeling. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off-label uses and a company that is found to have improperly promoted off-label uses may be subject to significant liability. The policies of the FDA and of other regulatory authorities 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.

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

Although we do not currently have any drugs on the market, if we begin commercializing our current or future product candidates, we will be subject to additional healthcare statutory and regulatory requirements and enforcement by the federal government and the states and foreign governments in which we conduct our business. Healthcare providers, physicians and third-party payors play a primary role in the recommendation and prescription of any current or future product candidates for which we obtain marketing approval. Our future arrangements with third-party payors and customers may expose us to broadly applicable fraud and abuse and other healthcare laws and regulations that may constrain the business or financial arrangements and relationships through which we market, sell and distribute our current or future product candidates for which we obtain marketing approval. Restrictions under applicable federal and state healthcare laws and regulations, include the following:

- the federal Anti-Kickback Statute prohibits, among other things, persons from knowingly and willfully soliciting, offering, receiving or providing remuneration, directly or indirectly, in cash or in kind, to induce or reward either the referral of an individual for, or the purchase, order or recommendation of, any good or service, for which payment may be made under federal and state healthcare programs such as Medicare and Medicaid. The Anti-Kickback Statute has been interpreted to apply to arrangements between pharmaceutical manufacturers on the one hand and prescribers, purchasers, and formulary managers on the other hand. The term remuneration has been interpreted

broadly to include anything of value. A person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;

- the federal False Claims Act imposes criminal and civil penalties, including through civil whistle-blower or qui tam actions, against individuals or entities for knowingly presenting, or causing to be presented, to the federal government, claims for payment that are false or fraudulent or making a false statement to avoid, decrease or conceal an obligation to pay money to the federal government. In addition, manufacturers can be held liable under the False Claims Act even when they do not submit claims directly to government payors if they are deemed to "cause" the submission of false or fraudulent claims. False Claims Act liability is potentially significant in the healthcare industry because the statute provides for treble damages and mandatory penalties. Government enforcement agencies and private whistle-blowers have investigated pharmaceutical companies for or asserted liability under the False Claims Act for a variety of alleged promotional and marketing activities, such as providing free products to customers with the expectation that the customers would bill federal programs for the products; providing consulting fees and other benefits to physicians to induce them to prescribe products; engaging in promotion for "off-label" uses; and submitting inflated best price information to the Medicaid Rebate Program. In addition, the government may assert that a claim including items and services resulting from a violation of the federal Anti-Kickback Statute constitutes a false of fraudulent claim for purposes of the False Claims Act;
- the federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, imposes criminal and civil liability for executing a scheme to defraud any healthcare benefit program, or knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false statement in connection with the delivery of or payment for healthcare benefits, items or services; similar to the federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;
- the federal physician payment transparency requirements, sometimes referred to as the "Sunshine Act" under the ACA require manufacturers of drugs, devices, biologics and medical supplies that are reimbursable under Medicare, Medicaid, or the Children's Health Insurance Program to report to the Department of Health and Human Services information related to physician payments and other transfers of value and the ownership and investment interests of such physicians (defined to include doctors, dentists, optometrists, podiatrists and chiropractors) and their immediate family members. Effective January 1, 2022, these reporting obligations will extend to include transfers of value made to certain non-physician providers such as physician assistants and nurse practitioners;
- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009, or HITECH, and its implementing regulations, which also imposes obligations on certain covered entity healthcare providers, health plans, and healthcare clearinghouses as well as their business associates that perform certain services involving the use or disclosure of individually identifiable health information, including mandatory contractual terms, with respect to safeguarding the privacy, security and transmission of individually identifiable health information. HITECH also created new tiers of civil monetary penalties, amended HIPAA to make civil and criminal penalties directly applicable to business associates, and gave state attorneys general new authority to file civil actions for damages or injunctions in federal courts to enforce the federal HIPAA laws and seek attorneys' fees and costs associated with pursuing federal civil actions; and
- analogous state laws and regulations, such as state anti-kickback and false claims laws that may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payors, including private insurers; and 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 drug manufacturers to report information related to payments to physicians and other health care providers or marketing expenditures, and state laws governing the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

Ensuring that our future business arrangements with third parties comply with applicable healthcare laws and regulations could involve substantial costs. It is possible that governmental authorities will conclude

that our business practices do 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, including anticipated activities to be conducted by our sales team, were to be found to be in violation of any of these laws or any other governmental regulations that may apply to us, we may be subject to significant civil, criminal and administrative penalties, damages, fines, exclusion from government funded healthcare programs, such as Medicare and Medicaid, and the curtailment or restructuring of our operations. If any of the physicians or other providers or entities with whom we expect to do business is found to be not in compliance with applicable laws, they may be subject to criminal, civil or administrative sanctions, including exclusions from government funded healthcare programs.

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

Obtaining and maintaining regulatory approval for 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 for TTX-MC138, comparable regulatory authorities in foreign jurisdictions must also approve the manufacturing, marketing and promotion of the product-candidate in those countries. Approval 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 preclinical studies and 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 charge for our product is also subject to regulatory 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.

Ongoing healthcare legislative and regulatory reform measures may have a material adverse effect on our business and results of operations.

Changes in regulations, statutes or the interpretation of existing regulations could impact our business in the future by requiring, for example, changes to our manufacturing arrangements; additions or modifications to product labeling; the recall or discontinuation of our products; or additional record-keeping requirements. If any such changes were to be imposed, they could adversely affect the operation of our business.

In the United States, there have been and likely will continue to be a number of legislative initiatives to contain healthcare costs. For example, in March 2010, the ACA was passed, which substantially changed the way health care is financed by both governmental and private insurers, and significantly impacted the U.S. biotechnology and biopharmaceutical industries. The ACA, among other things, addressed 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, increased the minimum Medicaid rebates owed by manufacturers under the Medicaid Drug Rebate Program and extended the rebate program to individuals enrolled in Medicaid managed care organizations, established annual fees and taxes on manufacturers of certain branded prescription drugs, and created a new Medicare Part D coverage gap discount program, in which manufacturers must agree to offer 70% point-of-sale discounts from the 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.

Since its enactment, there have been numerous judicial, administrative, executive, and legislative challenges to certain aspects of the ACA, and we expect there will be additional challenges and amendments to the ACA in the future. On December 14, 2018, a Texas U.S. District Court Judge ruled that the ACA is unconstitutional in its entirety because the "individual mandate" was repealed by Congress as part of the Tax Act. Additionally, on December 18, 2019, the U.S. Court of Appeals for the 5th Circuit upheld the District Court ruling that the individual mandate was unconstitutional and remanded the case back to the District Court to determine whether the remaining provisions of the ACA are invalid as well. On March 2, 2020, the United States Supreme Court granted the petitions for writs of certiorari to review this case. It is unclear how such litigation and other efforts to repeal and replace the ACA will impact the ACA and our business. In addition, the Trump administration has issued various Executive Orders, which eliminated cost sharing subsidies and various provisions 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. Additionally, Congress has introduced several pieces of legislation aimed at significantly revising or repealing the ACA. On December 20, 2019, President Trump signed into law the Further Consolidated Appropriations Act (H.R. 1865), which repeals the Cadillac tax, the health insurance provider tax, and the medical device excise tax. It is unclear whether the ACA will be overturned, repealed, replaced, or further amended. We cannot predict what affect further changes to the ACA would have on our business.

Other legislative changes have been proposed and adopted in the United States since the ACA was enacted. 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, including aggregate reductions of Medicare payments to providers of 2% per fiscal year. These reductions went into effect on April 1, 2013 and subsequent legislative amendments to the statute, including the Bipartisan Budget Act of 2018, or BBA, will remain in effect through 2030, unless additional congressional action is taken. However, these Medicare sequester reductions will be suspended from May 1, 2020 through December 31, 2020 due to the COVID-19 pandemic. The BBA also amended the ACA, effective January 1, 2019, by increasing the point-of-sale discount that is owed by pharmaceutical manufacturers who participate in Medicare Part D and closing the coverage gap in most Medicare drug plans, commonly referred to as the "donut hole". On January 2, 2013, the American Taxpayer Relief Act of 2012 was signed into law, which, among other things, further reduced Medicare payments to several types of 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.

Moreover, increasing efforts by governmental and third-party payors in the United States and abroad to cap or reduce healthcare costs may cause such organizations to limit both coverage and the level of reimbursement for newly approved products and, as a result, they may not cover or provide adequate payment for our product candidates. There has been increasing legislative and enforcement interest in the United States with respect to specialty drug pricing practices. Specifically, there have been several recent U.S. Congressional inquiries and proposed and enacted federal and state legislation designed to, among other things, bring more transparency to drug pricing, reduce the cost of prescription drugs under Medicare, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for drugs.

At the federal level, the Trump administration's budget for fiscal year 2021 includes a $135 billion allowance to support legislative proposals seeking to reduce drug prices, increase competition, lower out-of-pocket drug costs for patients, and increase patient access to lower-cost generic and biosimilar drugs. On March 10, 2020, the Trump administration sent "principles" for drug pricing to Congress, calling for legislation that would, among other things, cap Medicare Part D beneficiary out-of-pocket pharmacy expenses, provide an option to cap Medicare Part D beneficiary monthly out-of-pocket expenses, and place limits on pharmaceutical price increases. The Trump administration previously released a "Blueprint" to lower drug prices and reduce out of pocket costs of drugs that contained proposals to increase manufacturer competition, increase the negotiating power of certain federal healthcare programs, incentivize manufacturers to lower the list price of their products and reduce the out of pocket costs of drug products paid by consumers. The U.S. Department of Health and Human Services, or HHS, has solicited feedback on some of these measures and has implemented others under its existing authority. For example, in May 2019, CMS

issued a final rule that would allow Medicare Advantage Plans the option of using step therapy, a type of prior authorization, for Part B drugs beginning January 1, 2020. This final rule codified CMS's policy change that was effective January 1, 2019. On July 24, 2020, President Trump signed four Executive Orders aimed at lowering drug prices. The Executive Orders direct the Secretary of HHS to: (1) eliminate protection under an AKS safe harbor for certain retrospective price reductions provided by drug manufacturers to sponsors of Medicare Part D plans or pharmacy benefit managers that are not applied at the point-of-sale; (2) allow the importation of certain drugs from other countries through individual waivers, permit the re-importation of insulin products, and prioritize finalization of the proposed rule to permit the importation of drugs from Canada; (3) ensure that payment by the Medicare program for certain Medicare Part B drugs is not higher than the payment by other comparable countries (depending on whether pharmaceutical manufacturers agree to other measures); and (4) require Federally Qualified Health Centers, or FQHCs, participating in the 340B drug program to provide insulin and injectable epinephrine to certain low-income individuals at the discounted price paid by the FQHC, plus a minimal administrative fee. On October 1, 2020, the FDA issued the final rule allowing importation of certain prescription drugs from Canada. On August 6, 2020, President Trump signed an additional Executive Order directing U.S. government agencies to encourage the domestic procurement of Essential Medicines, Medical Countermeasures, and Critical Inputs, which include among other things, active pharmaceutical ingredients and drugs intended for use in the diagnosis, cure, mitigation, treatment, or prevention of COVID-19. The FDA has been directed to release a full list of Essential Medicines, Medical Countermeasures, and Critical Inputs affected by this Order by November 5, 2020. On September 13, 2020, President Trump signed an Executive Order directing HHS to implement a rulemaking plan to test a payment model, pursuant to which Medicare would pay, for certain high-cost prescription drugs and biological products covered by Medicare Part B, no more than the most-favored-nation price (i.e., the lowest price) after adjustments, for a pharmaceutical product that the drug manufacturer sells in a member country of the Organization for Economic Cooperation and Development that has a comparable per-capita gross domestic product. Although a number of these and other measures may require additional authorization to become effective, Congress and the Trump administration have each indicated that it will continue to seek new legislative and/or administrative measures to control drug costs. Any reduction in reimbursement from Medicare and other government programs may result in a similar reduction in payments from private payors.

At the state level, legislatures are increasingly passing legislation and implementing regulations designed to control pharmaceutical and biologic 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.

These laws, and future state and federal healthcare reform measures may be adopted in the future, any of which 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 approval or the frequency with which any such product candidate is prescribed or used. Additionally, we expect to experience pricing pressures in connection with the sale of any future approved product candidates due to the trend toward managed healthcare, the increasing influence of health maintenance organizations, cost containment initiatives and additional legislative changes.

We are subject to certain U.S. and foreign anti-corruption, anti-money laundering, export control, sanctions, and other trade laws and regulations. We can face serious consequences for violations.

Among other matters, U.S. and foreign anti-corruption, anti-money laundering, export control, sanctions, and other trade laws and regulations, which are collectively referred to as Trade Laws, prohibit companies and their employees, agents, clinical research organizations, legal counsel, accountants, consultants, contractors, and other partners from authorizing, promising, offering, providing, soliciting, or receiving directly or indirectly, corrupt or improper payments or anything else of value to or from recipients in the public or private sector. Violations of Trade Laws can result in substantial criminal fines and civil penalties, imprisonment, the loss of trade privileges, debarment, tax reassessments, breach of contract and fraud litigation, reputational harm, and other consequences. We have direct or indirect interactions with officials and employees of government agencies or government-affiliated hospitals, universities, and other organizations. We plan to engage third parties for clinical trials and/or to obtain necessary permits, licenses,

patent registrations, and other regulatory approvals, and we could be held liable for the corrupt or other illegal activities of our personnel, agents, or partners, even if we do not explicitly authorize or have prior knowledge of such activities.

Healthcare reform in the U.S. and other countries may materially and adversely affect us.

In the U.S. and in many foreign jurisdictions, the legislative landscape continues to evolve. Our revenue prospects could be affected by changes in healthcare spending and policies in our target markets. We operate in a highly regulated industry and new laws or judicial decisions, or new interpretations of existing laws or decisions, related to healthcare availability, the method of delivery or payment for healthcare products and services could materially and adversely affect us.

There is significant interest in promoting healthcare reform, as evidenced by the enactment in the U.S. of the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act in 2010, or together, the ACA. It is likely that many governments will continue to consider new healthcare legislation or changes to existing legislation. We cannot predict the initiatives that may be adopted in the future or whether initiatives that have been adopted will be repealed or modified, or how they may affect us. The continuing efforts of governments, insurance companies, managed care organizations and other third-party payors to contain or reduce healthcare costs may adversely affect:

- the demand for any products for which we may obtain regulatory approval;
- our ability to set a price that we believe is fair for our products;
- our ability to generate revenues and achieve or maintain profitability; and
- the level of taxes that we are required to pay.

Under the ACA, there are many programs and requirements for which details or consequences are still not fully understood. We are unable to predict what healthcare programs and regulations will ultimately be implemented at any level of government in or outside the U.S., but any changes that decrease reimbursement for our approved products, reduce volumes of medical procedures or impose new cost-containment measures could adversely affect us.

We are subject to geopolitical risks, economic volatility, anti-corruption laws, export and import restrictions, local regulatory authorities and the laws and medical practices in foreign jurisdictions.

The costs of healthcare internationally have risen significantly over the past decade**.** Numerous initiatives and reform by legislators, regulators and third-party payers to curb these costs have reduced reimbursement rates. One outcome of these dynamics is that hospitals and others are consolidating into larger integrated delivery networks and group purchasing organizations in an effort to reduce administrative costs and increase purchasing power. This consolidation has resulted in greater pricing pressure on suppliers, decreased average selling prices and changes in medical practices. If we secure marketing approval for our product candidates, our commercial success will be determined by, among other things, our ability to obtain acceptable pricing for approved products which will be subject to, among other things, the factors described above.

The expansion of group purchasing organizations, integrated delivery networks and large single accounts among hospitals could also put price pressure on our approved products. We expect that market demand, government regulation, third-party reimbursement policies, government contracting requirements and societal pressures will continue to change the worldwide healthcare industry, resulting in further business consolidations and alliances among our customers and competitors. The result may be further downward pressure on the prices we are able to obtain, thus adversely affecting us.

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.

Risks related to commercialization

We currently have no marketing and sales organization and have no experience as a company in commercializing products, and we may have to invest significant resources to develop these capabilities. If we are unable to establish marketing and sales capabilities or enter into agreements with third parties to market and sell any products for which we obtain regulatory approval, we may not be able to generate product revenue.

We have no internal sales, marketing or distribution capabilities, nor have we commercialized a product. If any of our product candidates ultimately receives regulatory approval, we expect to establish a marketing and sales organization with technical expertise and supporting distribution capabilities to commercialize each such product in major markets, which will be expensive and time consuming. We have no prior experience as a company in the marketing, sale and distribution of pharmaceutical products, and there are significant risks involved in building and managing a sales organization, including our ability to hire, retain and incentivize qualified individuals, generate sufficient sales leads, provide adequate training to sales and marketing personnel and effectively manage a geographically dispersed sales and marketing team. Any failure or delay in the development of our internal sales, marketing and distribution capabilities would adversely impact the commercialization of these products. We may also choose to collaborate with third parties that have direct sales forces and established distribution systems, either to augment our own sales force and distribution systems or in lieu of our own sales force and distribution systems. We may not be able to enter into collaborations or hire consultants or external service providers to assist us in sales, marketing and distribution functions on acceptable financial terms, or at all. In addition, our product revenues and our profitability, if any, may be lower if we rely on third parties for these functions than if we were to market, sell and distribute any products that we develop and for which we receive regulatory approval ourselves. We likely will have little control over such third parties, and any of them may fail to devote the necessary resources and attention to sell and market our products effectively. If we are not successful in commercializing our products, either on our own or through arrangements with one or more third parties, we may not be able to generate any future product revenue and we would incur significant additional losses.

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

In the United States and in other countries, patients who are prescribed treatment for their conditions generally rely on third-party payors to reimburse all or part of the costs associated with their treatment. Significant uncertainty exists as to the coverage and reimbursement status of any products for which we may obtain regulatory approval. In the United States, sales of any products for which we may receive regulatory marketing approval will depend, in part, on the availability of coverage and reimbursement from third-party payors. Third-party payors include government authorities such as Medicare, Medicaid, TRICARE, and the Veterans Administration, managed care providers, private health insurers, and other organizations. 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. Coverage and adequate reimbursement from governmental healthcare programs, such as Medicare and Medicaid, and commercial payors is critical to new product acceptance. Patients are unlikely to use our product candidates unless coverage is provided, and reimbursement is adequate to cover a significant portion of the cost. We cannot be sure that coverage and reimbursement will be available for, or accurately estimate the potential revenue from, our product candidates or assure that coverage and reimbursement will be available for any product that we may develop.

Government authorities and other third-party payors decide which drugs and treatments they will cover and the amount of reimbursement. Coverage and reimbursement by a third-party payor may depend upon a number of factors, including the third-party payor’s determination that use of a product is:

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

Our ability to commercialize any products successfully will depend in part on the extent to which coverage and adequate reimbursement for these products and related treatments will be available from third-party payors, including government health care programs and private health insurers. Moreover, a payor's decision to provide coverage for a drug product does not imply that an adequate reimbursement rate will be approved. If coverage and adequate reimbursement is not available, or is available only to limited levels, we may not be able to successfully commercialize our product candidates. Even if coverage is provided, the approved reimbursement amount may not be high enough to allow us to establish or maintain pricing sufficient to realize a sufficient return on our investment.

In the United States, no uniform policy of coverage and reimbursement for products exists among third-party payors. Therefore, coverage and reimbursement for our products can differ significantly from payor to payor. As a result, 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 each payor supporting scientific, clinical and cost-effectiveness data for the use of our products on a payor-by-payor basis, with no assurance that coverage and adequate reimbursement will be obtained. 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. Additionally, third-party payors may not cover, or provide adequate reimbursement for, long-term follow-up evaluations required following the use of product candidates, once approved. It is difficult to predict at this time what third-party payors will decide with respect to the coverage and reimbursement for our product candidates, if approved.

The Medicare Prescription Drug, Improvement, and Modernization Act of 2003, also called the Medicare Modernization Act, or the MMA, established the Medicare Part D program to provide a voluntary prescription drug and biologic benefit to Medicare beneficiaries. Under Part D, Medicare beneficiaries may enroll in prescription drug plans offered by private entities that provide coverage of outpatient prescription drugs and biologics. Unlike Medicare Parts A and B, Part D coverage is not standardized. Part D prescription drug plan sponsors are not required to pay for all covered Part D drugs and biologics, and each drug plan can develop its own formulary that identifies which drugs and biologics it will cover, and at what tier or level. However, Part D prescription drug formularies must include products within each therapeutic category and class of covered Part D drugs, though not necessarily all the drugs and biologics in each category or class. Any formulary used by a Part D prescription drug plan must be developed and reviewed by a pharmacy and therapeutic committee. Government payment for some of the costs of prescription drugs and biologics may increase demand for products for which we obtain marketing approval. Any negotiated prices for any of our products covered by a Part D prescription drug plan will likely be lower than the prices we might otherwise obtain. Moreover, while the MMA applies only to drug benefits for Medicare beneficiaries, private payors often follow Medicare coverage policy and payment limitations in setting their own payment rates. Any reduction in payment that results from the MMA may result in a similar reduction in payments from non-governmental payors.

For a drug or biologic product to receive federal reimbursement under the Medicaid or Medicare Part B programs or to be sold directly to U.S. government agencies, the manufacturer must extend discounts to entities eligible to participate in the 340B drug pricing program. The required 340B discount on a given product is calculated based on the average manufacturer price, or AMP, and Medicaid rebate amounts reported by the manufacturer. As of 2010, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act of 2010, or collectively the ACA, expanded the types of entities eligible to receive discounted 340B pricing, although under the current state of the law these newly eligible entities (with the exception of children's hospitals) will not be eligible to receive discounted 340B pricing on orphan drugs. As the required 340B discount is determined based on AMP and Medicaid rebate data, the revisions to the Medicaid rebate formula and AMP definition described above could cause the required 340B discount to increase. The Centers for Medicare & Medicaid Services, or CMS, has previously and may in the future implement reductions in Medicare Part B reimbursement for 340B drugs through notice and comment rulemaking. It is unclear how such reimbursement reductions could affect covered hospitals who might purchase our products in the future, and affect the rates we may charge such facilities for our approved products.

Changes to these current laws and state and federal healthcare reform measures that may be adopted in the future may result in additional reductions in Medicare and other healthcare funding and otherwise affect

the prices we may obtain for any product candidates for which we may obtain regulatory approval or the frequency with which any such product candidate is prescribed or used.

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

The development and commercialization of new oncology drug products is highly competitive. We may face competition with respect to any product candidates that we seek to develop or commercialize in the future from major biotechnology and biopharmaceutical companies, specialty biotechnology and biopharmaceutical companies, and other biotechnology and biopharmaceutical companies worldwide. Potential competitors also include academic institutions, government agencies, and other public and private research organizations that conduct research, seek patent protection, and establish collaborative arrangements for research, development, manufacturing, and commercialization.

Not only must we compete with other companies that are focused on therapeutics that treat cancer, but also any product candidates that we successfully develop and commercialize will compete with existing and new therapies that may become available in the future. Our competitors may develop more successful products similar to ours sooner than we can commercialize ours, which may negatively impact our results. Companies that we are aware of with targeted therapeutics in the treatment of various cancers include Nurix Therapeutics, Black Diamond Therapeutics and Precision Biosciences, which have product candidates in various stages of preclinical and clinical developments. Other companies focusing on RNA therapeutics include Arrowhead Pharmaceuticals, a clinical stage company, with a pipeline of investigational RNAi therapeutics focused on genetic medicines, cardio-metabolic diseases, hepatic infectious diseases, oncology and central nervous system/ocular diseases. However, we know of no other companies currently in clinical development with miRNA therapeutics targeting metastatic disease. For additional information regarding our competition, see “Business — Competition.”

Many of our current or potential competitors, either alone or with their strategic partners, have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing, conducting clinical trials, obtaining regulatory approvals, and marketing approved products than we do.

Mergers and acquisitions in the biopharmaceutical and biotechnology industries may result in even more resources being concentrated among a smaller number of our competitors. Smaller or early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. These competitors also compete with us in recruiting and retaining qualified scientific and management personnel and establishing clinical trial sites and patient registration for clinical trials, as well as in acquiring technologies complementary to, or necessary for, our programs. Our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize products that are safer, more effective, more convenient, or less expensive than any products that we may develop. Furthermore, products currently approved for other indications could be discovered to be effective treatments of the biological processes that drive cancers as well, which could give such products significant regulatory and market timing advantages over TTX-MC138 or other product candidates that we may identify. Our competitors also may obtain FDA or other regulatory approval for their products more rapidly than we do, which could result in our competitors establishing a strong market position before we are able to enter the market. Additionally, products or technologies developed by our competitors may render our potential product candidates uneconomical or obsolete and we may not be successful in marketing any product candidates we may develop against competitors. The availability of competitive products could limit the demand, and the price we are able to charge, for any products that we may develop and commercialize.

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

We do not currently have a sales or marketing infrastructure and have no experience in the sales, marketing, patient support or distribution of drugs. We currently intend to partner with a larger commercial organization to market any of our product candidates, if approved, though our intentions may change in

the future. To achieve commercial success for any approved product candidate for which we retain sales and marketing responsibilities, we must build our sales, marketing, patient support, managerial and other non-technical capabilities or make arrangements with third parties to perform these services. In the future, we may choose to build a focused sales and marketing infrastructure to sell, or participate in sales activities with our collaborators for, some of our current or future product candidates if and when they are approved.

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

Factors that may inhibit our efforts to commercialize our current or future product candidates on our own include:

- our inability to recruit and retain adequate numbers of effective sales and marketing personnel;
- the inability of sales personnel to obtain access to physicians or persuade adequate numbers of physicians to prescribe any future drugs, if approved;
- the lack of complementary drugs to be offered by sales personnel, which may put us at a competitive disadvantage relative to companies with more extensive product lines; and
- unforeseen costs and expenses associated with creating an independent sales and marketing organization.

If we enter into arrangements with third parties to perform sales, marketing, patient support and distribution services, our drug revenues or the profitability of these drug revenues to us are likely to be lower than if we were to market and sell any current or future product candidates that we develop ourselves. In addition, we may not be successful in entering into arrangements with third parties to sell and market our current or future product candidates or may be unable to do so on terms that are favorable to us. We likely will have little control over such third parties, and any of them may fail to devote the necessary resources and attention to sell and market our current or future product candidates effectively. If we do not establish sales and marketing capabilities successfully, either on our own or in collaboration with third parties, we will not be successful in commercializing our current or future product candidates. Further, our business, results of operations, financial condition and prospects will be materially adversely affected.

Risks related to third parties and suppliers

We expect to rely on third-party manufacturing and supply vendors, and our supply of research and development, preclinical and clinical development materials may become limited or interrupted or may not be of satisfactory quantity or quality.

We do not have any manufacturing facilities or personnel. We currently rely, and expect to continue to rely, on third parties for the manufacture of TTX-MC138 and any future potential product candidates that we may develop. There can be no assurance that our preclinical and clinical development product supplies will not be limited or interrupted, or that they will be of satisfactory quality or continue to be available at acceptable prices. For example, the extent to which the COVID-19 pandemic impacts our ability to procure sufficient supplies for the development of our product candidates will depend on the severity and duration of the spread of the virus and the actions undertaken to contain COVID-19 or treat its effects. In particular, any replacement of our manufacturer could require significant effort and expertise because there may be a limited number of qualified replacements.

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

- reliance on the third-party for sufficient quantity and quality at acceptable costs which could delay, prevent or impair our development or commercialization efforts;

- the possible breach of the manufacturing agreement by the third-party;
- failure to meet our manufacturing specifications;
- failure to meet our manufacturing schedule;
- misappropriation of our proprietary information, including our trade secrets and know-how;
- the possible termination or nonrenewal of the agreement by the third-party at a time that is costly or inconvenient for us;
- disruptions to the operations of our manufacturers or suppliers caused by conditions unrelated to our business or operations, including the bankruptcy of a manufacturer or supplier; and
- reliance on the third-party for regulatory compliance, quality assurance and safety reporting.

Our reliance on others for our manufacturing will reduce our control over these activities but will not relieve us of our responsibility to ensure compliance with all applicable regulations regarding manufacturing. Our product candidates and any products that we may develop may compete for access to manufacturing facilities with other product candidates and products. There are a limited number of manufacturers that operate in accordance with cGMP regulations that might be capable of manufacturing for us which could restrict our ability to supply products and, as a result, have a material adverse effect on us.

Any of these events could lead to clinical trial delays or failure to obtain regulatory approval or could otherwise adversely affect our ability to commercialize our approved products. Some of these events could be the basis for costly FDA action, including injunction, recall, seizure or total or partial suspension of production.

We will have limited control over the day-to-day manufacturing and quality operations of our contract manufacturers. While we will exercise commercially reasonable efforts to oversee operations and embed our quality system standards and controls in our manufacturing agreements, we will remain subject to the performance of our contract manufacturers. We must depend on our suppliers for proper oversight and control of their operations. Our outside manufacturers may themselves rely on other parties that they do not control. Our suppliers might fail to obtain, or experience delays in obtaining, regulatory approvals applicable to the aspects of their business that pertains to us. As a result, the development and commercialization of our products may be delayed. If this occurs, we may need to identify alternative sources of supply which may not be feasible, or which may adversely affect our timelines and financial results.

Our dependence upon others for the manufacture of our product candidates or products may adversely affect our ability to commercialize any products that receive marketing approval on a timely and competitive basis.

Thus, our current and anticipated future dependence upon others for manufacturing may adversely affect our timelines, our future profit margins or our ability to commercialize any product candidates that receive marketing approval on a timely and competitive basis.

We rely on third parties to conduct certain aspects of our preclinical studies and clinical trials. If these third parties do not successfully carry out their contractual duties, meet expected deadlines or comply with regulatory requirements, we may not be able to obtain regulatory approval of or commercialize any potential product candidates.

We depend, or may depend in the future, upon third parties to conduct certain aspects of our preclinical studies and clinical trials, under agreements with universities, medical institutions, CROs, strategic collaborators and others. We expect to have to negotiate budgets and contracts with such third parties, which may result in delays to our development timelines and increased costs.

We will rely especially heavily on third parties over the course of our clinical trials, and, as a result, will have limited control over the clinical investigators and limited visibility into their day-to-day activities, including with respect to their compliance with the approved clinical protocol. Nevertheless, we are responsible for ensuring that each of our trials is conducted in accordance with the 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 GCP requirements, which are regulations and guidelines enforced by the FDA and comparable foreign regulatory authorities for product candidates in clinical development. Regulatory authorities enforce these GCP requirements through periodic inspections of trial sponsors, clinical investigators and trial sites. If we or any of these third parties fail to comply with applicable GCP requirements, the clinical data generated in our clinical trials may be deemed unreliable and the FDA or comparable foreign regulatory authorities may require us to suspend or terminate these trials or perform additional preclinical studies or clinical trials before approving our marketing applications. We cannot be certain that, upon inspection, such regulatory authorities will determine that any of our clinical trials comply with the GCP requirements.

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 aspects of our preclinical studies or clinical trials will not be our employees and, except for remedies that may be available to us under our agreements with such third parties, we cannot control whether or not they devote sufficient time and resources to our preclinical studies and clinical programs. 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 product 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 preclinical or clinical data they obtain is compromised due to the failure to adhere to our protocols or regulatory requirements or for other reasons or if, due to federal or state orders or absenteeism due to the COVID-19 pandemic, they are unable to meet their contractual and regulatory obligations, our development timelines, including clinical development timelines, 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.

If any of our relationships with these third-party CROs or others terminate, we may not be able to enter into arrangements with alternative CROs or other third parties or to do so on commercially reasonable terms.

Switching or adding additional CROs involves additional cost and requires management time and focus. In addition, there is a natural transition period when a new CRO begins work. As a result, delays may occur, which can materially impact our ability to meet our desired development timelines. Though we carefully manage our relationships with our CROs, there can be no assurance that we will not encounter similar challenges or delays in the future or that these delays or challenges will not have a material adverse impact on our business, financial condition and prospects.

Parties conducting some or all of our product manufacturing may not perform satisfactorily.

Outside manufacturers may not be able to or may not comply with cGMP regulations or similar regulatory requirements outside the U.S. Our failure, or the failure of our manufacturers, to comply with applicable regulations could delay clinical development or marketing approval or result in sanctions being imposed on us, including clinical holds, fines, injunctions, civil penalties, delays, suspension or withdrawal of approvals, license revocation, seizures or recalls of product candidates or products, operating restrictions and criminal prosecutions, any of which could significantly and adversely affect supplies of our products.

We may not have arrangements for redundant supply or a second source for key materials, components or our products and product candidates. If our contract manufacturers cannot perform as expected, we may be required to replace such manufacturers. There may be only a small number of potential alternative manufacturers who could manufacture our product candidates. We may incur added costs and delays in identifying, gaining access to and qualifying any such replacement.

We are highly dependent on others to provide services for certain core aspects of our business.

To conserve financial resources, we utilize consultants, advisors and other parties for certain functions including regulatory affairs, clinical trials, medical practice issues, product management and human resources. If other parties are not available to provide services through completion of our programs at the time we require their services, or if the expertise we require is not readily available, the development and commercialization of our product candidates may be delayed.

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 materials, by our third-party manufacturers. Our manufacturers are subject to federal, state and local laws and regulations in the U.S. 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.

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

A part of our strategy is to seek, evaluate and, when strategically attractive, enter into development and commercial partnerships. Potential partners may include larger medical products companies. These potential partners often have their own internal development programs and priorities which may be a potential source of competition for our product candidates. We must develop technologies of value and then demonstrate the value of our technologies and product candidates if we are to be successful in arranging strategic partnerships on terms that will be attractive. There are no assurances that we will succeed in arranging any partnerships.

Identifying appropriate partners for our product candidates and the negotiation process is lengthy, time-consuming and complex and we have limited resources to do this. In order for us to successfully partner our product candidates, potential partners must view these product candidates as economically and technologically valuable with features or benefits that are superior to existing products or product candidates in development. We may not be able to maintain such strategic partnerships if, for example, development or approval of a product is delayed or sales of an approved product are disappointing. Any delay in entering into strategic partnership agreements related to our product candidates could delay their development and commercialization and reduce their competitiveness even if they reach the market.

In addition, strategic partners may not perform as we expect or may breach their agreements with us. We may not be able to adequately protect our rights under these agreements and attempting to do so is likely to be time consuming and expensive. Furthermore, our strategic partners will likely seek to control certain decisions regarding the development and commercialization of our product candidates and may not conduct those activities in the manner or time we would like.

If we fail to establish and maintain strategic partnerships related to our product candidates, we will bear all of the risk and costs related to the development and commercialization of our product candidates. This may require us to seek additional financing, hire additional employees and otherwise develop expertise which we do not have. These factors could materially and adversely affect the development or commercial success of any product-candidate for which we do not arrange a strategic partnership.

Risks related to managing our business and operations

The global pandemic of the novel coronavirus disease, COVID-19, has, and may continue to, adversely impact our business, including our preclinical studies and clinical trials.

In December 2019, a novel strain of coronavirus disease that causes COVID-19 was identified in Wuhan, China. As of the date of this prospectus, the novel coronavirus (also called SARS-CoV-2) has spread to a number of countries globally, including the United States, and the disease outbreak was declared a pandemic by the World Health Organization in March 2020. The outbreak and government measures taken in response have also had a significant impact, both direct and indirect, on businesses and commerce, as worker shortages have occurred; supply chains have been disrupted; facilities and production have been suspended; and demand for certain goods and services, such as medical services and supplies, has spiked, while demand for other goods and services, such as travel, has fallen. In response to the spread of COVID-19, we have continued operations and all employees are working from home.

Until March 15, 2021, we occupied lab space at the Pagliuca Harvard Life Lab. During the pandemic, access to the Life Lab was limited which adversely affected our ability to conduct drug product scaleup and other development work. In March 2021, we moved our laboratory operations to facilities leased from the Massachusetts Biomedical Initiatives, Inc., or MBI, in Worcester, Massachusetts. While we believe we will have greater access to the MBI facilities, there is no assurance that this will be the case. Should access to the MBI facility be limited, or should other pandemic-related restrictions be imposed, our development work would be further adversely affected. The extent of such adverse effects will depend on future developments which are highly uncertain and cannot be predicted.

As a result of the COVID-19 pandemic, we may experience disruptions that could severely impact our business, preclinical studies and clinical trials, including:

- delays or difficulties in commencing enrollment of patients in our clinical studies and/or clinical trials, including the Phase 0 exploratory IND study and, if permitted to proceed, our Phase 1 and Phase 2 clinical trials;
- the impact from potential delays, including potential difficulties in clinical site initiation, including difficulties in recruiting clinical site investigators and clinical site staff;
- diversion of healthcare resources away from the conduct of clinical trials, including the diversion of hospitals serving as our clinical trial sites and hospital staff supporting the conduct of our clinical trials;
- interruption of key clinical trial activities, such as clinical trial site data monitoring, due to limitations on travel imposed or recommended by federal or state governments, employers and others or interruption of clinical trial subject visits and study procedures that are deemed non-essential, which may impact the integrity of subject data and clinical study endpoints;
- interruption or delays in the operations of the FDA or other regulatory authorities, which may impact review and approval timelines;
- interruption of, or delays in receiving, supplies of our product candidates from our contract manufacturing organizations due to staffing shortages, production slowdowns or stoppages and disruptions in delivery systems;
- interruptions in preclinical studies due to restricted or limited operations at our laboratory facility;
- limitations on employee resources that would otherwise be focused on the conduct of our preclinical studies and clinical trials, including because of sickness of employees or their families or the desire of employees to avoid contact with large groups of people; and
- interruption or delays to our sourced discovery and clinical activities.

The COVID-19 pandemic continues to rapidly evolve.

The extent to which the outbreak ultimately impacts our business, preclinical studies and clinical trials will depend on future developments, which are highly uncertain and cannot be predicted with confidence,

such as the ultimate geographic spread of the disease, the duration of the pandemic, travel restrictions and social distancing in the United States and other countries, business closures or business disruptions and the effectiveness of actions taken in the United States and other countries to contain and treat the disease.

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

As of March 31, 2021, we had six employees, two of whom are full-time. As our clinical development and commercialization plans and strategies develop, and as we continue to operate as a public company, we expect we will need additional managerial, clinical, manufacturing, medical, regulatory, sales, marketing, financial, legal and other personnel. Future growth would impose significant added responsibilities on members of management, including:

- recruiting, integrating, retaining and motivating additional employees;
- managing our development efforts effectively, including the clinical, manufacturing and quality review process for our product candidates, while complying with our contractual obligations to contractors, collaboration partners 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, if approved, 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 third parties, including independent organizations, advisors and consultants, to provide certain services to support and perform our operations. There can be no assurance that the services of these third parties 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, accuracy or quantity of the services provided is compromised for any reason, our clinical trials may be delayed or terminated, and we may not be able to obtain, or may be substantially delayed in obtaining, 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 suitable 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, we may not be able to successfully execute the tasks necessary to further develop and commercialize our product candidates and, accordingly, may not achieve our development and commercialization goals.

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

Our ability to compete in the highly competitive oncology industry depends upon our ability to attract and retain highly qualified managerial, scientific and medical personnel. We are dependent on our management, scientific and medical personnel and advisors, including our co-founder and CEO, Robert Michael Dudley, our co-founder and Vice President of Drug Discovery, Dr. Zdravka Medarova, our CFO and director, Thomas A. Fitzgerald, our chief scientist Dr. Peter Liu, our VP of Operations Dr. Judy Carmody, our scientific co-founder Dr. Anna Moore, our board of directors and members of our scientific and business advisory boards as well as our many consultants. The loss of the services of any of these individuals, and our inability to find suitable replacements, could result in delays in product development and materially harm our business.

Recruiting and retaining qualified scientific, clinical, manufacturing and sales and marketing personnel will also be critical to our success. The loss of the services of our executive officers or other key employees could impede the achievement of our research, development and commercialization objectives and seriously harm our ability to successfully implement our business strategy. Furthermore, replacing executive officers and key employees may be difficult and may take an extended period of time because of the limited number

of individuals in our industry with the breadth of skills and experience required to successfully develop, gain regulatory approval of and commercialize drugs. Competition to hire from this limited pool is intense, and we may be unable to hire, train, retain or motivate these key personnel on acceptable terms given the competition among numerous pharmaceutical and biotechnology companies for similar personnel. We also experience competition for the hiring of scientific and clinical personnel from universities and research institutions. Failure to succeed in clinical trials may make it more challenging to recruit and retain qualified scientific personnel.

The estimates of market opportunity and forecasts of market growth included in this prospectus or that we may otherwise provide may prove to be inaccurate, and even if the markets in which we compete achieve the forecasted growth, our business may not grow at similar rates, or at all.

Market opportunity estimates and growth forecasts included in this prospectus or that we may otherwise provide are subject to significant uncertainty and are based on assumptions and estimates which may not prove to be accurate. The estimates and forecasts included in this prospectus relating to size and expected growth of our target market may prove to be inaccurate. Even if the markets in which we compete meet the size estimates and growth forecasts included in this prospectus, our business may not grow at similar rates, or at all. Our growth is subject to many factors, including our success in implementing our business strategy, which is subject to many risks and uncertainties.

We may be exposed to significant foreign exchange risk.

We incur portions of our expenses, and may in the future derive revenues, in a variety of currencies. As a result, we are exposed to foreign currency exchange risk as our results of operations and cash flows are subject to fluctuations in foreign currency exchange rates. Fluctuations in currency exchange rates have had, and will continue to have, an impact on our results as expressed in U.S. dollars. We currently do not engage in hedging transactions to protect against uncertainty in future exchange rates between particular foreign currencies and the euro. We cannot predict the impact of foreign currency fluctuations, and foreign currency fluctuations in the future may adversely affect our financial condition, results of operations and cash flows.

Compliance with governmental regulations regarding the treatment of animals used in research could increase our operating costs, which would adversely affect the commercialization of our products.

The Animal Welfare Act, or AWA, is the federal law that covers the treatment of certain animals used in research. Currently, the AWA imposes a wide variety of specific regulations that govern the humane handling, care, treatment and transportation of certain animals by producers and users of research animals, most notably relating to personnel, facilities, sanitation, cage size, and feeding, watering and shipping conditions. Third parties with whom we contract are subject to registration, inspections and reporting requirements under the AWA and comparable rules, regulations, and or obligations that may exist in many foreign jurisdictions. Furthermore, some states have their own regulations, including general anti-cruelty legislation, which establish certain standards in handling animals. Comparable rules, regulations, and/or obligations exist in many foreign jurisdictions. If we or our contractors fail to comply with regulations concerning the treatment of animals used in research, we may be subject to fines and penalties and adverse publicity, and our operations could be adversely affected.

Our ability to use our net operating loss carryforwards and certain tax credit carryforwards may be subject to limitation.

We have net operating loss carryforwards and tax credit carryforwards for U.S. federal and state income tax purposes which begin to expire in future years. Additionally, under Section 382 of the Internal Revenue Code of 1986, as amended, or the Code, changes in our ownership may limit the amount of our net operating loss carryforwards and tax credit carryforwards that could be utilized annually to offset our future taxable income, if any. This limitation would generally apply in the event of a cumulative change in ownership of our company of more than 50 percentage points within a three-year period. Any such limitation may significantly reduce our ability to utilize our net operating loss carryforwards and tax credit carryforwards before they expire. Private placements and other transactions that have occurred since our

inception, as well as this offering, may trigger such an ownership change pursuant to Section 382. Any such limitation, whether as the result of this offering, prior private placements, sales of our common stock by our existing stockholders or additional sales of our common stock by us, could have a material adverse effect on our results of operations in future years.

The reduction of the corporate tax rate under the Tax Cuts and Jobs Act of 2017, or the Tax Cuts and Jobs Act, may cause a reduction in the economic benefit of our net operating loss carryforwards and other deferred tax assets available to us. Our ability to utilize those net operating loss carryforwards could be limited by an "ownership change" as described above, which could result in increased tax liability to us.

Risks related to our intellectual property

Our success depends in part on our ability to protect our intellectual property. It is difficult and costly to protect our proprietary rights and technology, and we may not be able to ensure their protection.

Our business will depend in large part on obtaining and maintaining patent, trademark and trade secret protection of our proprietary technologies and our product candidates, their respective components, synthetic intermediates, formulations, combination therapies, methods used to manufacture them and methods of treatment, as well as successfully defending these patents against third-party challenges. Our ability to stop unauthorized third parties from making, using, selling, offering to sell or importing our product candidates is dependent upon the extent to which we have rights under valid and enforceable patents that cover these activities and whether a court would issue an injunctive remedy. If we are unable to secure and maintain patent protection for any product or technology we develop, or if the scope of the patent protection secured is not sufficiently broad, our competitors could develop and commercialize products and technology similar or identical to ours, and our ability to commercialize any product candidates we may develop may be adversely affected.

The patenting process is expensive and time-consuming, and we may not be able to file and prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner. The patenting process is subject to numerous risks and there can be no assurance that we will be successful in obtaining patents for which we have applied. In addition, we may not pursue, obtain, or maintain patent protection in all relevant markets. It is also possible that we will fail to identify patentable aspects of our research and development output before it is too late to obtain patent protection. Moreover, in some circumstances, we may not have the right to control the preparation, filing and prosecution of patent applications, or to maintain the patents, covering technology that we license from or license to third parties and are reliant on our licensors or licensees.

The strength of patents in the biotechnology and biopharmaceutical fields 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 technology, including our product candidates, or prevent others from designing around the claims in our patents. 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.

We cannot be certain that we were the first to file any patent application related to our technology, including our product candidates, and, if we were not, we may be precluded from obtaining patent protection for our technology, including our product candidates.

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. Furthermore, for United States 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 United States Patent and Trademark Office, or USPTO, to

determine who was the first to invent any of the subject matter covered by the patent claims of our applications. Similarly, for United States applications in which at least one claim is not entitled to a priority date before March 16, 2013, derivation proceedings can be instituted to determine whether the subject matter of a patent claim was derived from a prior inventor's disclosure.

We may be required to disclaim part or all of the term of certain patents. There may be prior art of which we are not aware that may affect the validity or enforceability of a patent or patent application 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. 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, would adequately protect our product candidates, or would be found by a court to be infringed by a competitor's technology or product. 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 that have the same effect as our products on an independent basis and that do not infringe our patents or other intellectual property rights, or will design around the claims of patents that may issue 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. Under the enacted Leahy-Smith America Invents Act, or the America Invents Act, after March 2013, the United States moved from a "first-to-invent" to a "first-inventor-to-file" system. Under a "first-inventor-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-inventor-to-file" provisions. In addition, the courts have yet to address many of these provisions and the applicability of the America Invents Act and new regulations on specific patents discussed herein, for which issues 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 that are similar to the compositions of our product candidates but that are not covered by the claims of our patents or those of our licensors;
- 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 invented or developed using U.S. government funding, 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. 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.

The patents covering our lead candidate, TTX-MC138, are currently issued only in the U.S. and there are no foreign applications pending for this invention at this time. We have limited foreign intellectual property rights and may not be able to protect our intellectual property rights throughout the world.

We have limited intellectual property rights outside the United States. Filing, prosecuting and defending patents on product candidates in all countries throughout the world would be prohibitively expensive, and our intellectual property rights in some countries outside the United States can be less extensive than those in the United States. In addition, the laws of 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.

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 oncology 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.

Third-party claims of intellectual property infringement may be costly and time consuming to defend, and could prevent or delay our product discovery, development and commercialization efforts.

Our commercial success depends in part on our ability to develop, manufacture, market and sell our product candidates and use our proprietary technologies without infringing the proprietary rights of third parties. There is a substantial amount of litigation involving patents and other intellectual property rights in the biotechnology and biopharmaceutical industries, as well as administrative proceedings for challenging patents, including interference, derivation, *inter partes* review, post grant review, and reexamination proceedings before the USPTO or oppositions and other comparable proceedings in foreign jurisdictions. We may be 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 biopharmaceutical 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 product candidates and any license that is available may be non-exclusive, which could result in our competitors gaining access to the same intellectual property; and
- the need to redesign our product candidates or processes so they do not infringe, which may not be possible or may require substantial monetary expenditures and time.

In addition, there could be public announcements of the results of hearings, motions or other interim proceedings or developments, and, if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock. This type of litigation or proceeding could substantially increase our operating losses and reduce our resources available for development activities. We may not have sufficient financial or other resources to adequately conduct such litigation or proceedings. Some of our competitors may be able to sustain the costs of 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. Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation or administrative proceedings, there is a risk that some of our confidential information could be compromised by disclosure.

If we are not able to obtain and enforce patent and other intellectual property protection for our technologies, development and commercialization of our product candidates may be adversely affected and our business materially harmed.

Our success depends in part on our ability to obtain and maintain patents and other forms of intellectual property rights, including in-licensing intellectual property rights of others, for our product candidates,

methods used to manufacture our product candidates and methods for treating patients using our product candidates, as well as our ability to preserve our trade secrets, to prevent third parties from infringing our proprietary rights and to operate without infringing the proprietary rights of others.

We and our current or future licensors and licensees may not be able to apply for or prosecute patents on certain aspects of our technologies at reasonable cost, in a timely fashion, or at all. The patent position of oncology companies can be highly uncertain because it involves complex legal and factual questions. There is no guarantee that any of our pending patent applications will result in issued or granted patents, that any of our issued or granted patents will not later be found to be invalid or unenforceable, or that any issued or granted patents will include claims that are sufficiently broad to cover our product candidates or delivery technologies or provide meaningful protection from our competitors. If third parties disclose or misappropriate our proprietary rights, it may materially and adversely affect us.

While we will endeavor to try to protect our technologies with intellectual property rights such as patents, the process of obtaining patents is time-consuming, expensive and sometimes unpredictable. The USPTO and various foreign governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other provisions during the process of pursuing patent coverage. 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 otherwise would have been the case. The standards applied by the USPTO and foreign patent offices in granting patents are not always applied uniformly or predictably. For example, there is no uniform worldwide policy regarding patentable subject matter or the scope of claims allowable in oncology patents. Moreover, changes in either the patent laws or in the interpretations of patent laws may diminish the value of our intellectual property. As such, we do not know the degree of future protection that we might have with respect to our proprietary technologies. Further, patents have a limited lifespan.

In the United States and in industrialized countries generally, a patent expires 20 years after it is filed (or 20 years after the filing date of the first non-provisional US patent application to which it claims priority). Various extensions may be available; however, the life of a patent, and the protection it affords, is limited. Without patent protection for our technologies, we may be more susceptible to competition, including from generic versions of our product candidates. Further, the extensive period of time between patent filing and regulatory approval for a product-candidate limits the time during which we can market a product-candidate under patent protection, which may particularly and adversely affect our profitability.

Intellectual property litigation and administrative patent office patent validity challenges in one or more countries could cause us to spend substantial resources and distract our personnel from their normal responsibilities.

Even if resolved in our favor, litigation or other legal proceedings relating to intellectual property claims may cause us to incur significant expenses, and could distract our technical and management personnel from their normal responsibilities. In addition, there could be public announcements of the results of hearings, motions or other interim proceedings or developments and if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock. Such litigation or proceedings could substantially increase our operating losses and reduce the resources available for development activities or any future sales, marketing, patient support or distribution activities. We may not have sufficient financial or other resources to conduct such litigation or proceedings adequately. As noted above, some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their greater financial resources. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could compromise our ability to compete in the marketplace, including compromising our ability to raise the funds necessary to continue our clinical trials, continue our research programs, license necessary technology from third parties, or enter into development collaborations that would help us commercialize our current or future product candidates, if approved. Any of the foregoing events would harm our business, financial condition, results of operations and prospects.

Confidentiality agreements with employees and others may not prevent unauthorized disclosure of proprietary information.

Among the ways we attempt to protect our intellectual property is by entering into confidentiality agreements with our employees, consultants, and outside scientific advisors, contractors and collaborators. These agreements are intended to protect (i) proprietary know-how that may not be patentable or that we may elect not to patent, (ii) processes for which patents are difficult to enforce and (iii) other elements of our technology not covered by patents. Although we use reasonable efforts to protect our intellectual property, our employees, consultants, contractors, or outside scientific advisors might intentionally or inadvertently disclose our intellectual property to competitors or others. In addition, competitors may otherwise gain access to our intellectual property or independently develop substantially equivalent information and techniques. Enforcing a claim that another party illegally obtained and is using any of our intellectual property is expensive and time consuming, and the outcome is unpredictable. In addition, courts outside the U.S. sometimes are less willing than U.S. courts to protect intellectual property. Misappropriation or unauthorized disclosure of our intellectual property could materially and adversely affect our competitive position and may have a material adverse effect on us.

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

As is common in the biotechnology and biopharmaceutical industries, we employ individuals who were previously employed at universities or other biotechnology or biopharmaceutical companies, including our competitors or potential competitors. Although no claims against us are currently pending, and although we try to ensure that our employees and consultants do not use the proprietary information or know-how of others in their work for us, we may be subject to claims that we or our employees, consultants or independent contractors have inadvertently or otherwise used or disclosed intellectual property, including trade secrets or other proprietary information, of a former employer or other third parties. Litigation may be necessary to defend against these claims. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel. Even if we are successful in defending against such claims, litigation or other legal proceedings relating to intellectual property claims may cause us to incur significant expenses and could distract our technical and management personnel from their normal responsibilities. In addition, there could be public announcements of the results of hearings, motions or other interim proceedings or developments, and, if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock. This type of litigation or proceeding could substantially increase our operating losses and reduce our resources available for development activities. We may not have sufficient financial or other resources to adequately conduct such litigation or proceedings. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their substantially greater financial resources. Uncertainties resulting from the initiation and continuation of patent litigation or other intellectual property related proceedings could adversely affect our ability to compete in the marketplace.

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

Patents have a limited lifespan. In the United States, if all maintenance fees are timely paid, the natural expiration of a patent is generally 20 years from its earliest claimed U.S. non-provisional filing date. Various extensions such as patent term adjustments and/or extensions, may be available, but the life of a patent, and the protection it affords, is limited. Even if patents covering our product candidates are obtained, once the patent life has expired, we may be open to competition from competitive products. Given the amount of time required for the development, testing and regulatory review of new product candidates, patents protecting such candidates might expire before or shortly after such candidates are commercialized. As a result, our owned and licensed patent portfolio may not provide us with sufficient rights to exclude others from commercializing products similar or identical to ours.

Changes in patent law could diminish the value of patents in general, thereby impairing our ability to protect our current or future product candidates.

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. Recent patent reform legislation in the U.S. and other countries, including the Leahy-Smith America Invents Act, or Leahy-Smith Act, signed into law on September 16, 2011, could increase those uncertainties and costs. The Leahy-Smith Act includes a number of significant changes to U.S. patent law. These include provisions that affect the way patent applications are prosecuted, redefine prior art and provide more efficient and cost-effective avenues for competitors to challenge the validity of patents. In addition, the Leahy-Smith Act has transformed the U.S. patent system into a "first inventor to file" system. The first-inventor-to-file provisions, however, only became effective on March 16, 2013. Accordingly, it is not yet clear what, if any, impact the Leahy-Smith Act will have on the operation of our business. However, the Leahy-Smith Act and its implementation could make it more difficult to obtain patent protection for our inventions and increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our issued patents, all of which could harm our business, results of operations and financial condition.

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

Risks related to our common stock and this offering

There has been no prior public market for our common stock, the stock price of our common stock may be volatile or may decline regardless of our operating performance, and you may not be able to resell your shares at or above the initial public offering price.

Prior to this offering, there has been no public market for shares of our common stock. You may not be able to sell your shares quickly or at the market price if trading in shares of our common stock is not active. The initial public offering price for our common stock will be determined through negotiations with the underwriters, and the negotiated price may not be indicative of the market price of the common stock after the offering. An active or liquid market in our common stock may not develop upon the completion of this offering or, if it does develop, it may not be sustainable. As a result of these and other factors, you may be unable to resell your shares of our common stock at or above the initial public offering price.

Further, an inactive market may also impair our ability to raise capital by selling shares of our common stock and may impair our ability to enter into strategic collaborations or acquire companies or products by using our shares of common stock as consideration.

The price of our common stock may be volatile and fluctuate substantially, which could result in substantial losses for purchasers of our common stock in this offering.

Our stock price is likely to be volatile. The stock market in general and the market for biopharmaceutical companies in particular have experienced extreme volatility that has often been unrelated to the operating performance of particular companies. As a result of this volatility, you may not be able to sell your common stock at or above the initial public offering price. The market price for our common stock may be influenced by many factors, including:

- the success of competitive drugs or technologies;
- results of clinical trials of our current or future product candidates or those of our competitors;
- regulatory or legal developments in the U.S. and other countries;
- developments or disputes concerning patent applications, issued patents or other proprietary rights;
- the recruitment or departure of key personnel;

- the level of expenses related to any of our current or future product candidates or clinical development programs;
- the results of our efforts to discover, develop, acquire or in-license additional current or future product candidates or drugs;
- actual or anticipated changes in estimates as to financial results, development timelines or recommendations by securities analysts;
- variations in our financial results or those of companies that are perceived to be similar to us;
- changes in the structure of healthcare payment systems;
- market conditions in the pharmaceutical and biotechnology sectors;
- general economic, industry and market conditions; and
- the other factors described in this "Risk Factors" section.

In addition, the stock market in general, and the market for biotechnology 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, including as a result of the COVID-19 pandemic. 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 after this offering does not exceed the initial public offering 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.

We have broad discretion in the use of the net proceeds from this offering and may not use them effectively.

Our management will have broad discretion in the application of the net proceeds from the offering, including for any of the purposes described in "Use of Proceeds." You will not have the opportunity as part of your investment decision to assess whether the net proceeds are being used effectively. Because of the number and variability of factors that will determine our use of the net proceeds, their ultimate use may differ substantially from what we currently intend. The failure by our management to apply these funds effectively could adversely affect us. Pending their use, we may invest the net proceeds in short-term, investment-grade, interest-bearing securities or commercial bank accounts. While we intend to invest the net proceeds conservatively, there is no assurance that these investments will not decline in value or yield reasonable returns.

If you purchase our common stock in this offering, you will incur immediate and substantial dilution in the book value of your shares.

You will suffer immediate and substantial dilution in the net tangible book value of the common stock you purchase in this offering. Based on the assumed initial public offering price of $9.00 per share, the midpoint of the range set forth on the cover of this prospectus, purchasers of common stock in this offering will experience immediate dilution of $6.35 per share in net tangible book value of the common stock. In addition, investors purchasing common stock in this offering will contribute 91% of the total amount invested by stockholders since inception but will only own 33% of the shares of common stock outstanding. In the past, we issued options to acquire common stock at prices significantly below the initial public offering price. To the extent these options are ultimately exercised, investors purchasing common stock in this offering will sustain further dilution. See the section of this prospectus titled "Dilution" for a more detailed description of the dilution to new investors in the offering.

Raising additional capital may cause dilution to our stockholders, including purchasers of common stock in this offering, restrict our operations or require us to relinquish rights to our technologies or current or future product candidates.

Until such time, if ever, as we can generate the cash we need from operations, we expect to finance our cash needs through a combination of private and public equity offerings, debt financings, collaborations,

strategic alliances and marketing, distribution or licensing arrangements. We do not currently have any committed external source of funds. To the extent that we raise additional capital through the sale of common stock or securities convertible or exchangeable into common stock, your ownership interest will be diluted, and the terms of these securities may include liquidation or other preferences that materially adversely affect your rights as a common stockholder. Debt financing, if available, would increase our fixed payment obligations and may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends.

If we raise funds through additional collaborations, strategic alliances or marketing, distribution or licensing arrangements with third parties, we may have to relinquish valuable rights to our intellectual property, future revenue streams, research programs or current or future product candidates or to grant licenses on terms that may not be favorable to us. If we are unable to raise additional funds through equity or debt financings when needed, we may be required to delay, scale back or discontinue the development and commercialization of one or more of our product candidates, delay our pursuit of potential in-licenses or acquisitions or grant rights to develop and market current or future product candidates that we would otherwise prefer to develop and market ourselves.

Our executive officers, directors, principal stockholders and their affiliates will continue to exercise significant influence over our company after this offering, which will limit your ability to influence corporate matters and could delay or prevent a change in corporate control.

Immediately following the completion of this offering, and disregarding any shares of common stock that they purchase in this offering or may obtain from exercising options previously awarded, the existing holdings of our executive officers, directors, principal stockholders and their affiliates, will represent beneficial ownership, in the aggregate, of approximately 54.9% of our outstanding common stock, assuming no exercise of the underwriters' option to acquire additional common stock in this offering and assuming we issue the number of shares of common stock as set forth on the cover page of this prospectus. As a result, these stockholders, if they act together, will be able to influence our management and affairs and the outcome of matters submitted to our stockholders for approval, including the election of directors and any sale, merger, consolidation or sale of all or substantially all of our assets. These stockholders acquired their shares of common stock for substantially less than the price of the shares of common stock being acquired in this offering, and these stockholders may have interests, with respect to their common stock, that are different from those of investors in this offering and the concentration of voting power among these stockholders may have an adverse effect on the price of our common stock. In addition, this concentration of ownership might adversely affect the market price of our common stock by:

- delaying, deferring or preventing a change of control of us;
- impeding a merger, consolidation, takeover or other business combination involving us; or
- discouraging a potential acquirer from making a tender offer or otherwise attempting to obtain control of us.

See the section of this prospectus titled "Principal Stockholders" for more information regarding the ownership of our outstanding common stock by our executive officers, directors, principal stockholders and their affiliates.

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, which are to become effective upon the closing of this offering, will 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 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 board of directors acting pursuant to a resolution approved by the affirmative vote of a majority of the directors then in office;
- 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, or DGCL, which may prohibit certain business combinations with stockholders owning 15% or more of our outstanding voting stock. These antitakeover 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.

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, or EGC, as defined in the JOBS Act, enacted in April 2012. For as long as we continue to be an EGC, we may take advantage of exemptions from various reporting requirements that are applicable to other public companies that are not EGCs, including not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act, or Section 404, reduced disclosure obligations regarding executive compensation in this prospectus and our 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 EGC for up to five years following the year in which we complete this offering, although circumstances could cause us to lose that status earlier. We will remain an EGC until the earlier of (i) the last day of the fiscal year (a) following the fifth anniversary of the completion of this offering, (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 $700.0 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.

We may choose to take advantage of some, but not all, of the available exemptions. We have taken advantage of reduced reporting burdens in this prospectus. In particular, we have not included all of the executive compensation information that would be required if we were not an EGC. We cannot predict whether investors will find our common stock less attractive if we rely on certain or all of 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.

Under the JOBS Act, EGCs can also delay adopting new or revised accounting standards until such time as those standards apply to private companies, which may make our financial statements less comparable to companies that comply with new or revised accounting pronouncements as of public company effective dates.

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. Furthermore, future debt or other financing arrangements may contain 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 the value of their stock.

We have identified material weaknesses in our internal control over financial reporting. If we are unable to remediate these material weaknesses, or if we identify additional material weaknesses in the future or otherwise fail to maintain an effective system of internal controls, we may not be able to accurately or timely report our financial condition or results of operations, which may adversely affect our business.

As a public company, we will be required to maintain internal control over financial reporting and to report any material weaknesses in such internal control. Section 404 of the Sarbanes-Oxley Act requires that we evaluate and determine the effectiveness of our internal control over financial reporting. A material weakness is a deficiency or combination of deficiencies in internal control over financial reporting such that there is a reasonable possibility that a material misstatement of our financial statements will not be prevented or detected on a timely basis.

To date, we have had limited financial and accounting personnel to fully execute our accounting processes and address our internal control over financial reporting. During 2021, in connection with the preparation of our financial statements as of and for the years ended December 31, 2020 and 2019, we identified material weaknesses in our control over financial reporting.

We did not design and therefore did not have an effective control environment commensurate with our financial reporting requirements. Specifically, we lacked a sufficient number of professionals with segregated duties with an appropriate level of accounting knowledge, training and experience to appropriately analyze, record and disclose accounting matters timely and accurately.

While these material weaknesses did not result in a misstatement for the years ended December 31, 2020 and 2019, each of the above material weaknesses could have resulted in a misstatement of the aforementioned account balances or disclosures that could have resulted in a material misstatement to the annual or interim financial statements that would not have been prevented or detected.

In order to remediate the material weaknesses in our internal control over financial reporting and address the material weaknesses in our accounting processes, we plan to establish more robust accounting policies and procedures, review the adoption of new accounting positions and the need for financial statement disclosures, and engage consultants to assist us in determining what personnel are needed and in evaluating new accounting policies.

We began implementing and plan to continue to implement steps to address the internal control deficiencies that contributed to the material weaknesses, including the following:

- hiring of additional finance and accounting personnel with requisite experience and technical accounting expertise, supplemented by third-party resources;
- documenting and formally assessing our accounting and financial reporting policies and procedures; and
- assessing significant accounting transactions and other technical accounting and financial reporting issues, preparing accounting memoranda addressing these issues and maintaining these memoranda in our corporate records.

While we believe that these efforts will improve our internal control over financial reporting, the implementation of these measures will be ongoing and will require validation and testing of the design and operating effectiveness of our internal controls over a sustained period of financial reporting cycles. We cannot reasonably estimate when these remediation measures will be completed nor can we assure you that the measures we have taken to date, and are continuing to take, will be sufficient to remediate the material

weaknesses we have identified or avoid potential future material weaknesses. If the steps we take do not correct the material weaknesses in a timely manner, we will be unable to conclude that we maintain effective internal controls over financial reporting. Furthermore, we may not have identified all material weaknesses, and our current controls and any new controls that we develop may become inadequate because of changes in conditions in our business. Accordingly, there continues to be a reasonable possibility that these deficiencies or others could result in a misstatement of our accounts or disclosures that would result in a material misstatement of our financial statements that would not be prevented or detected on a timely basis.

If we continue to fail to maintain an effective system of internal control over financial reporting, we may not be able to accurately report our financial results or prevent fraud. As a result, stockholders could lose confidence in our financial and other public reporting, which would harm our business and the trading price of our common stock.

Effective internal controls over financial reporting are necessary for us to provide reliable financial reports and, together with adequate disclosure controls and procedures, are designed to prevent fraud. Any failure to implement required new or improved controls, or difficulties encountered in their implementation, could cause us to fail to meet our reporting obligations. In addition, any testing by us conducted in connection with Section 404, or any subsequent testing by our independent registered public accounting firm, may reveal deficiencies in our internal controls over financial reporting that are deemed to be material weaknesses or that may require prospective or retroactive changes to our financial statements or identify other areas for further attention or improvement. Inferior internal controls could also cause investors to lose confidence in our reported financial information, which could have a negative effect on the trading price of our stock.

We will be required to disclose changes made in our internal controls and procedures on a quarterly basis, and our management will be required to assess the effectiveness of these controls annually. However, for as long as we are an EGC, our independent registered public accounting firm will not be required to attest to the effectiveness of our internal controls over financial reporting pursuant to Section 404. We could be an EGC for up to five years. An independent assessment of the effectiveness of our internal controls over financial reporting could detect problems that our management's assessment might not. Undetected material weaknesses in our internal controls over financial reporting could lead to restatements of our financial statements and require us to incur the expense of remediation.

Our amended and restated bylaws to be effective upon the completion of this offering will designate a certain court 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.

Pursuant to our amended and restated bylaws that will become effective upon the effectiveness of the registration statement of which this prospectus forms a part, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware will be the sole and exclusive forum for any state law claims 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, employees or agents 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 and our amended and restated bylaws, (iv) any action to interpret, apply, enforce or determine the validity of our certificate of incorporation or by-laws or (v) 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, or the Delaware Forum Provision. The Delaware Forum Provision will not apply to any causes of action arising under the Securities Act or the Exchange Act or any other claim for which the federal courts have exclusive jurisdiction. Unless we consent in writing to the selection of an alternate forum, the United Stated District Court for the District of Massachusetts shall be the sole and exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act, or the Federal Forum Provision, as our principal office is located in Boston, Massachusetts. In addition, our amended and restated bylaws provide that any person or entity purchasing or otherwise acquiring any interest in our shares of common stock is deemed to have notice of and consented to the Delaware Forum Provision and the Federal Forum Provision; provided, however, that stockholders cannot and will not be deemed to have waived our compliance with the federal securities laws and the rules and regulations thereunder.

The Delaware Forum Provision and the Federal Forum Provision may impose additional litigation costs on stockholders who assert the provision is not enforceable and may impose more general additional litigation costs in pursuing any such claims, particularly if the stockholders do not reside in or near the State of Delaware or the Commonwealth of Massachusetts. In addition, these forum selection clauses in our bylaws may limit our stockholders' ability to bring a claim in a judicial 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. Moreover, while the Delaware Supreme Court ruled in March 2020 that federal forum selection provisions purporting to require claims under the Securities Act be brought in federal court were "facially valid" under Delaware law, there is uncertainty as to whether other courts will enforce our Federal Forum Provision. If the Federal Forum Provision is found to be unenforceable, we may incur additional costs associated with resolving such matters. The Federal Forum Provision may also impose additional litigation costs on stockholders who assert that the provision is not enforceable or invalid. The Federal Forum Provision may also impose additional litigation costs on stockholders who assert the provision is not enforceable or invalid. 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.

We may not be able to satisfy listing requirements of the Nasdaq Capital Market or obtain or maintain a listing of our common stock on the Nasdaq Capital Market.

If our common stock is listed on the Nasdaq Capital Market, we must meet certain financial and liquidity criteria to maintain such listing. If we violate the Nasdaq Capital Market listing requirements, our common stock may be delisted. If we fail to meet any of the Nasdaq Capital's listing standards, our common stock may be delisted. In addition, our board of directors may determine that the cost of maintaining our listing on a national securities exchange outweighs the benefits of such listing. A delisting of our common stock from the Nasdaq Capital Market may materially impair our stockholders' ability to buy and sell our common stock and could have an adverse effect on the market price of, and the efficiency of the trading market for, our common stock. The delisting of our common stock could significantly impair our ability to raise capital and the value of your investment.

General Risk Factors

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

Despite the implementation of security measures, our internal computer systems and those of our third-party CROs and other contractors and consultants are vulnerable to damage from computer viruses, unauthorized access, natural disasters, terrorism, war and telecommunication and electrical failures. While we have not experienced any such system failure, accident, 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 programs. For example, the loss of clinical trial data for our current or future product candidates could result in delays in our regulatory approval efforts and significantly increase our costs to recover or reproduce the data. To the extent that any disruption or security breach results in a loss of or damage to our data or applications or other data or applications relating to our technology or current or future product candidates, or inappropriate disclosure of confidential or proprietary information, we could incur liabilities and the further development of our current or future product candidates could be delayed.

We may be unable to adequately protect our information systems from cyberattacks, which could result in the disclosure of confidential or proprietary information, including personal data, damage our reputation, and subject us to significant financial and legal exposure.

We rely on information technology systems that we or our third-party providers operate to process, transmit and store electronic information in our day-to-day operations. In connection with our product discovery efforts, we may collect and use a variety of personal data, such as name, mailing address, email addresses, phone number and clinical trial information. A successful cyberattack could result in the theft or

destruction of intellectual property, data or other misappropriation of assets, or otherwise compromise our confidential or proprietary information and disrupt our operations. Cyberattacks are increasing in their frequency, sophistication and intensity, and have become increasingly difficult to detect. Cyberattacks could include wrongful conduct by hostile foreign governments, industrial espionage, wire fraud and other forms of cyber fraud, the deployment of harmful malware, denial-of-service, social engineering fraud or other means to threaten data security, confidentiality, integrity and availability. A successful cyberattack could cause serious negative consequences for us, including, without limitation, the disruption of operations, the misappropriation of confidential business information, including financial information, trade secrets, financial loss and the disclosure of corporate strategic plans. Although we devote resources to protect our information systems, we realize that cyberattacks are a threat, and there can be no assurance that our efforts will prevent information security breaches that would result in business, legal, financial or reputational harm to us, or would have a material adverse effect on our results of operations and financial condition. Any failure to prevent or mitigate security breaches or improper access to, use of, or disclosure of our clinical data or patients' personal data could result in significant liability under state (*e.g.*, state breach notification laws), federal (*e.g.*, HIPAA, as amended by HITECH), and international law (*e.g.*, the European Union, or EU, General Data Protection Regulation, or GDPR) and may cause a material adverse impact to our reputation, affect our ability to use collected data, conduct new studies and potentially disrupt our business.

We rely on our third-party providers to implement effective security measures and identify and correct for any such failures, deficiencies or breaches. We also rely on our employees and consultants to safeguard their security credentials and follow our policies and procedures regarding use and access of computers and other devices that may contain our sensitive information. If we or our third-party providers fail to maintain or protect our information technology systems and data integrity effectively or fail to anticipate, plan for or manage significant disruptions to our information technology systems, we or our third-party providers could have difficulty preventing, detecting and controlling such cyber-attacks and any such attacks could result in losses described above as well as disputes with physicians, patients and our partners, regulatory sanctions or penalties, increases in operating expenses, expenses or lost revenues or other adverse consequences, any of which could have a material adverse effect on our business, results of operations, financial condition, prospects and cash flows. Any failure by such third parties to prevent or mitigate security breaches or improper access to or disclosure of such information could have similarly adverse consequences for us. If we are unable to prevent or mitigate the impact of such security or data privacy breaches, we could be exposed to litigation and governmental investigations, which could lead to a potential disruption to our business.

We or the third parties upon whom we depend may be adversely affected by earthquakes or other natural disasters, and our business continuity and disaster recovery plans may not adequately protect us from any such serious disaster.

Any unplanned event, such as flood, fire, explosion, earthquake, extreme weather condition, medical epidemics, power shortage, telecommunication failure or other natural or man-made accidents or incidents that result in us being unable to fully utilize our facilities, or the manufacturing facilities of our third-party contract manufacturers, may have a material and adverse effect on our ability to operate our business, particularly on a daily basis, and have significant negative consequences on our financial and operating conditions. Loss of access to these facilities may result in increased costs, delays in the development of our product candidates or interruption of our business operations. Earthquakes or other natural disasters could further disrupt our operations and have a material and adverse effect on our business, financial condition, results of operations and prospects. If a natural disaster, power outage or other event were to occur that prevented us from using all or a significant portion of our headquarters, that damaged critical infrastructure, such as our research facilities or the manufacturing facilities of our third-party contract manufacturers, or that otherwise disrupted operations, it may be difficult or, in certain cases, impossible, for us to continue our business for a substantial period of time.

The disaster recovery and business continuity plans we have in place may prove inadequate in the event of a serious disaster or similar event. We may incur substantial expenses as a result of the limited nature of our disaster recovery and business continuity plans, which could have a material adverse effect on our business. As part of our risk management policy, we maintain insurance coverage at levels that we believe are appropriate for our business. However, in the event of an accident or incident at these facilities, we cannot assure you that the amounts of insurance will be sufficient to satisfy any damages and losses. If our facilities,

or the manufacturing facilities of our third-party contract manufacturers, are unable to operate because of an accident or incident or for any other reason, even for a short period of time, any or all of our research and development programs may be harmed.

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

We are exposed to the risk that our employees, principal investigators, CROs and consultants may engage in fraudulent conduct or other illegal activity. Misconduct by these parties could include intentional, reckless and/or negligent conduct or disclosure of unauthorized activities to us that violate the regulations of the FDA and other regulatory authorities, including those laws requiring the reporting of true, complete and accurate information to such authorities; healthcare fraud and abuse laws and regulations in the U.S. and abroad; or laws that require the reporting of financial information or data accurately. In particular, sales, marketing, patient support and business arrangements in the healthcare industry are subject to extensive laws and regulations intended to prevent fraud, misconduct, kickbacks, self-dealing and other abusive practices. These laws and regulations may restrict or prohibit a wide range of pricing, discounting, marketing and promotion, sales commission, customer incentive programs and other business arrangements. Activities subject to these laws also involve the improper use of information obtained in the course of clinical trials or creating fraudulent data in our preclinical studies or clinical trials, which could result in regulatory sanctions and cause serious harm to our reputation. We intend to adopt, prior to the completion of this offering, a code of conduct applicable to all of our employees, but it is not always possible to identify and deter misconduct by employees and other third parties, and the precautions we take to detect and prevent this activity may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to comply with these laws or regulations. Additionally, we are subject to the risk that a person could allege such fraud or other misconduct, even if none occurred. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business, including the imposition of civil, criminal and administrative penalties, damages, monetary fines, possible exclusion from participation in Medicare, Medicaid and other federal healthcare programs, contractual damages, reputational harm, diminished profits and future earnings, and curtailment of our operations, any of which could adversely affect our ability to operate our business and our results of operations.

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. Infringement of these laws could result in substantial fines and imprisonment. Payments made to physicians in certain EU Member States must bepublicly 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 GDPR, which became effective on May 25, 2018. The GDPR is wide-ranging in scope and imposes numerous requirements on companies that process personal data, including requirements relating to processing health and other sensitive data, obtaining consent of the individuals to whom the personal data relates, providing information to individuals regarding data processing activities, implementing safeguards to protect the security and confidentiality of personal data, providing notification of data breaches, and taking certain measures when engaging third-party processors. The GDPR also imposes strict rules on the transfer of personal data to countries outside the EU, including the U.S., and permits data protection authorities to impose large penalties for violations of the GDPR, including potential fines of up to €20 million or 4% of annual global revenues, whichever is greater. The GDPR also confers a private right of action on data subjects and consumer associations to lodge complaints with supervisory authorities, seek judicial remedies, and obtain compensation for damages resulting from violations of the GDPR. Compliance with the GDPR is 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.

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 periods of severely diminished liquidity and credit availability, declines in consumer confidence, declines in economic growth, increases in unemployment rates and uncertainty about economic stability, including most recently in connection with the outbreak of the novel coronavirus.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, scale back or discontinue the development and commercialization of one or more of our product candidates or delay our pursuit of potential in-licenses or acquisitions. 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.

Furthermore, our stock price may decline due in part to the volatility of the stock market and the general economic downturn.

We may incur substantial costs in our efforts to comply with evolving global data protection laws and regulations, and any failure or perceived failure by us to comply with such laws and regulations may harm our business and operations.

The global data protection landscape is rapidly evolving, and we may be or become subject to or affected by numerous federal, state and foreign laws and regulations, as well as regulatory guidance, governing the collection, use, disclosure, transfer, security and processing of personal data, such as information that we collect about participants and healthcare providers in connection with clinical trials.

Implementation standards and enforcement practices are likely to remain uncertain for the foreseeable future, which may (i) create uncertainty in our business, (ii) affect our or our service providers' ability to operate in certain jurisdictions or to collect, store, transfer use and share personal data, (iii) result in liability or (iv) impose additional compliance or other costs on us. Any failure or perceived failure by us to comply with federal, state, or foreign laws or self-regulatory standards could result in negative publicity, diversion of management time and effort, or proceedings against us by governmental entities or others. Recently, California passed the California Data Privacy Protection Act of 2018, or the CCPA, which went into effect in January 2020. The CCPA provides new data privacy rights for consumers and new operational requirements for companies, which may increase our compliance costs and potential liability. The CCPA gives California residents expanded rights to access and delete their personal information, opt out of certain personal information sharing, and receive detailed information about how their personal information is used. The CCPA provides for civil penalties for violations, as well as for private rights of action for data breaches that is expected to increased at a breach litigation. While there is currently an exception for protected health information that is subject to HIPAA and clinical trial regulations, as currently written, the CCPA may impact certain of our business activities. The CCPA may lead to similar laws in other U.S. states or at a national level, which could increase our potential liability and adversely affect our business.

In addition to our operations in the United States, which may be subject to healthcare and other laws relating to the privacy and security of health information and other personal information, if we establish operations or conduct clinical trials in Europe , we will be subject to European data privacy laws, regulations and guidelines. The General Data Protection Regulation, (EU) 2016/679, or GDPR, became effective on May 25, 2018, and deals with the collection, use, storage, disclosure, transfer, or other processing of personal data, including personal health data, regarding individuals in the European Economic Area, or EEA. The GDPR imposes a broad range of strict requirements on companies subject to the GDPR, including requirements relating to having legal bases for processing personal information relating to identifiable individuals and transferring such information outside the EEA, including to the United States, providing details to those individuals regarding the processing of their personal health and other sensitive data, obtaining consent of the individuals to whom the personal data relates, keeping personal information secure, having data processing agreements with third parties who process personal information, responding to individuals' requests to exercise their rights in respect of their personal information, reporting security breaches involving personal data to the competent national data protection authority and affected individuals, appointing data protection officers, conducting data protection impact assessments, and record-keeping. The GDPR increases substantially the penalties to which we could be subject in the event of any non-compliance, including fines of up to €10 million or up to 2% of our total worldwide annual turnover for certain comparatively minor offenses, or up to €20 million or up to 4% of our total worldwide annual turnover (i.e., revenues), whichever is greater, for more serious offenses. 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. In addition, the GDPR includes restrictions on cross-border data transfers.

Further, national laws of member states of the EU are in the process of being adapted to the requirements under the GDPR, possibly implementing national laws which may partially deviate from the GDPR and impose different obligations from country to country. As a result, we do not expect to operate in a uniform legal landscape in the EEA. Also, as it relates to processing and transfer of genetic data, the GDPR specifically allows national laws to impose additional and more specific requirements or restrictions. European laws have historically differed quite substantially in this field, leading to additional uncertainty. The U.K.'s decision to leave the EU, often referred to as Brexit, has created uncertainty with regard to data protection regulation in the U.K. In particular, it is unclear how data transfers to and from the U.K. will be regulated now that the U.K. has left the EU.

We may conduct clinical trials in the EEA where the GDPR would increase our responsibility and liability in relation to personal data that we process when such processing is subject to the GDPR, and when we are required to have in place additional mechanisms and safeguards to ensure compliance with the GDPR, including as implemented by individual countries. Compliance with the GDPR is a rigorous and time-intensive process that would increase our cost of doing business or require us to change our business practices. 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. We expect that we will face uncertainty as to

whether our efforts to comply with any obligations under European privacy laws will be sufficient. If we are investigated by a European data protection authority, we may face fines and other penalties. Any such investigation or charges by European data protection authorities could have a negative effect on our business and on our ability to attract and retain new clients or biotechnology and biopharmaceutical partners. We may also experience hesitancy, reluctance, or refusal by European or multi-national vendors or biotechnology and biopharmaceutical partners to use our products due to the potential risk exposure as a result of data protection obligations imposed on them by law, including the GDPR. Such vendors or biotechnology and biopharmaceutical partners may also view any alternative approaches to compliance as being too costly, too burdensome, too legally uncertain, or otherwise objectionable and therefore decide not to do business with us. Any of the forgoing could materially harm our business, prospects, financial condition and results of operations.

We or any future strategic partners may become subject to third-party claims or litigation alleging infringement of patents or other proprietary rights or seeking to invalidate patents or other proprietary rights.

We or any future strategic partners may be subject to third-party claims for infringement or misappropriation of patent or other proprietary rights. If we, our licensors or any future strategic partners are found to infringe a third-party patent or other intellectual property rights, we could be required to pay substantial damages, potentially including treble damages and attorneys' fees, if we are found to have willfully infringed. In addition, we, our licensors or any future strategic partners may choose to seek, or be required to seek, a license to technology owned by a third-party, which license may not be available on acceptable terms, if at all. Even if a license can be obtained on acceptable terms, the rights may be limited which could give our competitors access to the same technology or intellectual property rights as is licensed to us. If we fail to obtain a required license, we may be unable to effectively market certain approved products which could materially harm us. Alternatively, we may need to redesign our infringing products, which may be impossible or require substantial time and monetary expenditure. In addition, we may find it necessary to pursue claims or initiate lawsuits to protect or enforce our patent or other intellectual property rights. The cost to us in litigation or other proceedings relating to patent or other proprietary rights, even if resolved in our favor, could be substantial, and would divert our management's attention from operating the business. Most of our competitors would be better able to sustain the costs of complex patent litigation than us because they have substantially greater resources. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could materially delay our research and development efforts and significantly limit our ability to continue our operations.

If we are unable to adequately protect and enforce our trade secrets, our business and competitive position would be harmed.

In addition to the protection afforded by patents we may own or in-license, we seek to rely on trade secret protection, confidentiality agreements, and license agreements to protect proprietary know-how that may not be 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 may not be covered by patents. Although we 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, trade secrets can be difficult to protect and we have limited control over the protection of trade secrets used by our collaborators and suppliers. We cannot be certain that we have or will obtain these agreements in all circumstances and we cannot guarantee that we have entered into such agreements with each party that may have or have had access to our trade secrets or proprietary information.

Moreover, any of these parties might breach the agreements and intentionally or inadvertently disclose our trade secret information and we may not be able to obtain adequate remedies for such breaches. In addition, competitors may 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 and trade secrets to the same extent or in the same manner as the laws of the U.S. As a result, we may encounter significant problems in protecting and defending our intellectual property both in the U.S. 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, financial condition, results of operations and future prospects.

Enforcing a claim that a party illegally disclosed or misappropriated a trade secret is difficult, expensive and time-consuming, and the outcome is unpredictable. 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. 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. If any of our trade secrets were to be lawfully obtained or independently developed by a competitor or other third-party, we would have no right to prevent them from using that technology or information to compete with us.

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 addition, we take other appropriate precautions, such as physical and technological security measures, to guard against misappropriation of our proprietary technology by third parties. 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. Although we require all of our employees to assign their inventions to us, we may be unsuccessful in executing such an agreement with each party who, in fact, conceives or develops intellectual property that we regard as our own. The assignment of intellectual property rights may not be self-executing, or the assignment agreements may be breached, and we may be forced to bring claims against third parties, or defend claims that they may bring against us, to determine the ownership of what we regard as our intellectual property. Such claims could have a material adverse effecton our business, financial condition, results of operations, and prospects.

We may initiate, become a defendant in, or otherwise become party to lawsuits to protect or enforce our intellectual property rights, which could be expensive, time-consuming and unsuccessful.

Competitors may infringe any patents we may own or in-license. In addition, any patents we may own or in-license also may become involved in inventorship, priority, validity or unenforceability disputes. To counter infringement or unauthorized use, we may be required to file infringement claims, which can be expensive and time-consuming. We may not prevail in any lawsuits that we initiate, and the damages or other remedies awarded, if any, may not be commercially meaningful. In addition, in an infringement proceeding, a court may decide that one or more of any patents we may own or in-license is not valid or is unenforceable or that the other party's use of our technology that may be patented falls under the safe harbor to patent infringement under 35 U.S.C. §271(e)(1). There is also the risk that, even if the validity of these patents is upheld, the court may refuse to stop the other party from using the technology at issue on the grounds that any patents we may own or in-license do not cover the technology in question or that such third-party's activities do not infringe our patent applications or any patents we may own or in-license. An adverse result in any litigation or defense proceedings could put one or more of any patents we may own or in- license at risk of being invalidated, held unenforceable, or interpreted narrowly and could put our patent applications at risk of not issuing. Such litigation or proceedings could substantially increase our operating losses and reduce the resources available for development activities or any future sales, marketing, patient support or distribution activities. We may not have sufficient financial or other resources to conduct such litigation or proceedings adequately. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their greater financial resources and more mature and developed intellectual property portfolios. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could have a material adverse effect on our ability to compete in the marketplace.

Depending upon the timing, duration and specifics of FDA marketing approval of our current or future product candidates, one or more of the U.S. patents we own or license may be eligible for limited patent term restoration under the Drug Price Competition and Patent Term Restoration Act of 1984, referred to as the Hatch-Waxman Amendments. The Hatch-Waxman Amendments permit a patent restoration term of up to five years as compensation for patent term lost during product development and the FDA regulatory review process. Different laws govern the extension of patents on approved pharmaceutical products in Europe and other jurisdictions. However, we may not be granted a patent 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. For example, we may not be granted an extension in the U.S. if all of our patents covering an approved product expire more than fourteen years from the date of NDA approval for a product covered by those patents. 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 restoration or the term of any such extension is less than we request, our competitors may obtain approval of competing products following our patent expiration, and our ability to generate revenues could be materially adversely affected.

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 patent applications or any patents we may own or in-license. These proceedings are expensive, and 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. In addition to potential USPTO post-grant proceedings, we may become a party to patent opposition proceedings in the EPO, or similar proceedings in other foreign patent offices or courts where our patents may be challenged. The costs of these proceedings could be substantial, and may result in a loss of scope of some claims or a loss of the entire patent. An unfavorable result in a post-grant challenge proceeding may result in the loss of our right to exclude others from practicing one or more of our inventions in the relevant country or jurisdiction, which could have a material adverse effect on our business. Litigation or post-grant proceedings within patent offices 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, misappropriation of our trade secrets or confidential information, particularly in countries where the laws may not protect those rights as fully as in the U.S.

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.

We may not be able to detect infringement against any patents we may own or in-license. Even if we detect infringement by a third-party of any patents we may own or in-license, we may choose not to pursue litigation against or settlement with the third-party. If we later sue such third-party for patent infringement, the third-party may have certain legal defenses available to it, which otherwise would not be available except for the delay between when the infringement was first detected and when the suit was brought. Such legal defenses may make it impossible for us to enforce any patents we may own or in-license against such third-party.

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

The trading market for our common stock will rely in part on the research and reports that industry or financial analysts publish about us or our business. We may never obtain research coverage by industry or financial analysts. If no or few analysts commence coverage of us, the trading price of our stock would likely decrease. Even if we do obtain analyst coverage, if one or more of the analysts covering our business downgrade their evaluations of our stock, the price of our stock could decline. If one or more of these analysts cease to cover our stock, we could lose visibility in the market for our stock, which in turn could cause our stock price to decline.

We will incur 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, or the Exchange Act, which will require, among other things, that we file with the SEC annual, quarterly and current reports with respect to our business and financial condition. In addition, the Sarbanes-Oxley Act of 2002, as amended, or Sarbanes-Oxley Act, as well as rules subsequently adopted by the SEC and Nasdaq 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, or the Dodd-Frank Act, was enacted. There are significant corporate governance and executive compensation related provisions in the Dodd-FrankAct 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 this offering. 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.

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus contains forward-looking statements that involve substantial risks and uncertainties. All statements, other than statements of historical fact, contained in this prospectus, including statements regarding our strategy, future preclinical studies and clinical trials, future financial position, projected costs, prospects, plans and objectives are forward-looking statements. The words “anticipate,” “believe,” “contemplate,” “could,” “estimate,” “expect,” “intend,” “seek,” “may,” “might,” “plan,” “potential,” “predict,” “project,” “target,” “aim,” “should,” ‘will” “would,” or the negative of these words or other similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain these words. Forward-looking statements reflect our current views with respect to future events and are based on assumptions and subject to risks and uncertainties.

The forward-looking statements in this prospectus include, among other things, statements relating to:

- the timing and the success of preclinical studies and clinical trials of TTX-MC138, TTX-siPDL1 and TTX-siLIN28b and any other product candidates we develop;
- the potential advantages of our TTX platform in identifying drug candidates and patient populations that are likely to respond to a drug candidate;
- our strategic plans to advance the development of any of our drug candidates;
- our research and development efforts of our internal drug discovery programs and the utilization of our TTX platform to streamline the drug development process;
- the initiation, timing, progress, and results of our preclinical studies or clinical trials on any of our drug candidates;
- the timing of, the ability to submit applications for and the ability to obtain and maintain regulatory approvals for any of our drug candidates;
- our plans to discover and develop drug candidates and to maximize their commercial potential by advancing such drug candidates ourselves or in collaboration with others;
- our expectations regarding our ability to fund our operating expenses and capital expenditure requirements with our cash, cash equivalents, and the proceeds of this offering;
- our ability to secure sufficient funding and alternative source of funding to support our existing and proposed preclinical studies and clinical trials;
- our estimates regarding the potential market opportunity for our drug candidates we or any of our collaborators may in the future develop;
- our anticipated growth strategies and our ability to manage the expansion of our business operations effectively;
- our expectations related to the use of proceeds from this offering;
- our ability to keep up with rapidly changing technologies and evolving industry standards, including our ability to achieve technological advances;
- the effect of the COVID-19 pandemic, including mitigation efforts and economic effects, on any of the foregoing or other aspects of our business operations, including but not limited to our preclinical studies and future clinical trials;
- our ability to source our needs for skilled labor in the fields of biology, oncology and drug development;
- the impact of government laws and regulations on the development and commercialization of our drug candidates; and
- our use of the proceeds from this offering.

We may not actually achieve the plans, intentions, or expectations disclosed in our forward-looking statements, and you should not place undue reliance on our forward-looking statements. Actual results or

events could differ materially from the plans, intentions, and expectations disclosed in the forward-looking statements we make. We have included important factors in the cautionary statements included in this prospectus, particularly in the “Risk Factors” section, that we believe could cause actual results or events to differ materially from the forward-statements that we make.

Furthermore, we operate in a competitive and rapid changing environment. New risks and uncertainties emerge from time to time, and it is not possible for us to predict all risks and uncertainties that could have an impact on the forward-looking statements contained in this prospectus.

You should read this prospectus and the documents we reference in this prospectus and have filed as exhibits to the registration statement of which this prospectus is a part completely and with the understanding that our actual future results may be materially different from what we expect. The forward-looking statements contained in this prospectus are made as of the date of this prospectus, and we do not assume any obligation to update any forward-looking statements, whether as a result of new information, future events or otherwise, except as required by applicable law.

In addition, statements that “we believe” and similar statements reflect our beliefs and opinions on the relevant subject. These statements are based upon information available to us as of the date of this prospectus, and while we believe such information forms a reasonable basis for such statements, such information may be limited or incomplete. Our statements should not be read to indicate that we have conducted an exhaustive inquiry into, or review of, all potentially available relevant information. These statements are inherently uncertain, and investors are cautioned not to unduly rely upon these statements.

USE OF PROCEEDS

We estimate that the net proceeds from our sale of shares of our common stock in this offering will be approximately $22.0 million, or $25.5 million if the underwriters exercise in full their option to purchase additional shares, assuming an initial public offering price of $9.00 per share, the midpoint of the price range set forth on the cover page of this prospectus, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

A $1.00 increase (decrease) in the assumed initial public offering price of $9.00 per share, the midpoint of the price range set forth on the cover page of this prospectus, would increase (decrease) the net proceeds to us from this offering by $2.6 million, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. An increase (decrease) of one million shares in the number of shares offered by us, as set forth on the cover page of this prospectus, would increase (decrease) our net proceeds from this offering by $8.3 million, assuming no change in the assumed initial public offering price per share and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. We do not expect that a change in the initial public offering price or the number of shares by these amounts would have a material effect on our intended uses of the net proceeds from this offering, although it may impact the amount of time prior to which we may need to seek additional capital.

We intend to use the net proceeds of this offering as follows:

- approximately $8.0 million to fund testing required to file an IND for the Phase 0 trial of TTX-MC138, our lead product candidate focused on metastatic cancer treatment, and to complete this trial;
- approximately $8.4 million to fund further development of TTX-MC138, to file an IND for a Phase I clinical trial of TTX-MC138, and for initial dosing of patients in this trial;
- approximately $1.0 million to fund the strategic expansion of our drug candidate portfolio through internal research and development or the acquisition or in-licensing of intellectual property assets; and
- the balance for working capital and general corporate purposes.

We will retain broad discretion over the use of the net proceeds of this offering which may result in an allocation of net proceeds in differing amounts than those listed above, or in entirely new areas. The amount and timing of these proposed expenditures will depend on a number of factors, including the progress of any partnering efforts, progress of our research and development efforts, technological advances and the competitive environment for our drug candidates. As a result, you will be relying on the judgment of our management with regard to the use of these net proceeds, and you will not have the opportunity, as part of your investment decision, to assess whether the proceeds are being used appropriately. It is possible that the net proceeds will be used in a way that does not yield a favorable, or any, return for us.

We believe that the net proceeds from this offering, together with our existing cash and cash equivalents as of December 31, 2020, will enable us to fund our operating expenses and capital expenditure requirements for at least 18 months from the date of this prospectus. We have based this estimate on assumptions that may prove to be wrong, and we could use our available capital resources sooner than we currently expect. We believe the amount of net proceeds from this offering allocated to clinical trials of TTX-MC138 will be sufficient to complete a Phase 0 clinical trial for TTX-MC138. We also believe that the amount of net proceeds from this offering allocated to preclinical development work on TTX-siPDL1 and TTX-siLIN28b will be sufficient to complete that preclinical development. We will need to raise substantial additional funds to complete additional clinical trials on TTX-MC138 and any clinical trials on other drug candidates, including TTX-siPDL1 and TTX-siLIN28b, and before we can expect to commercialize any of our drug candidates, if approved.

In the ordinary course of our business, we anticipate that from time to time we may evaluate the acquisition of, investment in or in-license of additional drug candidates that we believe are commercially viable or for new drug development and we could use a portion of the net proceeds from this offering for such purposes. While from time to time we engage in preliminary discussions relating to the evaluation of

potential drug candidates that we may be interested in acquiring or in-licensing, we currently do not have any agreements, arrangements or commitments with respect to any additional investment in new drug candidates.

Pending application of the net proceeds as described above, we intend to invest the proceeds in investment grade interest bearing instruments or will hold the proceeds in interest bearing or non-interest-bearing accounts in U.S. banks.

DIVIDEND POLICY

We have never declared or paid any cash dividends on our capital stock. We intend to retain all available funds and future earnings, if any, for development and expansion of our business. Any future determination regarding the declaration and payment of dividends, if any, will be at the discretion of our board of directors and will depend on then-existing conditions, including our financial condition, operating results, contractual restrictions, capital requirements, business prospects and other factors our board of directors may deem relevant. Investors should not purchase our common stock with the expectation of receiving cash dividends.

CAPITALIZATION

The following unaudited table sets forth our cash and cash equivalents and our capitalization at December 31, 2020:

- on an actual basis;
- on a pro forma basis to reflect (i) the automatic conversion of all outstanding convertible promissory notes into 1,058,475 shares of common stock and exercise of warrants to purchase 12,615 shares of common stock immediately prior to the closing of this offering and (ii) the filing and effectiveness of our amended and restated certificate of incorporation, which will become effective immediately prior to the closing of this offering; and
- on a pro forma as adjusted basis to give further effect to the sale and issuance by us of 2,777,778 shares of our common stock in this offering, at the assumed initial public offering price of $9.00 per share, the midpoint of the price range set forth on the cover page of this prospectus, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

You should read the following table together with our financial statements and the related notes appearing at the end of this prospectus and the "Selected Financial Data," "Management's Discussion and Analysis of Financial Condition and Results of Operations" and "Description of Capital Stock" sections of this prospectus.

	December 31, 2020		
	Actual	Pro Forma	Pro Forma As Adjusted
Cash and cash equivalents	$ 828,016	$ 828,016	$22,853,018
Convertible promissory notes, net of unamortized debt issuance costs and debt discount	$ 2,086,675	$ —	$ —
Accrued interest — convertible promissory notes	191,687	—	—
Derivative liabilities	1,751,000	—	—
	4,029,362	—	—
Stockholders' equity (deficit)			
Preferred stock — $0.0001 par value; 5,000,000 shares authorized actual; 10,000,000 shares authorized pro forma, no shares issued or outstanding pro forma; and 10,000,000 shares authorized pro forma as adjusted, no shares issued or outstanding pro forma as adjusted	—	—	—
Common stock — $0.0001 par value; 20,000,000 shares authorized and 4,636,216 shares issued and outstanding actual; 290,000,000 shares authorized pro forma, 5,707,306 shares issued and outstanding pro forma; and 290,000,000 shares authorized pro forma as adjusted, 8,485,084 shares issued and outstanding pro forma as adjusted	464	571	849
Additional paid-in capital	65,950	9,705,652	31,506,223
Subscription receivable	(12,763)	(12,763)	(12,763)
Accumulated deficit	(3,461,882)	(9,042,954)	(9,042,954)
Total stockholders' equity (deficit)	(3,408,232)	650,506	22,451,355
Total capitalization	$ 621,130	$ 650,506	$22,451,355

(1) The pro forma as adjusted information is illustrative only, and will depend on the actual initial public offering price and other terms of this offering determined at pricing. Each $1.00 increase or decrease in the assumed initial public offering price of $9.00 per share, the midpoint of the price range set forth on the cover page of this prospectus, would increase or decrease, as applicable, each of pro forma as

adjusted cash and cash equivalents, additional paid-in capital, total stockholders' equity and total capitalization by $2.6 million, assuming that the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. We may also increase or decrease the number of shares we are offering. Each increase or decrease of one million shares in the number of shares we are offering would increase or decrease, as applicable, each of pro forma as adjusted cash and cash equivalents, additional paid-in capital, total stockholders' equity and total capitalization by $8.3 million, assuming the assumed initial public offering price per share remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

The pro forma as adjusted information discussed above is illustrative only and will be adjusted based on the actual public offering price and other terms of this offering determined between us and the underwriter at pricing. The number of shares of common stock at December 31, 2020, in the table above excludes the following:

- 1,792,672 shares of common stock issuable upon exercise of outstanding stock options at a weighted average exercise price of $0.32 per share;
- 1,240,115 shares of common stock reserved under our 2020 Plan, which Plan will terminate upon completion of this offering;
- 2,500,000 shares of common stock to be reserved for future issuance under our 2021 Plan, to be effective on the day immediately prior to the effectiveness of the registration statement of which this prospectus forms a part; and
- 150,000 shares of common stock to be reserved for future issuance under our 2021 ESPP, to be effective on the day immediately prior to the effectiveness of the registration statement of which this prospectus forms a part.

DILUTION

If you invest in our common stock in this offering, your ownership interest will be diluted immediately to the extent of the difference between the public offering price per share of our common stock and the pro forma as adjusted net tangible book value per share of our common stock immediately after this offering.

At December 31, 2020, we had a net tangible book value of negative $3,408,232 or negative $0.74 per share. Net tangible book value (deficit) per share represents our total tangible assets (total assets less intangible assets) less total liabilities, divided by the total number of our outstanding shares of common stock as of December 31, 2020.

Our pro forma net tangible book value at December 31, 2020, was approximately $650,506 or approximately $0.11 per share. Our pro forma net tangible book value per share represents our total tangible assets, less total liabilities, divided by the number of shares of common stock outstanding as of December 31, 2020, after giving effect to the conversion of all outstanding convertible promissory notes into 1,058,475 shares of our common stock, and exercise of outstanding warrants for 12,615 shares of our common stock, immediately prior to the closing of this offering.

After giving effect to (i) the pro forma adjustments set forth above and (ii) the sale and issuance of 2,777,778 shares of common stock in this offering, at the assumed initial public offering price of $9.00 per share, the midpoint of the price range set forth on the cover page of this prospectus, after deducting estimated underwriting discounts and commissions, estimated offering expenses payable by us, and deferred offering costs, our pro forma as adjusted net tangible book value as of December 31, 2020, would have been approximately $22.4 million, or $2.65 per share of our common stock. This represents an immediate increase in pro forma net tangible book value of approximately $2.53 per share to our existing stockholders and an immediate dilution of $6.35 per share to new investors.

Dilution per share to investors participating in this offering is determined by subtracting pro forma as adjusted net tangible book value per share after this offering from the initial public offering price per share paid by investors participating in this offering. The following table illustrates this dilution (without giving effect to any exercise by the underwriters of their option to purchase additional shares).

The following table illustrates this dilution on a per share basis:

Assumed public offering price per share		$9.00
Net tangible book value per share at December 31, 2020	$(0.74)	
Pro forma increase attributable to the pro forma adjustments	0.85	
Pro forma net tangible book value per share at December 31, 2020	0.11	
Increase in book value per share attributable to new investors	2.53	
Pro forma as adjusted net tangible book value per share after this offering		2.65
Dilution per share to new investors		$6.35

A $1.00 increase (decrease) in the assumed initial public offering price of $9.00 per share, the midpoint of the price range set forth on the cover page of this prospectus, would increase (decrease) the pro forma as adjusted net tangible book value per share by $0.30 ($0.30) to $2.95 ($2.34) per share and the dilution to investors participating in this offering by $7.05 ($5.66) per share, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions, estimated expenses payable by us, and deferred offering costs.

Similarly, each increase (decrease) of one million shares in the number of shares offered by us in this offering would increase (decrease) the pro forma as adjusted net tangible book value by per share by $0.59 ($0.75) to $3.24 ($1.89) per share and the dilution to investors participating in this offering by $5.76 ($7.11) per share, assuming the assumed initial public offering price of $9.00 per share, the midpoint of the price range set forth on the cover page of this prospectus, remains the same, and after deducting estimated underwriting discounts and commissions, estimated expenses payable by us, and deferred offering costs.

If the underwriters' over-allotment option is exercised in full, our pro forma as adjusted net tangible book value per share after this offering would be $2.91 and dilution per share to new investors purchasing

common stock in this offering would be $6.09, assuming an initial public offering price of $9.00 per share, which is the midpoint of the price range set forth on the cover page of this prospectus, and after deducting the estimated underwriting discounts and commissions, estimated offering expenses payable by us, and deferred offering costs.

The following table summarizes, on a pro forma as adjusted basis as of December 31, 2020, the differences between the number of shares of common stock purchased from us, the total cash consideration and the average price per share paid to us by existing stockholders and by new investors purchasing shares in this offering at the assumed initial public offering price of $9.00 per share, the midpoint of the price range set forth on the cover of this prospectus before deducting estimated underwriting discounts and commissions, estimated offering expenses payable by us, and deferred offering costs. As the table shows, new investors purchasing shares of common stock in this offering will pay an average price per share substantially higher than our existing investors paid.

	Shares Purchased		Total Consideration		Average Price Per Share
	Number	%	Amount	%	
Existing Shareholders	5,707,306	67%	$ 2,509,894	9%	$0.44
New Investors	2,777,778	33%	$25,000,002	91%	$9.00
Total	8,485,084	100%	$27,509,896	100%	$3.24

A $1.00 increase (decrease) in the assumed initial public offering price of $9.00 per share, which is the midpoint of the price range set forth on the cover page of this prospectus, would increase (decrease) the total consideration paid by new investors by approximately $2.8 million and, would increase (decrease) the percentage of total consideration paid by new investors by approximately one percentage point, assuming that the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same. An increase (decrease) of one million shares in the number of shares offered by us, as set forth on the cover page of this prospectus, would increase (decrease) the total consideration paid by new investors by $9 million and, in the case of an increase, would increase the percentage of total consideration paid by new investors by approximately two percentage points and, in the case of a decrease, would decrease the percentage of total consideration paid by new investors by approximately four percentage points, assuming no change in the assumed initial public offering price per share.

The table above assumes no exercise of the underwriters' over-allotment option. If the underwriters' over-allotment option is exercised in full, the number of shares of common stock held by existing stockholders will be reduced to approximately 64% of the total number of shares of common stock to be outstanding after this offering, and the number of shares of common stock held by investors participating in this offering will be further increased to approximately 36% of the total number of shares of common stock to be outstanding after this offering.

The tables and discussion above are based on 5,707,306 shares of common stock outstanding at December 31, 2020, after giving effect to the conversion of all outstanding convertible promissory notes into shares of our common stock and the exercise of all warrants outstanding immediately prior to the closing of this offering, and excludes, as of that date, the following:

- 1,792,672 shares of common stock issuable upon exercise of outstanding stock options at a weighted average exercise price of $0.32 per share;
- 1,240,115 shares of common stock reserved under our 2020 Plan, which Plan will terminate upon completion of this offering;
- 2,500,000 shares of common stock to be reserved for future issuance under our 2021 Plan, to be effective on the day immediately prior to the effectiveness of the registration statement of which this prospectus forms a part; and
- 150,000 shares of common stock to be reserved for future issuance under our 2021 ESPP, to be effective on the day immediately prior to the effectiveness of the registration statement of which this prospectus forms a part.

To the extent that outstanding options are exercised, or shares are issued under our equity incentive plans, you will experience further dilution. In addition, we may choose to raise additional capital due to market conditions or strategic considerations even if we believe we have sufficient funds for our current or future operating plans. To the extent that additional capital is raised in the future through the sale of equity, convertible debt securities, or securities with equity components, those issuances may result in further dilution to our stockholders.

MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

You should read the following discussion and analysis of our financial condition and results of operations together with the "Selected Financial Data" section of this prospectus and our financial statements and related notes appearing elsewhere in this prospectus. Some of the information contained in this discussion and analysis or set forth elsewhere in this prospectus, including information with respect to our plans and strategy for our business and related financing, 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 prospectus, 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.

TransCode Therapeutics is an emerging RNA oncology company, created on the belief that cancer can be defeated through the intelligent design and effective delivery of RNA therapeutics. We have created a platform of drug candidates designed to target a variety of tumor types with the objective of significantly improving patient outcomes. Our lead therapeutic candidate, TTX-MC138, is focused on treating metastatic cancer, which causes approximately 90% of all cancer deaths representing over nine million deaths per year worldwide. We believe that TTX-MC138 has the potential to produce regression without recurrence in a range of cancers, including breast, pancreatic, ovarian and colon cancer, glioblastomas and others. Our drug candidates, TTX-siPDL1 and TTX-siLIN28b, focus on the treatment of tumors by targeting PD-L1 and Lin28b, respectively.

For decades, RNA has been a topic of investigation by the scientific community as a potentially attractive therapeutic modality because it can target any gene and it lends itself to rational and straightforward drug design. RNA-based therapeutics are highly selective to their targets with the potential to unleash a broad array of previously undruggable targets in the human genome. To date, research into RNA efficacy has been limited due to three delivery-related challenges: protecting the RNA from being dismantled by the immune system; maintaining stability so the molecule has time to do its job; and penetrating the targeted organs and cells. We believe these challenges have led researchers to focus on other approaches to cancer therapeutics. Our strategy seeks to overcome these delivery challenges by repurposing a particle used extensively in humans for imaging purposes to deliver synthetic RNA molecules (called oligonucleotides) to cancer cells.

We anticipate submitting an investigational new drug application, or IND, in the second half of 2021 to support initiation of a Phase 0 clinical study with TTX-MC138. Our Phase 0 clinical trial is intended to assess delivery of our lead candidate to metastatic tumor cells, as well as engagement with the target microRNA-10b. Concurrent with the Phase 0 study, we expect to complete additional IND enabling studies to support an IND for a Phase I clinical trial with TTX-MC138. We expect to file the latter IND in the second half of 2022.

We employ a modular drug design approach to develop product candidates that we believe can efficiently deliver therapeutics to genetic targets. To date, we have utilized our modular design approach to develop novel product candidates for treatment of metastasis and additional therapeutic areas in oncology.

At TransCode, we are driven to change how cancer is treated both as a therapeutic modality and in terms of improving patient outcomes. We believe that RNA therapeutics could offer patients complete regression of their disease without recurrence rather than the current norm of giving patients additional months of survival.

Notice of SBIR Award

In November, we received a fundable score on a Fast-Track Small Business Innovation Research, or SBIR, application we submitted to the National Cancer Institute in April 2020. The SBIR grant, if awarded, is expected to provide $2,392,845 to fund a two-phased research partnership between us and Massachusetts General Hospital. The program is anticipated to begin in April 2021 and end in March 2024. Funds are expected to be paid out as follows: Year 1: $308,862; Year 2: $1,213,387; and Year 3: $870,597. There is no assurance that any SBIR funding will be received.

In the application, we proposed performing key translational experiments including IND enabling and supporting imaging studies using MRI to assess delivery and target engagement of TTX-MC138 in metastatic lesions of breast cancer patients. The experiments are designed to achieve the following aims:

SBIR Phase I:

Aim 1. Optimize a method for measuring miR-10b expression in breast cancer clinical samples.

SBIR Phase II:

Aim 2. File an IND application for TTX-MC138.

Aim 3. Use imaging to determine the uptake of TTX-MC138 by radiologically-confirmed metastases in breast cancer patients.

Financial Operations Overview

Since our inception in January 2016, we have devoted substantially all of our efforts and financial resources to organizing and staffing our company, business planning, raising capital, securing intellectual property rights, conducting research and development activities and preparing for manufacturing related to our lead product candidate. We do not have any products approved for sale and have not generated any revenue from product sales. We may never be able to develop or commercialize a marketable product. We have not yet completed any clinical trials, obtained any regulatory approvals, manufactured a commercial-scale drug, or conducted sales and marketing activities. Through December 31, 2020, we had received gross proceeds of $2.24 million from borrowings under convertible promissory notes (before deduction of debt issuance costs and debt discount).

We have incurred significant operating losses since inception. Our net losses were $2.3 million and $607 thousand for the years ended December 31, 2020 and 2019, respectively. At December 31, 2020, we had an accumulated deficit of $3.5 million. 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 current or future product candidates for which there is no assurance of occurrence. We expect that our expenses and capital requirements will increase substantially in connection with our ongoing activities, particularly if and as we:

- continue preclinical studies and initiate clinical trials for TTX-MC138 and other product candidates we may develop;
- advance the development of our product candidate pipeline;
- continue to develop and expand our proprietary TTX platform to identify additional product candidates;
- obtain new intellectual property and maintain, expand and protect our intellectual property portfolio;
- seek marketing approvals for our product candidates that successfully complete clinical trials, if any;
- hire additional clinical, scientific, commercial and administrative personnel;
- acquire or in-license additional product candidates;
- expand our infrastructure and facilities to accommodate increased personnel; and
- add operational, financial and management information systems and personnel, including personnel to support our research and development programs, any future commercialization efforts and our transition to operating as a public company following the completion of this offering.

Furthermore, upon the closing of this offering, we expect to incur additional costs associated with operating as a public company, including significant legal, accounting, insurance, investor relations and other expenses that we did not incur as a private company.

As a result, we will need substantial additional funding to support our continuing operations and pursue our business strategy. Until such time as we can generate significant revenue from product sales, if

ever, we expect to finance our operations through the sale of equity, debt financings or other capital sources, which may include collaborations with other companies or other strategic transactions. 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 or delay our pursuit of potential in-licenses or acquisitions.

Because of the numerous risks and uncertainties associated with product development, we are unable to predict the timing or amount of increased expenses or when or if we will be able to achieve or maintain profitability. Even if we are able to generate product sales, we may not become profitable. If we fail to become profitable or are unable to sustain profitability on a continuing basis, we may be unable to continue our operations at planned levels and be forced to reduce or terminate our operations.

At December 31, 2020, we had cash and cash equivalents of $828 thousand. We believe that the anticipated net proceeds from this offering, together with our cash and cash equivalents at December 31, 2020, will enable us to fund our operating expenses and capital expenditure requirements through September 2022. We have based this estimate on assumptions that may prove to be wrong, and we could exhaust our available capital resources sooner than we expect. To finance our operations beyond that point, we will need to raise additional capital, which cannot be assured. If we are unable to raise additional capital in sufficient amounts or on terms we find acceptable, we may have to significantly delay, scale back or discontinue the development or commercialization of our product candidates or other research and development initiatives. Our future viability beyond that point is dependent on our ability to raise additional capital to finance our operations. See "— Liquidity and capital resources."

Impact of the Novel Coronavirus (COVID-19) Pandemic

Since it was reported to have surfaced in December 2019, a novel strain of coronavirus, or COVID-19, has spread across the world and has been declared a pandemic by the World Health Organization. Efforts to contain the spread of COVID-19 have intensified and governments around the world, including in the United States, Europe and Asia, have implemented severe travel restrictions, social distancing requirements, stay-at-home orders and have delayed the commencement of non-COVID-19-related clinical trials, among other restrictions. As a result, the current COVID-19 pandemic has presented a substantial public health and economic challenge around the world and is affecting employees, patients, communities and business operations, as well as contributing to significant volatility and negative pressure on the U.S. economy and in financial markets. We expect that COVID-19 precautions and effects will directly or indirectly impact the timeline for some of our preclinical studies and possibly our planned clinical trials. We are continuing to assess the potential impact of the COVID-19 pandemic on our current and future business and operations, including our expenses, preclinical studies and clinical trials, as well as on our industry and the healthcare system.

As a result of the outbreak, many companies have experienced disruptions in their operations and in markets served. To date, we have initiated some precautionary measures and we may take additional temporary precautionary measures intended to help ensure our employees' well-being and minimize business disruption. These measures include devising contingency plans and securing additional resources from third-party service providers. Certain of our third-party service providers have also experienced shutdowns or other business disruptions. We are continuing to assess the impact of the COVID-19 pandemic on our current and future business and operations, including our expenses and planned clinical studies and other development timelines, as well as on our industry and the healthcare system.

Components of our results of operations

Revenue

To date, we have not generated any revenue from any sources, including from product sales, and we do not expect to generate any revenue from the sale of products in the foreseeable future. If our development efforts for our product candidates are successful and result in regulatory approval, or license agreements with third parties, we may generate revenue in the future from product sales. However, there can be no assurance as to when, if ever, we will generate such revenue.

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 product candidates. We expense research and development costs as incurred, which include:

- expenses incurred in performing preclinical and clinical development;
- expenses incurred to conduct the necessary preclinical studies and clinical trials related to seeking regulatory approval to market our product candidates that successfully complete clinical trials;
- expenses incurred under agreements with contract research organizations, or CROs, engaged in the conduct of our drug discovery efforts, preclinical studies, and clinical trials, and contract manufacturing organizations, or CMOs, engaged to produce preclinical and clinical drug substance and drug product for our research and development activities;
- other costs related to acquiring and manufacturing materials in connection with our drug discovery efforts and our preclinical studies, materials for our clinical trials, including manufacturing validation batches, as well as costs related to investigative sites and consultants that conduct our clinical trials, preclinical studies and other scientific development services;
- payments made under third-party licensing, acquisition and option agreements;
- personnel-related expenses, including salaries, benefits, travel and other related expenses, and stock-based compensation expense for research and development personnel;
- costs related to compliance with regulatory requirements; and
- allocated facilities-related costs, depreciation and other facilities-related expenses, which may include rent and utilities.

We recognize external development costs based on an evaluation of the progress to completion of specific tasks using information provided to us by our service providers. This process involves reviewing open contracts and purchase orders, communicating with our personnel to identify services that have been performed on our behalf and estimating the level of service performed and the associated cost incurred for the service when we have not yet been invoiced or otherwise notified of actual costs. Nonrefundable advance payments that we make for goods or services to be received in the future for use in research and development activities are to be recorded as prepaid expenses. Such amounts are subsequently expensed as the related goods are delivered or the related services are performed, or until it is no longer expected that the goods will be delivered or the services rendered.

We intend to track our research and development expenses on a program-by-program basis. Our direct external research and development expenses comprise primarily fees paid to outside consultants, CROs, CMOs, research laboratories, and suppliers in connection with our preclinical development, process development, manufacturing and clinical development activities. Our direct external research and development expenses also include fees incurred under license and option agreements. We do not intend to allocate costs of management personnel, certain costs associated with our discovery efforts, certain supplies used in the laboratory, and certain facilities costs, including depreciation or other indirect costs, to specific programs when these costs are incurred across multiple programs and where it may not be practical to track them by program. We use internal resources along with outside parties primarily to conduct our research and discovery as well as for managing our preclinical development, process development, manufacturing and clinical development activities.

Research and development activities are central to our business model. Product candidates in later stages of clinical development generally are expected to 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. As a result, we expect that our research and development expenses will increase substantially over the next several years if we commence planned clinical trials for TTX-MC138, as well as conduct other preclinical and clinical development, including submitting regulatory filings. In addition, we expect our discovery research

efforts and related personnel costs will increase and, as a result, we expect our research and development expenses, including costs associated with stock-based compensation, will increase significantly over prior levels. Also, we may incur additional expenses related to milestone and royalty payments to third parties with whom we have entered or may enter into license, acquisition and option agreements to assess, use or acquire intellectual property rights or rights to future product candidates.

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 or when, if ever, material net cash inflows may commence from any of our product candidates. The successful development and commercialization of our product candidates is highly uncertain due to the numerous risks and uncertainties associated with product development and commercialization, including:

- the scope, progress, outcome and costs of our preclinical development activities, clinical trials and other research and development;
- establishing an appropriate safety and efficacy profile with IND enabling studies;
- the timing and terms of regulatory approvals, if any, to conduct clinical trials;
- the number of sites needed to complete clinical trials, the number of patients needed to conduct clinical trials, the length of time required to enroll suitable patients and complete clinical trials, and the duration of patient follow-ups;
- the timing, receipt and terms of marketing approvals, if any, from applicable regulatory authorities including the FDA and regulators outside the U.S.;
- the extent of any post-marketing approval commitments that may be required by regulatory authorities;
- establishing clinical and commercial manufacturing capabilities or making arrangements with third-party manufacturers to supply the quantities and quality of product we need;
- development and timely delivery of clinical-grade and commercial-grade drug formulations as required for use in our clinical trials and for commercial launch;
- obtaining, maintaining, defending and enforcing patent claims and other intellectual property rights;
- significant and changing government regulation;
- launching commercial sales of our product candidates, if and when approved, whether alone or in collaboration with others;
- competitive developments;
- the impact of any business interruptions to our operations, including the timing and enrollment of patients in our planned clinical trials, or to those of our manufacturers, suppliers, or other vendors resulting from the COVID-19 pandemic or similar public health crisis or for any other reason; and
- maintaining an acceptable safety profile of our product candidates following approval, if any, of our product candidates.

Any changes in or adverse outcome of any of these variables or others with respect to the development of our product candidates in preclinical and clinical development could mean a significant change in the costs and timing associated with the development of our product candidates.

General and administrative expenses

General and administrative expenses consist primarily of salaries, benefits, travel and other related costs, including stock-based compensation expense, for personnel serving in executive, business development, finance, human resources, legal, information technology, pre-commercial and support personnel functions. General and administrative expenses also include direct and allocated facility-related costs as well as corporate and office expenses, insurance costs and professional fees for legal, patent, consulting, investor and public relations, accounting, tax and audit services.

We anticipate that our general and administrative expenses will increase in the future as we increase our headcount to support our research activities and development of our product candidates and prepare for potential commercial activities including possible partnerships for the sales, marketing and distribution of approved product candidates, if any. We also anticipate that we will incur significantly increased accounting, audit, tax, legal, regulatory, compliance and director and officer insurance costs as well as investor and public relations expenses associated with operating as a public company as well as the costs of additional personnel in these areas. Additionally, if and when we believe regulatory approval of a product candidate appears likely, we anticipate an increase in payroll and other personnel-related expenses as we prepare for commercial operations, especially as it relates to the sales and marketing of that product candidate. There is a risk that we could incur the foregoing expenses but not receive the anticipated regulatory approval.

Other income (expense)

Interest expense

Interest expense has consisted of interest accrued on our convertible promissory notes which convert into shares of common stock concurrent with an equity financing of $5 million or more, including our initial public offering. As a result, in periods subsequent to this offering, we will no longer incur interest expense on these notes. Interest expense also includes charges for amortizations of debt discount related to the embedded derivative element of our convertible promissory notes and of debt issuance costs.

Interest income

Interest income consists primarily of income earned on our cash balances. Our interest income has not been significant due to low cash balances and low interest rates earned on those balances.

Charges related to conversion of convertible promissory notes and exercise of warrants

We estimate that the fair value of the shares of our common stock being issued in connection with the conversion of our convertible promissory notes in this offering exceeds the carrying value of these notes, including related liabilities that will be extinguished on conversion. The difference between our estimate of the fair value of the shares and the carrying value of the notes and note-related liabilities is approximately $5.5 million. This difference will be a non-cash charge to our equity at the time of conversion. There will be a similar non-cash charge related to the exercise of the warrants in connection with this offering. We estimate the warrant-related charge to be approximately $84 thousand.

Change in fair value of derivative liabilities

Our convertible promissory notes provide for conversion into our common stock at a discount which conversion feature meets the accounting definition of a derivative instrument. We classified this derivative instrument as a liability on our balance sheet. We remeasure fair value of this derivative liability at each reporting date and recognize any changes in fair value as other income (expense) in our statement of operations.

Upon completion of this offering, these convertible promissory notes will automatically convert into shares of our common stock. Upon conversion, no convertible promissory notes will remain outstanding and therefore we will no longer have a derivative liability related to the convertible promissory notes.

Income taxes

Since inception, we have not recorded any U.S. federal or state income tax benefits for the net losses we have incurred each year as we believe, based upon the weight of available evidence, that it is more likely than not that all of our net operating loss carryforwards will not be realized. As of December 31, 2019, our most recent tax year, we had U.S. federal and state net operating loss carryforwards of $837 thousand and $835 thousand, respectively, which expire at various dates beginning in 2036 except that $799 thousand of federal net operating loss carryforwards do not expire. We have recorded a full valuation allowance against our net deferred tax assets at each balance sheet date.

In response to the COVID-19 pandemic, the Coronavirus Aid, Relief and Economic Security Act, or the CARES Act, was signed into law in March 2020. The CARES Act lifts certain deduction limitations originally imposed by the Tax Cuts and Jobs Act of 2017, or the 2017 Tax Act. Corporate taxpayers may carryback net operating losses originating during 2018 through 2020 for up to five years, which was not previously allowed under the 2017 Tax Act. The CARES Act also eliminates the 80% taxable income limitations by allowing corporate entities to fully utilize net operating loss carryforwards to offset taxable income in 2018, 2019 or 2020. Taxpayers may generally deduct interest up to the sum of 50% of adjusted taxable income plus business interest income (30% limit under the 2017 Tax Act) for tax years beginning January 1, 2019 and 2020. The CARES Act allows taxpayers with alternative minimum tax credits to claim a refund in 2018 or 2019 for the entire amount of the credits instead of recovering the credits through refunds over a period of years, as originally enacted by the 2017 Tax Act. In addition, the CARES Act raises the corporate charitable deduction limit to 25% of taxable income and makes qualified improvement property generally eligible for 15-year cost-recovery and 100% bonus depreciation. We continue to evaluate the potential impact of the CARES Act on our income tax provision, or on our net deferred tax assets.

The staff of the U.S. Securities and Exchange Commission, or SEC, issued Staff Accounting Bulletin No. 118 to address the application of U.S. Generally Accepted Accounting Principles, or GAAP, in situations when a registrant does not have the necessary information available, prepared or analyzed (including computations) in reasonable detail to complete the accounting for certain income tax effects of the 2017 Tax Act. In connection with the initial analysis of the impact of the 2017 Tax Act, the company remeasured its deferred tax assets and liabilities based on the rates at which they are expected to reverse in the future, which is generally 21% for federal tax purposes. The remeasurement of the company's deferred tax assets and liabilities was offset by a change in the valuation allowance.

Net operating loss and tax credit carryforwards are subject to review and possible adjustment by the Internal Revenue Service, or IRS, and may become subject to an annual limitation in the event of certain cumulative changes over a three-year period in the ownership interest of significant shareholders in excess of 50% as defined under Sections 382 and 383 in the Internal Revenue Code. This could substantially limit the amount of tax attributes that can be utilized annually to offset future taxable income or tax liabilities. The amount of the annual limitation is determined based on our value immediately prior to the ownership change. Subsequent ownership changes may further affect the limitation in future years.

Comparison of the years ended December 31, 2020 and 2019

The following table summarizes our results of operations for the years ended December 31, 2020 and 2019:

	Year ended December 31,		
	2020	2019	Change
	(in thousands)		
Operating expenses:			
Research and development	$ 284	$ 226	$ 58
General and administrative	442	231	212
Total operating expenses	726	457	269
Loss from operations	(726)	(457)	(269)
Interest expense	(395)	(157)	(238)
Change in fair value of derivative liabilities	(1,208)	4	(1,212)
Change in fair value of warrant liability	(15)	3	(17)
Total other income (expense), net	(1,617)	(150)	(1,467)
Net loss	$(2,344)	$(607)	$ (1,737)

Research and development expenses

Research and development, or R&D, expenses were $284 thousand for the year ended December 31, 2020, compared to $226 thousand for the year ended December 31, 2019. The increase of $58 thousand was

primarily due to increased R&D consulting, lab facilities, materials and stock compensation expenses partly offset by reduced license fees and expenses.

General and administrative expenses

General and administrative expenses were $442 thousand for the year ended December 31, 2020, compared to $231 thousand for the year ended December 31, 2019. The increase of $212 thousand was primarily a result of increased expenses for accounting, audit and tax services largely to meet requirements for this offering, consulting fees primarily related to human resource and compensation programs the company expects to put in place after the offering, stock compensation mainly related to the issuance of options in 2020 whereas no options had been issued in 2019, and technology costs offset partly by reduced various other professional costs.

Change in fair value of derivative liabilities

The change in the fair value of derivative liabilities was $(1,208) thousand for the year ended December 31, 2020 as compared to $4 thousand for the year ended December 31, 2019.

Change in fair value of warrant liability

The change in the fair value of the warrant liability was $(15) thousand for the year ended December 31, 2020 as compared to $3 thousand for the year ended December 31, 2019. We issued warrants to purchase shares of our common stock in consideration for finder's services in connection with a sale of one of our convertible promissory notes in 2018. The number of shares of common stock subject to the warrants is equal to five percent of the number of shares of common stock into which the related note converts. We classify these warrants as a liability on our consolidated balance sheets which we remeasure to fair value at each reporting date. We recognize changes in the fair value of the warrant liability as a component of other income (expense) in our statements of operations. We will continue to recognize changes in the fair value of the warrant liability until the warrants are exercised, expire or qualify for equity classification. If not exercised prior to the closing of this offering, the warrants will terminate.

Interest expense

Interest expense was $395 thousand for the year ended December 31, 2020, compared to $157 thousand for the year ended December 31, 2019. The increase of $238 thousand was due to higher balances of convertible promissory notes outstanding and increased amortization of debt discount on our convertible promissory notes.

Liquidity and capital resources

Sources of liquidity

Since inception, we have not generated any revenue from product sales or any other sources, and we have incurred significant operating losses and negative cash flows from our operations. We have not yet commercialized any of our product candidates and we do not expect to generate revenue from sales of any product candidates for several years, if ever. We have funded our operations to date primarily with proceeds from borrowings under convertible promissory notes. Through December 31, 2020, we had received gross cash proceeds of $2.24 million from these borrowings.

As of December 31, 2020, we had cash and cash equivalents of $828 thousand.

Future funding requirements

We expect our expenses to increase substantially in connection with our ongoing and planned activities, particularly as we advance preclinical activities and clinical trials of TTX-MC138. In addition, upon the closing of this offering, we expect to incur additional costs associated with operating as a public company, including significant legal, accounting, tax, investor relations and other expenses that we did not incur as a private company.

The timing and amount of our operating expenditures will depend largely on our ability to, among other things:

- advance clinical development of TTX-MC138;
- manufacture, or have manufactured on our behalf, our preclinical and clinical drug materials and develop processes for commercial manufacturing of any product candidates that may receive regulatory approval;
- seek regulatory approvals for any product candidates that successfully complete clinical trials;
- establish a sales, marketing, medical affairs and distribution infrastructure to commercialize any product candidates for which we may obtain marketing approval and intend to commercialize on our own;

  establish collaborations to commercialize any product candidates for which we may obtain marketing approval but do not intend to commercialize on our own;
- hire additional clinical, quality control and scientific personnel;
- expand our operational, financial and management systems and hire additional personnel, including personnel to support our clinical development, manufacturing and commercialization efforts, our general and administrative activities and our operations as a public company; and
- obtain new intellectual property and maintain, expand and protect our intellectual property portfolio.

At December 31, 2020, we had cash and cash equivalents of $828 thousand. We believe that the anticipated net proceeds from this offering, together with our existing cash and cash equivalents, will enable us to fund our operating expenses and capital expenditure requirements through September 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. We anticipate that we will require additional capital for additional research, development, clinical trials, as we seek regulatory approval of our product candidates, company operations, and for in-licenses or acquisitions of other product candidates we may choose to pursue. If we receive regulatory approval for TTX-MC138 or other product candidates we may develop, we expect to incur significant commercialization expenses related to product manufacturing, sales, marketing and distribution, which will vary depending on where and how we choose to commercialize.

Because of the numerous risks and uncertainties associated with research, development and commercialization of biologic product candidates, we are unable to estimate the exact amount and timing of our working capital requirements. Our future funding requirements will depend on and could increase significantly as a result of many factors, including:

- the scope, progress, outcome and costs of conducting preclinical development activities, clinical trials, and other research and development;
- the costs, timing and outcome of regulatory review of our product candidates;
- the costs, timing and requirements to manufacture our product candidates to supply our preclinical development efforts and our clinical trials;
- the costs of future activities, including product sales, medical affairs, marketing, manufacturing and distribution, for any of our product candidates for which we receive marketing approval;
- the costs of manufacturing commercial-grade product and building inventory to support commercial launch;
- the ability to receive non-dilutive funding, including grants from governments, organizations and foundations;
- the revenue, if any, received from commercial sale of our products, should any of our product candidates receive marketing approval;
- the costs of preparing, filing and prosecuting patent applications, maintaining, expanding and enforcing our intellectual property rights and defending intellectual property-related claims;

- the terms of any industry collaborations we are able to establish;
- the extent to which we acquire or in-license other product candidates and technologies; and
- the efficiency with which we operate our business.

Until such time, if ever, as we can generate substantial product revenue, we expect to finance our operations through a combination of public or private equity offerings, debt financings, governmental funding, collaborations, strategic partnerships and alliances or marketing, distribution or licensing arrangements with third parties. There is no assurance that funding from any of the foregoing sources or otherwise will be available on acceptable terms, if at all. To the extent that we raise additional capital through the sale of equity or convertible debt securities, your ownership interest may be materially diluted, and the terms of such securities could 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 restrictive covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends. In addition, debt financing would result in fixed payment obligations.

If we raise additional funds through governmental funding, collaborations, strategic partnerships and 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 product 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 product candidates that we would otherwise prefer to develop and market ourselves.

Cash flows

The following table summarizes our cash flows for each of the years presented:

	Year ended December 31,	
	2020	2019
	(in thousands)	
Net cash used in operating activities	$ (493)	$(509)
Net cash provided by (used in) investing activities	—	—
Net cash provided by financing activities	1,117	500
Net increase (decrease) in cash and cash equivalents	$ 624	$ (9)

Operating activities

During the year ended December 31, 2020, we used cash of $493 thousand in operating activities, primarily resulting from our net loss of $2,344 thousand, partially offset by the $1,208 thousand change in fair market value of our derivative liabilities, non-cash interest expense charges totaling $273 thousand related to our convertible promissory notes, an increase in accounts payable and accrued expenses of $191 thousand and $122 thousand in accrued interest on convertible promissory notes.

During the year ended December 31, 2019, we used cash of $509 thousand in operating activities, primarily resulting from our net loss of $607 thousand and a $55 thousand reduction in accounts payable and accrued expenses, partially offset by non-cash interest expense charges totaling $109 thousand related to our convertible promissory notes and $48 thousand in accrued interest on convertible promissory notes.

Changes in accounts payable and accrued expenses were generally due to the timing of vendor invoicing and payments.

Financing activities

During the year ended December 31, 2020, we obtained cash from financing activities of $1,190 thousand from borrowings under convertible promissory notes less payments of $73 thousand in deferred offering costs.

During the year ended December 31, 2019, we obtained cash from financing activities of $500 thousand from borrowings under convertible promissory notes.

Contractual obligations and commitments

As of December 31, 2020, we had no future minimum lease payments under non-cancelable operating lease commitments. We enter into contracts in the normal course of business with CMOs, CROs and other third parties for the manufacture of our product candidates and to support clinical trials and preclinical research studies and testing and for other purposes. These contracts are generally cancelable by us. Payments due upon cancellation generally consist only of payments for services provided or expenses incurred, including noncancelable obligations of our service providers, up to the date of cancellation. These payments are not included in the preceding table as the amount and timing of such payments are not known.

Critical accounting policies and significant judgments and estimates

We have based our management's discussion and analysis of financial condition and results of operations on our financial statements. Our financial statements are prepared in accordance with United States GAAP. The preparation of our financial statements and related disclosures requires us to make estimates and judgments that affect the reported amounts of assets, liabilities, costs and expenses and the disclosure of contingent assets and liabilities at the date of the 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 our judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. We evaluate estimates and assumptions on an ongoing basis. Our actual results may differ from amounts derived from these estimates or from amounts obtained under different assumptions or conditions.

While our significant accounting policies are described in more detail in Note 2 to our financial statements appearing elsewhere in this prospectus, we believe that the following accounting policies are those most critical to the judgments and estimates used in the preparation of our financial statements.

Research and development expenses

In preparing our financial statements, we are required to estimate our accrued research and development expenses.

We rely to a significant extent on third parties to conduct preclinical studies, provide materials, and to provide clinical trial services, including trial conduct, data management, statistical analysis and electronic compilation. At the end of each reporting period, we will compare the payments made to each service provider to the estimated progress towards completion of the related project. Factors that we will consider in preparing these estimates include materials delivered or services provided, the number of patients enrolled in studies, milestones achieved, and other criteria related to the efforts of these vendors. These estimates will be subject to change as additional information becomes available. Depending on the timing of payments to vendors and estimated services provided, we will record net prepaid or accrued expenses related to these costs.

The estimating process involves reviewing open contracts and purchase orders, communicating with our relevant personnel to identify services that have been performed on our behalf or deliveries of materials made to us, 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 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, including research laboratories, in connection with preclinical development activities;
- CROs and investigative sites in connection with preclinical and clinical trials; and

- CMOs in connection with the production of drug substance and drug product formulations for use in preclinical testing and clinical trials.

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 the 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-based awards granted to employees and directors based on the fair value of the underlying award on the date of the grant. We recognize the corresponding compensation expense of those awards over the requisite service period, generally the vesting period of the respective award. As of December 31, 2020, we had issued restricted stock and stock options, each with service-based vesting conditions; we recorded stock compensation expense resulting from those awards as vesting occurred. We would apply the graded-vesting method to all stock-based awards with performance-based vesting conditions or to awards with both service-based and performance-based vesting conditions.

For stock-based awards granted to consultants and non-employees, we recognize compensation expense over the period during which services are rendered by such consultants and non-employees until completed.

Determination of the fair value of common stock

As there has been no public market for our common stock prior to this offering, the estimated fair value of our common stock has been determined by our Board as of the date of each stock-based award. Based on the fact that most of our activities from inception through mid-2018 related to organizing the company, including identifying management, directors and advisors, business planning, identifying potential product candidates, acquiring or developing intellectual property, conducting a limited amount of research and development, establishing arrangements with third parties to manufacture initial quantities of our product candidates and component materials, and seeking financing, and that our preclinical development had not advanced significantly, the Board determined that the fair value of our common stock had remained relatively constant at its par value during this period. In September 2018, the Board retained an independent third-party appraisal firm to provide an estimate of the fair value of our common stock. In November 2018, the appraisal firm estimated that, as of June 30, 2018, the value of a single share of our common stock was $0.04. In March 2020, the appraisal firm estimated that as of December 31, 2019, it was $0.08 per share and in December 2020, it was estimated to be $3.91 per share as of October 1, 2020.

The valuations were performed in accordance with the Standards of the National Association of Certified Valuators and Analysts and in consideration of guidance from valuation literature, relevant court decisions, Financial Accounting Standards Board, or FASB, Accounting Standards Codification, or ASC, 820, Internal Revenue Service Revenue Ruling, or RR, 59-60, RR 68-609, and 26 Code of Federal Regulations, or CFR, Part 2, Section 1.409A. Estimates and processes used by the independent appraiser in performing the valuation are highly complex and include both objective and subjective factors. Assumptions underlying these valuations included certain estimates provided by the company's management to the appraisal firm, which estimates involved inherent uncertainties and application of management's judgment. Had significantly different assumptions or estimates been used, the fair value of our common stock and our stock-based compensation expense could have been materially different. Further, those factors may have changed between the date of the then most recent valuation and the date of the grant.

Factors considered by the appraiser in determining the fair value of our common stock as of each grant date, included:

- our stage of development and business strategy;

- the progress of our research and development programs, including the status and results of preclinical studies and plans for clinical trials for TTX-MC138;
- our capital structure, including, if outstanding at the time of a grant, our convertible promissory notes and the superior rights and preferences of the notes relative to our common stock;
- external market conditions affecting the biopharmaceutical industry and trends within the biopharmaceutical industry;
- our financial position, including cash on hand, and our historical and forecasted performance and results of operations;
- the absence of an active public market for our common stock;
- the likelihood of achieving a liquidity event, such as an initial public offering, or IPO, or sale of our company in light of prevailing market conditions; and
- an analysis of IPOs and the market performance of similar companies in the biopharmaceutical industry.

If a public trading market for our common stock is established after this offering, we do not expect it to be necessary thereafter for our board to estimate the fair value of our common stock in connection with our accounting for stock-based awards that we may grant, as the fair value of our common stock will be determined based on the quoted market price of our common stock.

Awards granted

The following table sets forth the number of shares of restricted stock we granted from January 11, 2016, through October 7, 2018 (the date of the last grant of restricted stock), the per share purchase prices of such shares, and the estimated fair value per share of the awards on the date of grant:

Grant Date	Number of shares subject to award	Per share purchase price of restricted stock	Per share estimated fair value of award on grant date
February 1, 2016	3,245,082	$ 0.0001	$0.0001
April 1, 2016	36,393	$ 0.0001	$0.0001
August 17, 2016	139,508	$ 0.0001	$0.0001
June 1, 2017	812,787	$ 0.0001	$0.0001
June 1, 2017(1)	(594,426)	$ 0.0001	$0.0001
June 12, 2017	600,491	$ 0.0001	$0.0001
July 15, 2017	211,991	$ 0.0001	$0.0001
August 28, 2017	184,393	$ 0.0001	$0.0001
December 11, 2017(1)	(1,024,778)	$ 0.0001	$0.0001
January 22, 2018	670,246	$ 0.0001	$0.0001
July 1, 2018(2)	127,377	$ 0.0001	$0.0400
October 1, 2018	49,889	$ 0.0400	$0.0400
October 7, 2018	177,266	$ 0.0400	$0.0400

(1) Cancellations

(2) For restricted stock granted on July 1, 2018, prior to receipt in November 2018 of the report of fair value of our common stock as of June 30, 2018, our board of directors determined that the fair value of our common stock was $0.0001 per share as of the grant date. Receipt of the valuation of the appraisal reporting a higher value at approximately the date of the grant resulted in a stock compensation charge for accounting purposes.

Valuation of derivative liabilities — conversion feature

We issued convertible promissory notes that each contained a conversion feature meeting the accounting definition of a derivative instrument as the feature was not clearly and closely related to the economic characteristics and risks of the convertible promissory notes. This is because the conversion feature provided for (i) conversion of the notes at a discount to the price obtained by the company for shares sold in a "Qualified Financing" (as defined) that would trigger the required conversion of the notes as well as (ii) a "cap" on the conversion price notwithstanding the discount. We classified this feature of the notes as derivative liabilities, which were initially recorded at their fair value upon issuance of the convertible promissory notes and are subsequently remeasured to fair value at each reporting date, with changes in fair value recognized in our statement of operations.

The fair value of the derivative liabilities was determined by an independent appraisal firm using a "with and without" analysis within a probability-weighted expected return method, or PWERM. This analysis considered as inputs the type, timing and probability of occurrence of a future Qualified Financing; the potential amount of the payment under each of the potential settlement scenarios (with and without the conversion feature); and the discount rate reflecting the expected risk profile for each of the potential settlement scenarios. The estimates were based, in part, on subjective assumptions. Changes to these assumptions could have had a significant effect on the fair value of the derivative liabilities.

In connection with the sale of our common stock in this offering, all of the outstanding principal and accrued interest under the convertible promissory notes will automatically convert into shares of common stock. As a result, subsequent to this offering, we will no longer have derivative liabilities recorded on our balance sheet and will no longer recognize changes in fair value of the derivative liabilities in our statement of operations.

Off-balance sheet arrangements

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

Recently issued accounting pronouncements

A description of recently issued accounting pronouncements that may affect our financial position and results of operations is disclosed in Note 2 to our financial statements included elsewhere in this prospectus.

Internal control over financial reporting

In preparation of our financial statements to meet the requirements of this offering, we determined that material weaknesses in our internal control over financial reporting existed during fiscal 2020 and remain unremediated. See "Risk factors — We have identified material weaknesses in our internal control over financial reporting. If we are unable to remediate these material weaknesses, or if we identify additional material weaknesses in the future or otherwise fail to maintain an effective system of internal controls, we may not be able to accurately or timely report our financial condition or results of operations, which may adversely affect our business."

Quantitative and qualitative disclosures about market risks

Interest rate risk

We are exposed to market risk related to changes in interest rates. As of December 31, 2020 and 2019, our cash and cash equivalents were held in checking and savings accounts at a major U.S. bank. Our primary exposure to market risk is interest income sensitivity, which is affected by changes in the general level of U.S. interest rates. However, because of the short-term nature of the instruments in our portfolio, an immediate 10% change in the interest rate would not materially affect the fair market value of our investments or on our financial position or results of operations.

As of December 31, 2020 and 2019, we had no debt outstanding other than our convertible promissory notes and are therefore not subject to interest rate risk related to debt.

Foreign currency exchange risk

Our primary exposure to market risk is foreign exchange rate sensitivity to the Euro, the currency for certain of our major purchases. For the years ended December 31, 2020 and 2019, we did not recognize foreign currency transaction losses. Foreign currency transaction losses, if any, are recorded as a component of other income (expense) in our statements of operations. An immediate 5% change in the Euro exchange rate would not have a material effect on our results of operations.

As we continue to develop our business, our results of operations and cash flows will likely be more affected by fluctuations in foreign currency exchange rates, including the Euro and other currencies, which could adversely affect our results of operations. To date, we have not entered into any foreign currency hedging contracts to mitigate our exposure to foreign currency exchange risk.

Emerging Growth Company and Smaller Reporting Company Status

We are an "emerging growth company" as defined in the JOBS Act. We will remain an emerging growth company until the earliest to occur of: (i) the last day of the fiscal year in which we have more than $1.07 billion in annual revenue; (ii) the date we qualify as a "large accelerated filer," with at least $700 million of equity securities held by non-affiliates; (iii) the date on which we have issued more than $1.0 billion in non-convertible debt securities during the prior three-year period; and (iv) the last day of the fiscal year ending after the fifth anniversary of our initial public offering. As a result of this status, we have taken advantage of reduced reporting requirements in this prospectus and may elect to take advantage of other reduced reporting requirements in our future filings with the SEC. In particular, in this prospectus, we have provided only two years of audited financial statements and have not included all of the executive compensation related information that would be required if we were not an emerging growth company.

In addition, the JOBS Act provides that an emerging growth company can take advantage of an extended transition period for complying with new or revised accounting standards by delaying adoption of these standards until they would apply to private companies. We have elected to use the extended transition period to enable us to comply with new or revised accounting standards that have different effective dates for public and private companies until the earlier of the date on which we (i) are no longer an emerging growth company and (ii) affirmatively and irrevocably opt out of the extended transition period provided in the JOBS Act. As a result, our financial statements may not be comparable to companies that comply with new or revised accounting pronouncements as of effective dates applicable to public companies.

We are also a "smaller reporting company" meaning that the market value of our stock held by non-affiliates plus the proposed aggregate amount of gross proceeds to us as a result of this offering is less than $700 million and our annual revenue was less than $100 million during the most recently completed fiscal year. We may continue to be a smaller reporting company after this offering if either (i) the market value of our stock held by non-affiliates is less than $250 million or (ii) our annual revenue was less than $100 million during the most recently completed fiscal year and the market value of our stock held by non-affiliates is less than $700 million. If we are a smaller reporting company at the time we cease to be an emerging growth company, we may continue to rely on exemptions from certain disclosure requirements that are available to smaller reporting companies. Specifically, as a smaller reporting company, we may choose to present only the two most recent fiscal years of audited financial statements in our Annual Report on Form 10-K and, similar to emerging growth companies, smaller reporting companies have reduced disclosure obligations regarding executive compensation and other matters.

BUSINESS

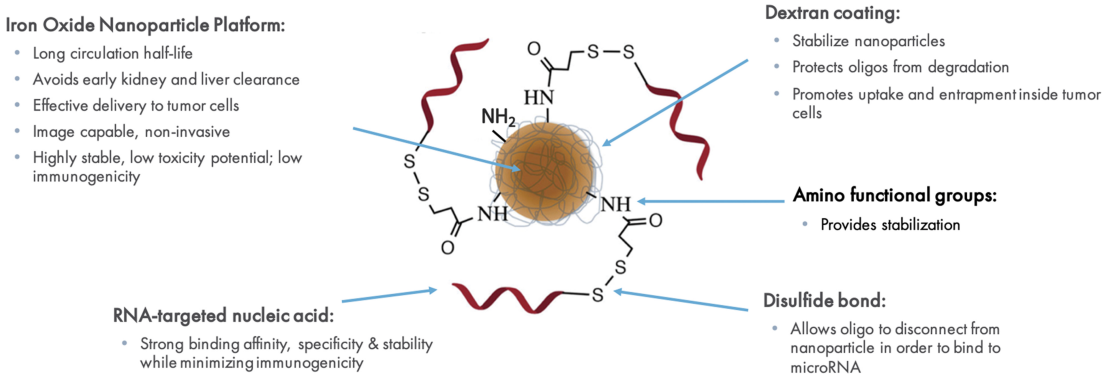
Overview

TransCode Therapeutics is an emerging RNA oncology company, created on the belief that cancer can be defeated through the intelligent design and effective delivery of RNA therapeutics. We have created a platform of drug candidates designed to target a variety of tumor types with the objective of significantly improving patient outcomes. Our lead therapeutic candidate, TTX-MC138, is focused on treating metastatic cancer, which causes approximately 90% of all cancer deaths representing over nine million deaths per year worldwide. We believe that TTX-MC138 has the potential to produce regression without recurrence in a range of cancers, including breast, pancreatic, ovarian and colon cancer, glioblastomas and others. Our drug candidates, TTX-siPDL1 and TTX-siLIN28b, focus on the treatment of tumors by targeting PD-L1 and Lin28b, respectively.

For decades, RNA has been a topic of investigation by the scientific community as a potentially attractive therapeutic modality because it can target any gene and it lends itself to rational and straightforward drug design. RNA-based therapeutics are highly selective to their targets with the potential to unleash a broad array of previously undruggable targets in the human genome. To date, research into RNA efficacy has been limited due to three delivery-related challenges: protecting the RNA from being dismantled by the immune system; maintaining stability so the molecule has time to do its job; and penetrating the targeted organs and cells. We believe these challenges have led researchers to focus on other approaches to cancer therapeutics. Our strategy seeks to overcome these delivery challenges by repurposing a particle used extensively in humans for imaging purposes to deliver synthetic RNA molecules (called oligonucleotides) to cancer cells.

We anticipate submitting an exploratory investigational new drug application, or eIND, in the second half of 2021 to support initiation of a First-in-Human (FIH) clinical study with TTX-MC138. This study is intended to demonstrate delivery of our lead therapeutic candidate inside metastatic tumor cells, as well as engagement of the microRNA-10b target. We believe that demonstrating our ability to overcome the challenge of RNA delivery to genetic targets outside the liver would represent a major step forward in unlocking therapeutic access to genetic targets involved in a range of cancers.

Our delivery system is designed as follows:



Our Lead Product Candidate

Our scientific founders developed the initial TransCode therapeutic candidate at The General Hospital Corporation, d/b/a Massachusetts General Hospital, or MGH, to target microRNA-10b, a well-validated biomarker linked to metastatic cancer. In contrast, most anti-cancer therapies target primary tumors and do not address metastatic disease specifically. MicroRNA-10b has been shown to be the master regulator of metastatic disease in multiple tumor types. Effective therapeutics have not been developed targeting microRNA-10b because of challenges in delivering therapeutics to tumors despite microRNA-10b's strong association with cancer metastasis, as documented in over 200 peer-reviewed scientific publications over the last ten years.

TTX-MC138 comprises proprietary iron-oxide nanoparticles and oligonucleotides — synthetic RNA/DNA molecules that specifically target microRNA-10b, a regulatory RNA. The nanoparticles serve as a vehicle to deliver oligonucleotides to metastatic cancer cells. The magnetic properties of these nanoparticles allow for monitoring of their delivery using non-invasive imaging, which we believe adds value for clinical implementation of this therapeutic approach.

Our scientific co-founders conducted a variety of preclinical animal studies involving human metastatic breast cancer models. In these studies, TTX-MC138 was successfully delivered to existing metastatic lesions in the lymph nodes, lungs, and bones as shown by non-invasive imaging performed 24 hours after injection. In five separate studies comprising over 125 mice, TTX-MC138 was injected into mice bearing metastatic breast cancer tumors. These mice models included: the rodent 4T1-luc2 cell line, which is a very aggressive model of stage IV metastatic breast cancer, the human MDA-MB-231-luc-D3H2LN cell line, which is a stage II/III cancer model, and the human MDA-MB-231-BrM2-831 cell line, which is a model of breast cancer metastatic to the brain. Tumors in mice implanted with MDA-MB231 cells typically progress from localized disease to lymph node metastases within 21 days of implantation. Tumors in mice implanted with 4T1-luc2 cells typically progress to distant sites in the animals within 10 days of implantation.

To test TTX-MC138 in the model of lymph node metastatic breast cancer, mice had their primary tumors surgically removed four to five weeks after tumor inoculation, following confirmation of lymph node metastases via imaging. This was done to better simulate a clinical scenario, since the current standard of care involves surgical removal of the primary tumor in patients with lymph node metastatic breast cancer. Treatment with TTX-MC138 was then initiated during the week of tumor removal. Because tumors in mice replicate more rapidly than is typical in humans, we combined low-dose doxorubicin with the TTX-MC138 because doxorubicin slows metastatic cell replication specific to these tumor models. Doing so allowed the TTX-MC138 to more efficiently reach and inhibit the targeted RNA (miR-10b) inside the tumor cells.

After four weeks of therapy, mice treated with TTX-MC138 showed complete regression of lymph node metastases. By contrast, in the control groups, there was metastatic progression (Within-Subjects ANOVA: $p < 0.05$). Treatment was discontinued once complete metastatic regression was observed. By the end of the study at 12 weeks, no recurrence of disease was observed and there was complete regression without recurrence in 100% of treated subjects having this cancer model.

In similar studies involving mice implanted with 4T1-luc2 breast tumors, we observed regression of distant metastases by week six, at which point treatment was stopped (Within-Subjects ANOVA: $p < 0.05$). Despite stopping treatment, the animals remained metastasis-free and by the end of the study, no recurrence of disease had been observed. There was evidence of complete regression without recurrence in 65% of treated subjects while 35% progressed due to insufficient inhibition of miR-10b in this group. We believe this was due to the high cell replication rate of the tumor model, which we do not expect to be the case in humans with metastatic disease, whose replication rates are dramatically lower than in mouse models.

We anticipate submitting an exploratory investigational new drug application, or eIND, in the second half of 2021 to support initiation of a First-in-Human (FIH) clinical study with TTX-MC138. This study is intended to demonstrate delivery of our lead therapeutic candidate inside metastatic tumor cells, as well as engagement of the microRNA-10b target. We believe that demonstrating our ability to overcome the challenge of RNA delivery to genetic targets outside the liver would represent a major step forward in unlocking therapeutic access to genetic targets involved in a range of cancers. Concurrent with the Phase 0 study, we expect to complete additional IND enabling studies to support an IND for a Phase I clinical trial with TTX-MC138.

Modular Design Toolbox

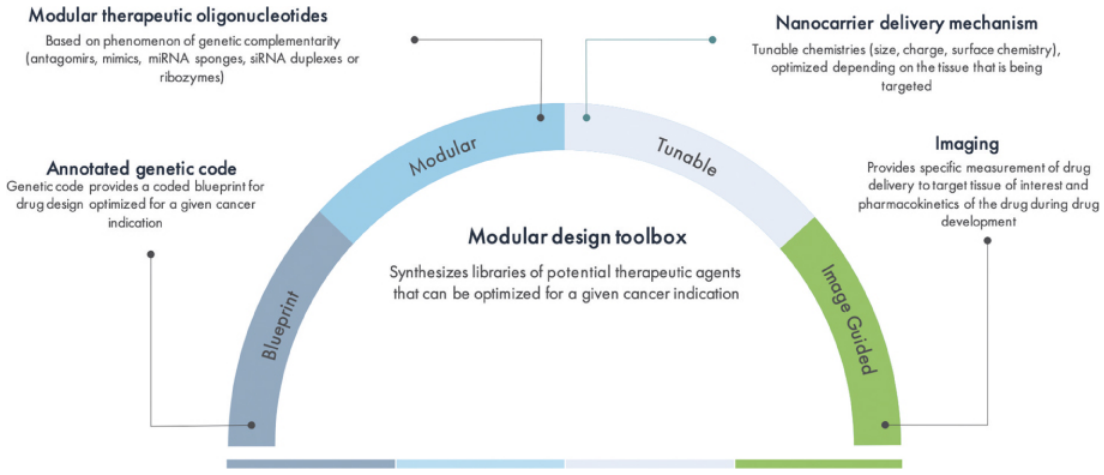
We employ a modular drug design approach to develop product candidates that we believe can efficiently deliver therapeutics to genetic targets. This approach is based on four complementary design elements that together address the challenges of RNA drug development in oncology:

- **Modular Design for Therapeutic Development —** Our discovery platform consists of a modular ‘toolbox’ for developing therapeutic candidates designed to attack specific disease-causing RNA targets based on the phenomenon of genetic complementarity. These therapeutics incorporate synthetic

RNA/DNA molecules called oligonucleotides (oligos), that can be designed as antagomirs, mimics, miRNA sponges, siRNA duplexes, ribozymes, and others depending on the desired therapeutic strategy. In addition to the varied oligo design approach, we can also synthesize nanocarriers with tunable chemistry properties. Combined, the modularity and tunability of these oligonucleotides and nanocarrier components allow us to synthesize libraries of potential therapeutic agents designed for a given indication or a given patient in terms of therapeutic oligonucleotide design, size, surface coating and charge, hydrophilicity and hydrophobicity, and antigen-targeting through incorporation of targeting peptides.

- **Genetic Code** — Our approach to drug development takes advantage of our rapidly expanding knowledge about the human genome and the annotation of the genome — the knowledge about what different genes are responsible for especially in cancer. Armed with this knowledge, we can take advantage of the coded nature of the genome to design specific oligos that correspond to genetic targets of interest. Once we determine the code of the cancer target, we can develop therapeutic candidates using specific oligos that are harmonized to that target and potentially rewrite the story on cancer. This is what TransCode means — to change the code.
- **Nanocarrier Delivery Mechanism** — Our strategy seeks to leverage a nanoparticle that has been extensively used in humans for imaging purposes by repurposing it to deliver oligonucleotides to cancer cells. The nanocarrier is tunable to pre-designed specifications to deliver therapeutic oligonucleotides to an RNA target in tumors and metastases without compromising its integrity. These nanocarriers differentiate us from competitive delivery approaches which rely on lipid particles or chemical structures, such as GalNAc. Competitive delivery approaches effectively target sites in the liver but not sites in tumors and metastases. Our nanocarrier is derived from and is chemically similar to nanoparticles extensively used in imaging (Feridex, AdvancedMagnetics) or for treating iron deficiency anemia (Feraheme, AdvancedMagnetics).
- **Image Guided** — Because our product candidates are innately detectable using non-invasive imaging, we can monitor their delivery to the tissue of interest and measure their bioavailability. The ability to monitor delivery using Magnetic Resonance Imaging, or MRI, can be instrumental to assessing and controlling the amount of oligonucleotide that reaches the targeted tissues. MRI use during the design phase of the product candidate could guide drug design, delivery schedule, route, and dose and could suggest alternatives should treatment with the therapeutic candidate fail in a given patient. This is critical during drug development because it should allow us to optimize drug design to maximize therapeutic effect.

The following graphic summarizes our modular design approach:



Our Team

At TransCode, we are driven to change how cancer is treated both as a therapeutic modality and in terms of improving patient outcomes. We believe in the potential ability of RNA therapeutics to offer

patients complete regression of their disease without recurrence rather than the current norm of giving patients additional months of survival. We are led by an experienced team of dedicated scientists and experts with decades of experience in the foundational areas of RNA and drug development, including RNA drug development using antisense oligonucleotide, or ASO, and silencing RNA approaches. Our Co-Founder and CEO Michael Dudley has over 40 years of executive leadership experience in the fields of medical device, diagnostics and therapeutics. Dr. Zdravka Medarova, our Co-Founder and Vice President of Drug Discovery, is a geneticist and cancer biologist by training. She is an internationally recognized leader in the field of non-coding RNAs for cancer therapy and one of the inventors of TransCode's technology. She developed the core TTX delivery platform and validated many of the therapeutic targets. Dr. Anna Moore, our co-founder, is internationally known for her groundbreaking research on targeted imaging and image-guided therapy. Tom Fitzgerald, our CFO, has over 30 years of accomplishments as a CFO and an investment banker for companies from emerging growth to turnarounds to Fortune 500 companies in the life sciences, technology, financial and industrial sectors. Dr. Peter Liu, our Chief Scientist, has over 20 years of research and development, or R&D, experience and leadership in the biopharma industry and has in-depth knowledge and expertise in chemistry, oligonucleotide biochemistry, and assay development. In addition, the executive management team has years of experience and expertise in areas of healthcare business development and management, finance, and clinical operations and project management as well as mergers, acquisitions and other strategic transactions. Our advisory team has years of experience and expertise in chemistry manufacturing controls, or CMC, scaleup and commercialization of oligonucleotide and nanoparticle based therapeutics as well as strong expertise in regulatory affairs, business strategy, legal, and clinical trial design.

Our Pipeline

We plan to continue research on a variety of microRNAs and biomarkers involved in cancer cell proliferation, carcinogenesis and metastasis. Our lead candidate, TTX-MC138, is expected to enter its first phase of clinical assessment in the second half of 2021, subject to submission to and clearance by FDA of our eIND. In addition, we intend to request fast track designation by the FDA. In addition, we recently amended our worldwide exclusive license with MGH to include a small interfering RNA therapeutic created at MGH by one of our scientific co-founders against PD-L1 in pancreatic and other cancer types including melanoma, breast and non-small cell lung cancer. Our testing in a preclinical pancreatic cancer model demonstrated encouraging results. In addition, we have secured an exclusive option from MGH to license a therapeutic target, LIN28b, for the potential treatment of pancreatic cancer and several other cancer types including hepatocellular, breast, colon, and gastric cancers among others, in which Lin28b expression has been linked to outcome. There is no assurance that even if we successfully license any additional technologies, they will prove successful in further testing.

The following table summarizes our development pipeline:

Drug Candidate	Target	Disease Indication	Discovery	Preclinical	Phase 0	Phase 1	Phase 2	Phase 3	Key Anticipated Milestones
TTX-MC138	miR-10b	Metastatic Cancer							Tox study Q2 '21; Ph0 Q4 '21
		Glioblastoma (GBM)							Preclinical study 1H '21
TTX-siPDL1	PD-L1	Solid Tumors							Preclinical study 1H '21
TTX-siLin28b *	Lin28b	Solid Tumors							Preclinical Study 1H '21
TTX-RIGA	Multiple	Cancer Agnostic							Preclinical Studies 2H '21

* TransCode has signed an Exclusive Option Agreement with The General Hospital Corporation, d/b/a Massachusetts General Hospital, or MGH, for TTX-siLin28b. Under this Option, TransCode has the right to negotiate a license to this asset with MGH. TransCode's decision will depend on the results of a preclinical study it plans to conduct in the first half of 2021.

Our Strategy

Our goal is to become a leading oncology-focused biotechnology company, leveraging our proprietary platform to discover, develop and commercialize transformative treatments to defeat cancer. Key components of our strategy include the following:

- **Advance the development of our TTX-MC138, TTX-siPD-L1 and TCDx programs to deliver potentially transformative therapies and diagnostics to patients**. The modular design toolbox takes advantage of the "coded" nature of the genome and transcriptome. Because of that, DNA/RNA-targeted methods provide an ideal platform for rational design of therapeutic and diagnostic agents based on the phenomenon of complementarity. This approach can be used while relying on recent advances in bioinformatics, genomics, and transcriptomics. The therapeutic molecules can be antisense oligonucleotides (LNA oligonucleotides, antagomirs, miRNA sponges), siRNA duplexes, or ribozymes. These molecules can be synthesized to target portions of the code that is aberrant in disease and thus the unique genome of the patient would in turn direct us to an equally unique cocktail of therapeutic agents. We are specifically focused on delivering therapeutic solutions that reach previously inaccessible targets, in particular those in which the biological pathways are clinically and genetically well-validated, in order to address significant unmet medical needs within broad patient populations. We believe our TTX-MC138 and TTX-siPD-L1 programs have the potential to treat multiple cancer indications that fit these criteria. We expect to submit an eIND for TTX-MC138 in the second half of 2021, and if permitted to proceed, to initiate a Phase 0 trial in patients with stage IV breast cancer shortly thereafter. We also expect to submit an IND for TTX-MC138 in the second half of 2022, and if permitted to proceed, to initiate a Phase 1 trial in adult patients for multiple tumor types shortly thereafter.
- **Further expand the capabilities of our TTX delivery platform to additional RNA targets**. We believe our ability to identify and utilize previously undruggable microRNAs, particularly those with selective or restricted expression, may unlock new opportunities across broad therapeutic applications.
- **Continue to build a broad and diverse pipeline of novel oncology product candidates**. Guided by our drug development principles and the clinical results from our TTX-MC138 program, we intend to continue to identify therapeutic targets that have disruptive therapeutic potential and are predicted to be well-suited for a therapeutic approach. Given the unique genetic profiles in some of the patient populations that we aim to serve, we plan to continue to leverage a precision medicine approach to help identify patients with the highest probability of responding to our drug candidates. The capabilities of our discovery platform, such as our expanded toolbox that includes our image capable delivery system, enable us to pursue targets linked to a wider range of indications.
- **Expand and protect our proprietary know-how and intellectual property**. We have developed a broad patent portfolio meant to protect our intellectual property, which we intend to expand further. Our intellectual property, which includes proprietary know-how as well as various patents, applies not only to our licensed compounds but also to our newly developed therapeutic patents assigned to TransCode.
- **Pursue synergistic collaboration opportunities**. To further our goal of delivering transformative therapies to the broadest possible patient populations, we expect to leverage strategic partnerships that can contribute complementary capabilities in manufacturing, distribution and commercialization in disease areas within our core area of therapeutic focus.

Background of RNA

RNA has long been viewed as an attractive therapeutic modality because it can be used to target a wide array of diseases; it involves rational and straightforward drug design, the drugs are highly selective for their target, and nominal amounts of drug are required to achieve powerful therapeutic activity. In addition, such drugs have the ability to engage targets that are otherwise 'undruggable' by small molecules and proteins, thus opening up whole new avenues for treating intractable diseases. Turning this concept into a clinical reality, however, is no small feat. ASOs and siRNAs have been in clinical development for decades, and for much of this time, clinical success has been out of reach. This lack of clinical success is due to three delivery-related challenges: protecting the therapeutic oligonucleotide from dismantling by the immune system;

maintaining stability so the molecule can do its job; and penetrating the target organs and cells. Because of these challenges, RNA as a cancer treatment modality has been bypassed largely by the interest in other forms of treatment including immunotherapy. One enticing feature of RNA-targeting therapeutics is that once chemistry and delivery are optimized, designing and producing a lead compound for a new target is relatively straightforward, and their *in vivo* pharmacokinetics are highly predictable. This means that the timeline from target identification to preclinical proof of concept in animal models, to having a lead compound ready to be tested in clinical trials, can be as short as six months rather than years, which has been the norm for drug development until now. This is reflected in a burgeoning clinical pipeline: currently more than a hundred investigational RNA-targeting drugs are under clinical development for disease indications encompassing neurodegeneration, metabolic and cardiovascular disorders and various cancers. Advancements in the field are now accelerating after years of slow progress. In 2016, nusinersen, a splicing switching ASO, was approved by the FDA and became the first drug to treat spinal muscular atrophy, a rare and often fatal disease of the nervous system, and 2018 witnessed the first ever approval of an RNAi drug — patisiran — to treat polyneuropathy of hereditary transthyretin-mediated amyloidosis, another rare and devastating disease mediated by the liver. These recent successes validated the clinical utility of RNA-targeting therapeutics and brought forward lifesaving drugs for patients who previously had no effective treatment options.

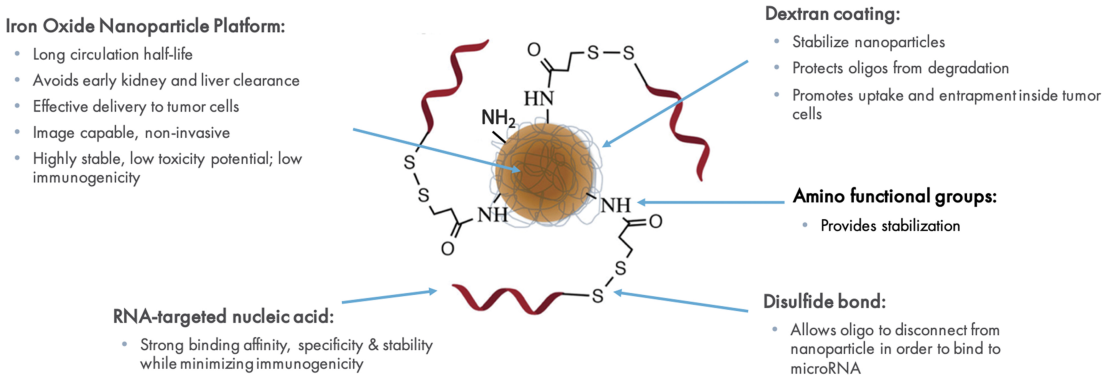
Our scientific approach is based on three complementary elements that address these challenges: the ability to precisely deliver an oligonucleotide to an RNA target without compromising the integrity of the oligonucleotide; a platform to develop oligonucleotides that are designed to attack specific disease-causing RNA targets; and a diagnostic test for optimal targeting which can guide therapeutic intervention.

Our scientific founders initially developed the lead candidate therapeutic at MGH to address the challenge of targeting microRNA-10b, a well validated target linked to metastatic cancer, which causes approximately 90% of all cancer deaths. In contrast, most anti-cancer therapies target primary tumors and do not address metastatic disease specifically. Until now an effective therapeutic has not been developed to target microRNA-10b because of the delivery challenge despite microRNA-10b's strong association with cancer metastasis as documented in over 200 scientific publications.

TTX Design

Our delivery solution utilizes a similar construct as products that are already in clinical use for other indications. It leverages a particle that has been extensively used for imaging purposes and has been repurposed to be used as a delivery system for oligonucleotides. The nanocarrier is tunable to pre-designed specifications to shuttle therapeutic oligonucleotides to tumors and metastases and to precisely deliver oligonucleotides to an RNA target without compromising their integrity. Our platform, which has undergone more than 12 years of research and development optimization at MGH, is designed to deliver the oligonucleotide to the tumor cells with enhanced stability and binding affinity. We believe that the nanocarrier's small size may allow for a long circulation time and efficient accumulation in metastatic tumor cells while minimizing kidney and liver clearance. A dextran coating stabilizes the oligonucleotide by blocking large nuclease proteins from gaining access to it. Our delivery platform allows for the custom development of product candidates as well as targeting of specific biomarkers in multiple cancer types. The biomarker acts as both a diagnostic and therapeutic target in that the molecule is designed for a specific RNA target and the target itself is a biomarker for the particular cancer.

Another advantage of the delivery system is noninvasive monitoring of the therapeutics' biodistribution using MRI. We believe that this advantage represents an indispensable tool to assess and control delivery to targeted tissues which has the potential to enhance both efficacy and safety. Our most advanced program focuses on metastatic cancers, which are responsible for over nine million deaths per year worldwide. In preclinical mice studies, our lead therapeutic candidate demonstrated the ability to be delivered to existing metastatic lesions and potentially eliminate metastasis. In one preclinical study using a stage II/III cancer model, our lead therapeutic candidate elicited complete regression without recurrence during the 12-week study period in 100% of animals treated. In another preclinical study using an aggressive stage IV cancer model, our lead therapeutic candidate elicited complete regression without recurrence during the study period in 65% of animals treated. We anticipate submission of an eIND to support initiation of our first in human clinical trial in the second half of 2021 for our lead product candidate.



The general design of our therapeutic agents is described above in **Fig. 1.** The modular delivery system that constitutes the core of our therapeutic and diagnostic platform, TTX, represents iron-oxide nanoparticles that have been designed for optimized delivery to primary and metastatic tumors. Based on the literature and our own studies, we believe that the delivery of TTX and other similar iron oxide nanoparticles to tumors and metastases relies on a combination of hemodynamic, physicochemical and metabolic factors. The TTX nanoparticles have been observed to be long circulating with the blood half-life of 17-24 hours based on the experience with the clinically approved iron oxide nanoparticle to treat iron deficiency anemia, Feraheme (ferumoxytol). The nanoparticles distribute to the interstitium (spaces between cells) of tumors and metastases via the enhanced permeability and retention (EPR) effect, followed by cell uptake of the positively charged nanoparticles. The nanoparticles are also coated with a non-metabolizable sugar which further facilitates uptake based on the Warburg effect (form of modified cellular metabolism found in cancer cells). An additional advantage derives from the capability for noninvasive imaging via MRI, due to the incorporation of a superparamagnetic iron oxide into the design of TTX.

The clearance pathway for these nanoparticles is also well understood. Like other iron oxide nanoparticles, TTX accumulates in the organs of the reticuloendothelial system. There, it is taken up by the cells and rapidly broken down. The iron from the iron oxide core enters the endogenous iron pool, whereas the dextran from the nanoparticle coating is cleared through the kidneys. After over 12 years of R&D optimization, we have extensively studied the delivery nanoparticle's step-by-step synthesis and characterization, as well as their hydrodynamic size, surface charge, relaxivity, toxicity, stability and immunogenicity.

The TTX delivery platform is highly differentiated from other oligonucleotide delivery systems that have been developed commercially **(Fig. 2)**.

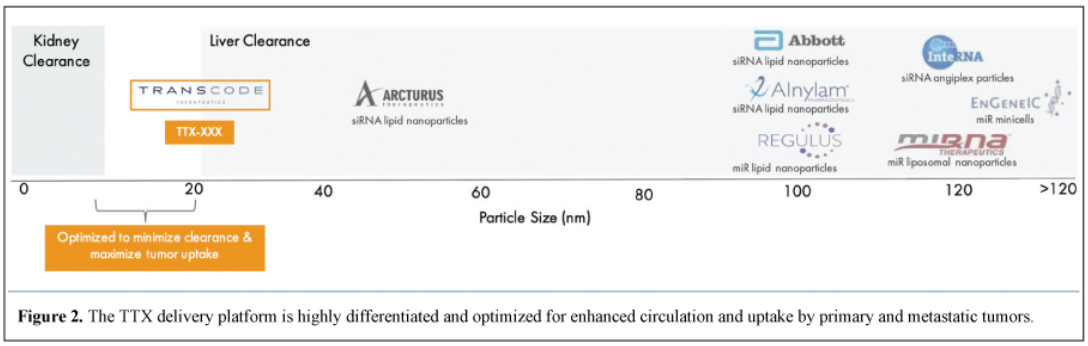


Figure 2. The TTX delivery platform is highly differentiated and optimized for enhanced circulation and uptake by primary and metastatic tumors.

We describe our delivery system as "Inhibitory Oligonucleotide Conjugated Nanoparticle" and believe it offers the following advantages:

- Small size (20nm+/-) gains access to tumors and metastases and avoids early clearance by the liver and kidneys;

- Long circulation half-life;
- Low risk of immunogenicity vs competitor lipid particles which have been shown to induce undesirable immune responses via a number of different mechanisms, including complement activation and inflammatory cytokine overproduction;
- Quantitative non-invasive imaging via MRI & measurement of drug bioavailability during treatment;
- Surface coating consisting of a non-metabolizable glucose polymer creates steric hindrance by blocking large nuclease proteins from gaining access to oligonucleotide during the binding process to our target microRNA and at the same time results in a positive zeta potential improving stability and improving cell uptake;
- Highly stable, low toxicity potential; and
- Greater binding affinity and specificity to intended target.

Our Programs

Target Identification

microRNA's

MicroRNAs, or miRNAs, are important post-transcriptional regulators of gene expression. The recent literature abounds in examples of the key role played by miRNAs in determining cell fate. These examples are particularly compelling with regard to cancer emergence, progression, and response to therapy. Consequently, miRNAs represent candidates as targets of therapeutic intervention. To specifically inhibit cancer causing miRNAs, we design therapeutics capable of first accumulating in tumor cells which then allow for target engagement of the specific miRNA of interest.

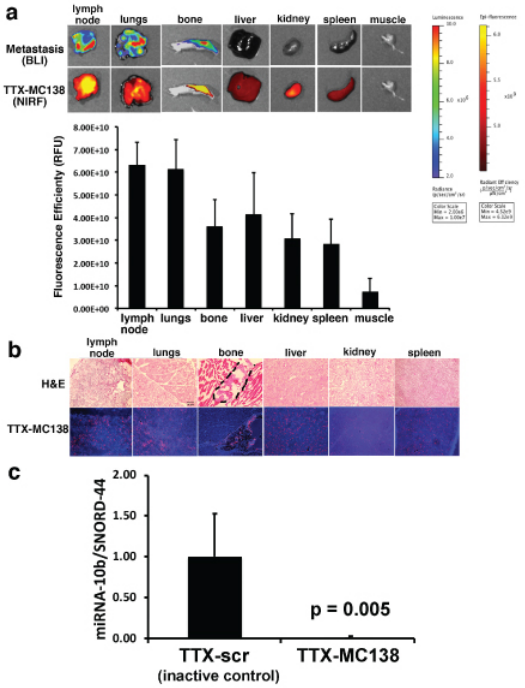


Figure 3. Delivery of TTX-MC138 to metastatic sites. **a** Macroscopic imaging of excised organs with metastases visible by bioluminescence imaging (BLI) showing accumulation of TTX-MC138 visible by NIRF imaging (NIRF). **b.** Histology of excised organs. Top: H&E, bottom: fluorescence (TTX-MC138: red, Cy5.5). **c.** Target engagement was demonstrated by qRT-PCR for miR-10b expression.

The process for therapeutic target identification is now well established. It involves differential expression analysis in cancer cell lines and animal models of cancer. These targets are then further validated as clinically actionable targets through examination of gene expression in genomic databases, such as The Cancer Genome Atlas, or TCGA, which can give us information about level of expression of each target in large populations of cancer patients and can correlate target expression to parameters such as patient survival and other clinical measures of outcome.

Target Engagement

Preclinical Proof of Delivery

In our preclinical studies, we used our lead therapeutic TTX-MC138, which is designed to specifically target miRNA-10b. The product candidate which was fluorescently labeled was injected into mice implanted with the murine breast cancer cell line. In this model, orthotopically-implanted tumors progress from localized disease to lymph node, lung, and bone metastases by 3 weeks after tumor inoculation. Optical imaging performed 24 hours after intravenous injection of the product candidate revealed uptake by the metastatic lesions in the lymph nodes, lungs, and bone **(Fig. 3a)**. Fluorescence microscopy confirmed widespread uptake by the metastatic tumor cells in these organs **(Fig. 3b)** supporting our hypothesis that the product candidate, as designed can target disseminated cancer to distant organs. In addition to demonstrating delivery, we have also observed efficient target engagement. We analyzed the expression of the miRNA-10b target in a mouse model treated with TTX-MC138 and observed abolition of the target **(Fig. 3c)**.

Clinical Feasibility of Delivery

Clinical proof of delivery is derived from studies in patients using the clinically approved agent ferumoxytol, which is marketed for the treatment of iron deficiency anemia and has also been used off-label

in clinical studies as an imaging agent detectable by MRI. The authors observed that all brain metastases showed accumulation of the agent in the metastatic lesions **(Fig. 4)**. Results of the studies provide preliminary grounds that at clinically acceptable doses of TTX (5 mg/kg), we will be able to achieve robust target engagement and therapeutic effects in human patients.

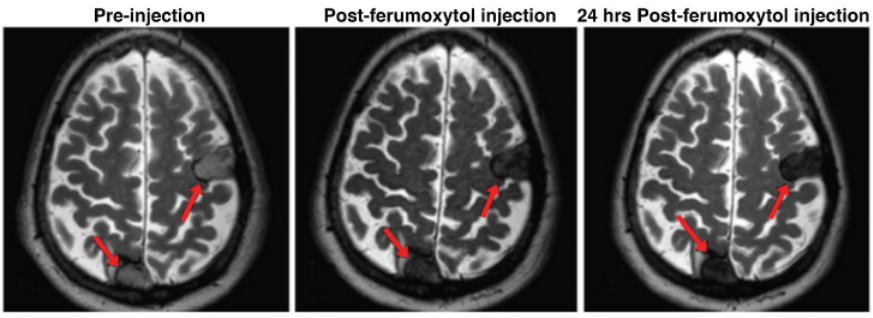


Figure 4. Axial MR images in a 59 year-old male with multiple pancreatic carcinoid tumor dural metastases demonstrates two masses (arrows). Axial T2-weighted MR images show a heterogeneous mildly hyperintense appearance of the dural-based masses (arrows) on non-contrast MRI (left). New hypointensity in both masses (arrows) immediately post ferumoxytol injection (middle). Hypointensity progressively darkens at 24 hours (right).

TTX-MC138

Metastatic cancer, also termed stage IV cancer, is the advanced form of cancer which has spread from an original tumor location to new sites in the body. Treatment of metastatic cancer is more complicated than treating early-stage cancer. Most of the treatments for metastatic cancer are focused on providing palliative care. With increases in the prevalence of disease and in life expectancy, there is also a rise in R&D expenditures in the field of oncology.

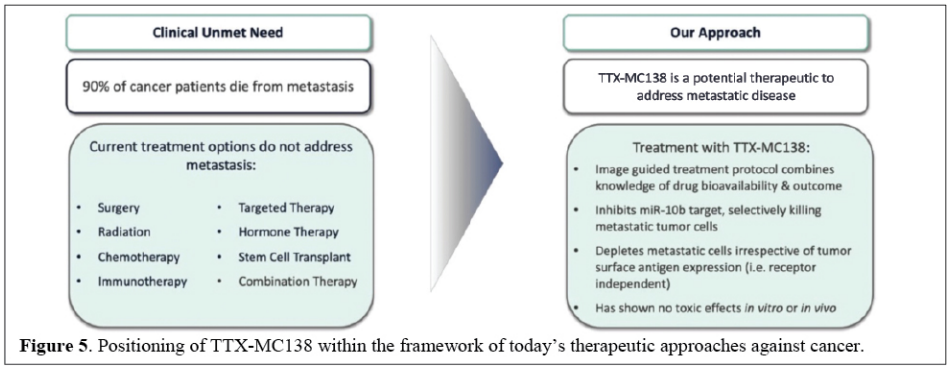


Figure 5. Positioning of TTX-MC138 within the framework of today's therapeutic approaches against cancer.

The global metastatic cancer treatment market was valued $54.11 billion in 2017 and is anticipated to reach $111 billion by 2027. Rising prevalence of cancer and high unmet medical needs of patients suffering from metastatic cancer are the drivers stimulating the growth of the metastatic cancer treatment market. We are developing TTX-MC138, our lead product candidate for the treatment of metastatic cancer. TTX-MC138 targets the validated critical driver of metastatic progression, microRNA-10b. We believe that TTX-MC138 has the potential to improve outcomes over current treatment options as well as other drugs currently in development, which are geared towards treating primary cancer but of limited efficacy treating disseminated malignancy (**Fig. 5**). In preclinical studies, TTX-MC138 was successfully delivered to existing metastatic lesions, in all subjects, eliminated metastasis and elicited complete regression without recurrence in 100% of subjects treated in a stage II/III cancer model and 65% of subjects treated in a very aggressive stage IV cancer model. We expect to submit an eIND for TTX-MC138 in the second half of 2021, and if permitted to proceed, to initiate a Phase 0 trial in patients with stage IV breast cancer shortly thereafter. We

also expect to submit an IND for TTX-MC138 in the second half of 2022, and if permitted to proceed, to initiate a Phase 1 trial in adult patients for multiple tumor types shortly thereafter.

MicroRNA-10b (miR-10b)

One of the first miRNAs to be shown as having aberrant expression in cancer was miR-10b. Since the inaugural study on miR-10b in Robert Weinberg's lab at the Whitehead Institute for Biomedical Research and Department of Biology, Massachusetts Institute of Technology, its role as a metastasis promoting factor has been extensively validated. To date, more than 200 studies have been completed on miR-10b and metastasis across 18 different cancer types. This immense set of information holds possibilities for novel methods to improve the lives of many. The therapeutic target, miRNA, is a regulatory RNA. miRNAs are placed at the apex of the gene regulatory pyramid and play a fundamental role in defining cell fate. Therefore, we believe by targeting microRNAs, it may be likely to achieve persistent therapeutic response in cancer patients. Our hypothesis is based on the rationale that the tumor cell phenotype is critically dependent on fundamental molecular pathways of oncogenesis and that altering these pathways can result in very specific and robust therapeutic effects. The miRNA genome, in particular, is a target because it is uniquely altered in tumor cells and represents a "hub" of carcinogenesis, since a single microRNA can coordinately affect the expression of multiple genes resulting in a comprehensive therapeutic response. In addition, because of the fundamental role played by microRNAs in defining tumor cell phenotypes, evasion of this therapeutic intervention by mutation is less likely.

Metastatic cells are uniquely capable of leaving the primary tumor, surviving in the circulation and colonizing a distant organ, which has properties distinct from the primary tumor in which the cells originated. Cells endowed with this capability evolve in response to an adaptive process driven by a cellular "survival instinct." Specifically, as tumors proliferate, within them arise pockets characterized by inadequate resource supply, due to failure of the tumor vasculature to keep up with the rapidly increasing tumor cell burden. This generates local inhospitable areas of low pH, high inflammation, and insufficient stromal supportive network necessary to maintain the survival of the tumor cells. As a result, some of the tumor cells within these pockets evolve by activating mechanisms, such as those driven by high miR-10b expression, that allow them to survive in the absence of abundant nutrient supply and to persist without the strong attachment to the extracellular matrix. These newly emergent cells become "refugees" from the primary tumor, invisible to most diagnostic/imaging modalities and resistant to most currently available therapeutic modalities.

In our search for the ideal therapeutic target, TransCode's founders identified microRNA-10b as critical for the survival of these cells. Our lead candidate is designed to enter these tumor cells and inhibit miR-10b. Without the high level of expression of miR-10b, these cells, stripped out of their natural microenvironment, do not have the adaptive mechanism they need in order to survive, so they simply die.

Preclinical and clinical evidence of miR-10b's role in cancer

Against this conceptual framework, we have designed our lead therapeutic-candidate, TTX-MC138, which has the potential, based on its specific design, to efficiently inhibit microRNA-10b in metastatic cancers. In mouse models of metastatic breast cancer, the study concluded that weekly treatment with TTX-MC138 in combination with low-dose chemotherapy, was the likely reason for a regression of established metastatic lesions in the lymph nodes, as well as distant organs such as the lungs and bone. Once disappearance of the metastatic lesions was observed, in treated subjects in stage II, III and IV cancer models treatment of the animals was stopped, and the investigators monitored for recurrence. The study observed no recurrence of metastatic disease within the observational period, suggesting that metastasis had been regressed.

The choice of microRNA-10b as a target is supported by its potentially broad relevance to cancer. Recent studies have demonstrated that the influence of microRNA-10b extends beyond breast cancer to 18 different tumor types which includes pancreatic, lung, colorectal, gastric, bladder, ovarian, and hepatocellular cancer amongst others, suggesting that the described approach can be broadly applicable to metastatic disease. TTX-MC138 is hormone receptor independent and its mechanism of action has been observed to treat metastatic breast cancer in rodents regardless of hormone receptor type (ER+/-, PR+/-, HER2+/-, or combinations thereof).

Our understanding of the pathway miR-10b uses to exert its effects is constantly evolving. However, the currently known downstream effects of miR-10b can be divided into six pathways: promotion of migration and invasion, promotion of epithelial-mesenchymal transition (EMT), inhibition of apoptosis, promotion of proliferation, and induction of angiogenesis and self-renewal.

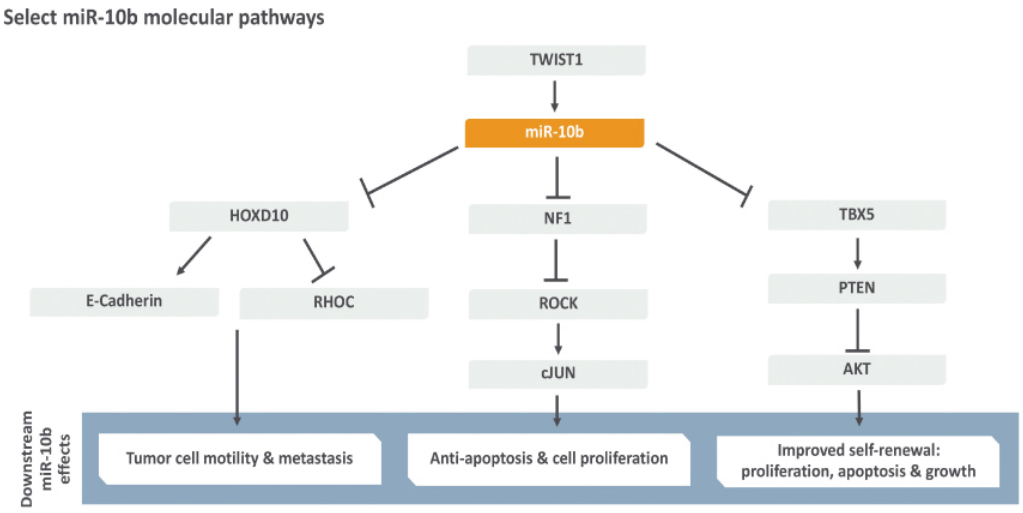


Figure 6. Key signaling pathways influenced by miR-10b.

Known microRNA-10b targets include **Homeobox D10 (HOXD10)**, implicated in tumor cell migration and invasion, **c-JUN**, a critical inducer of cell proliferation and tumor progression, and phosphatase and tensin homolog (PTEN), which results in maintained AKT activation, a Ser/Thr kinase associated with proliferation, apoptosis, and growth. This effect on the PI3K/AKT pathway allows for the improved self-renewal found in cancer stem cells highly expressing miR-10b. The key pathways through which miR-10b exerts its pro-metastatic effects are summarized in **Fig. 6**.

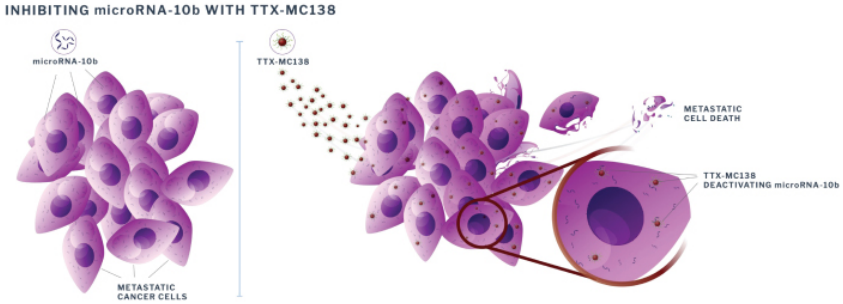


Figure 7. Therapeutic concept behind MC-138. TTX-MC138 arrests transit of metastatic tumor cells to local and distant organs; combining TTX-MC138 with a low dose of doxorubicin leads to regression of existing metastases.

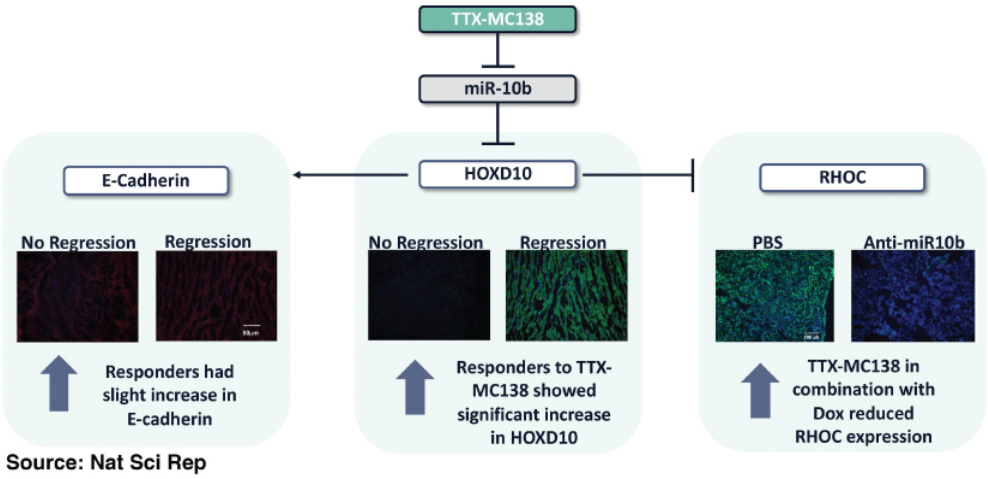


Figure 8. Effect of TTX-MC138 on the HOXD10 pathway.

Our approach — Mechanism of action of TTX-MC138

Our therapeutic concept is summarized in **Fig. 7**. TTX-MC138 represents a proprietary therapeutic-candidate that inhibits microRNA-10b. In primary tumors, inhibition of microRNA-10b by TTX-MC138 leads to arrest of tumor cell dissemination to local and distant organs. We believe a combination of TTX-MC138 with low dose doxorubicin may lead to metastatic cell death and complete and persistent regression of already formed metastatic lesions in local and distant organs. Low dose doxorubicin was used to slow down cell division in tumor cells. In preclinical studies that utilize aggressive metastatic tumor models, the use of doxorubicin was necessary to allow TTX-MC138 to fully inhibit microRNA-10b. Because metastatic growth is slower in humans, the use of a cytostatic such as doxorubicin will likely be unnecessary, and TTX-MC138 would likely be administered as a monotherapy. In our mechanistic studies, the studies described an effect of TTX-MC138 on HOXD10 **(Fig. 8)**. In a different study, a group from Tel Aviv University the study concluded that it likely had a robust effect on c-JUN, as illustrated in **Fig. 9**. Specifically, the study showed that loss of cell contacts or restructuring of the cytoskeleton, manifested as loss of E-cadherin in metastatic cells, led to a significant increase in miR-10b expression. Interestingly, the increase in miR-10b expression was accompanied by an increase in the accumulation of c-Jun. Silencing miR-10b in metastatic breast cancer cells resulted in a reduced c-Jun expression, whereas overexpression of miR-10b elevated the

accumulation of c-Jun. Furthermore, detailed mechanistic studies revealed that miR-10b activates the expression of c-Jun through RhoC and NF1, through a novel pathway for promoting migration and invasion of tumor cells

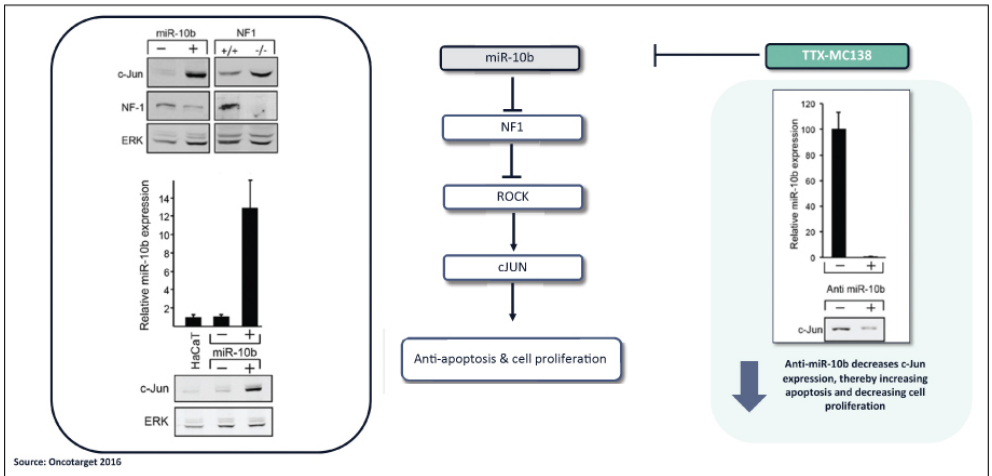


Figure 9. Effect of miR-10b inhibition on the c-Jun pathway. Left, top: Protein analysis of c-Jun, NF1 and ERK in HaCaT cells stably transfected with miR-10b (+) or control (−) construct (left panel) or in wild type (NF1+/+) or NF1 knockout (NF1−/−) MEFs (right panel). Left, bottom: HaCaT cells were stably transfected with a miR-10b expression vector (+) or an empty vector (−) as control. RNA samples from untransfected or transfected cells were analyzed by Real Time RT-PCR using primers for miR-10b and U6 snRNA. Parallel protein samples were assayed by western blotting to determine the protein level of c-Jun and ERK. Middle: a schematic representation of the miR-10b-cJUN pathway. Right: MDA-MB-231 cells were transfected with antisense oligonucleotide against miR-10b (+) or with control oligonucleotide (−). RNA samples were analyzed by quantitative RT-PCR using primers for miR-10b and U6 snRNA (upper panel). Parallel protein samples were analyzed by western blot using anti c-Jun and anti ERK antibodies (lower panel). All experiments were repeated at least two times and representative immunoblots are shown.

Results

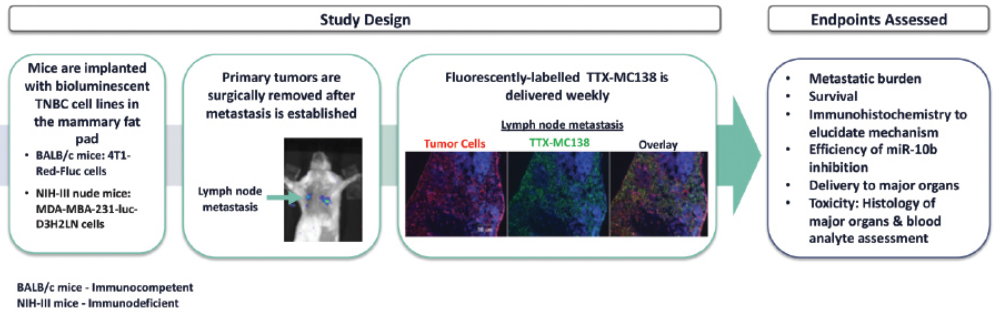


Figure 10. Study design (n = 35 for NIHIII; n = 39 for BALB/c).

In our preclinical studies outlined in **Figure 10**, when TTX-MC138 was combined with a low-dose cytostatic (doxorubicin), there was complete and persistent regression of pre-existing metastatic cancer with no evidence of recurrence and no systemic toxicity. Doxorubicin was used to slow down cell division in tumor cells since the tumor model we used was extremely aggressive. In preclinical studies that utilized aggressive metastatic tumor models, the use of doxorubicin was necessary to allow TTX-MC138 to fully inhibit microRNA-10b. Because metastatic cell growth is slower in humans, we believe that the use of a cytostatic such as doxorubicin should not be necessary, and TTX-MC138 would be administered as a monotherapy. Specifically, in mice with lymph node metastases from breast cancer, just four weekly treatments eliminated metastatic burden in all animals. By contrast, in the control groups, there was metastatic

progression (Within-Subjects ANOVA: $p < 0.05$). Once metastases were eliminated, the therapy was stopped **(Fig. 11)**. Thereafter, the animals were observed by bioluminescence optical imaging to detect recurrence. No recurrence of metastatic disease was observed by the end of the study at 12 weeks after tumor implantation. This translated into 100% survival. Similar results were obtained in a model of stage IV breast cancer **(Fig. 11)**. Specifically, in mice implanted with 4T1-luc2 breast tumors, we observed regression of distant metastases by week six, at which point treatment was stopped (Within-Subjects ANOVA: $p < 0.05$).

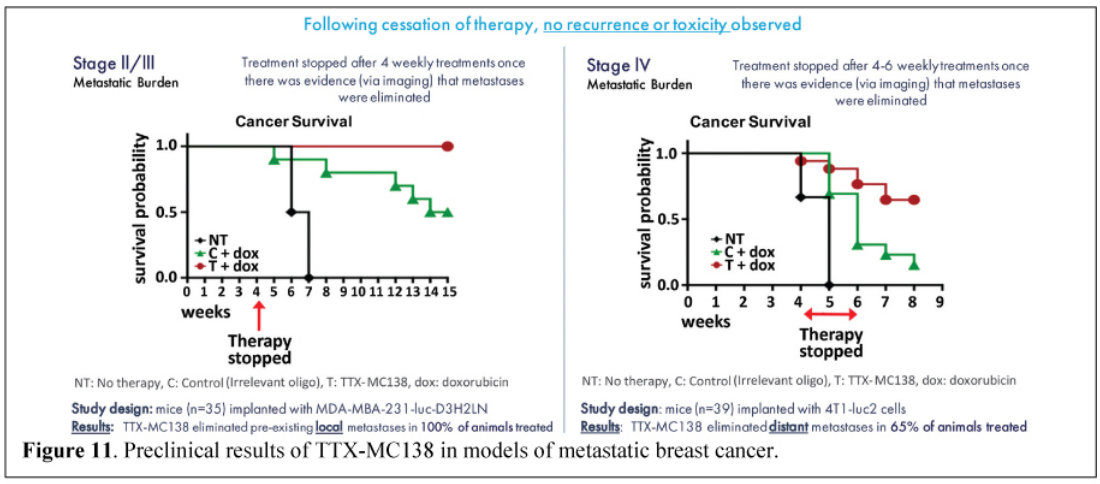


Figure 11. Preclinical results of TTX-MC138 in models of metastatic breast cancer.

With an outlook towards clinical translation of our approach we performed initial toxicity studies after 6 weekly injections of either TTX-MC138 or combination (TTX-MC138+Dox) (15 mg/kg iron, 10 mg/kg antagomir). We found no elevation in serum biochemistry markers following treatment suggesting the absence of acute toxicity associated with the product candidate. In addition, histopathology of major organs resulted in no observed gross tissue abnormalities **(Fig. 12)** suggesting that there was no sub-chronic toxicity as a result of treatment.

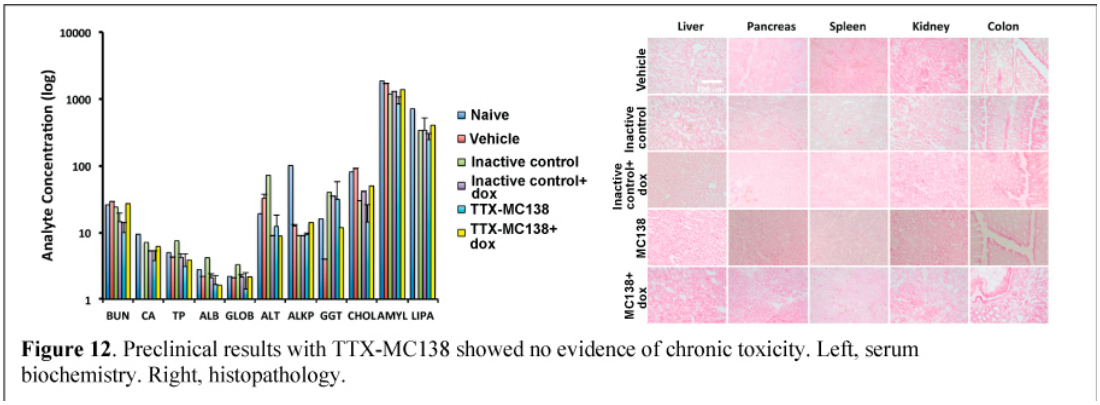


Figure 12. Preclinical results with TTX-MC138 showed no evidence of chronic toxicity. Left, serum biochemistry. Right, histopathology.

Clinical Development Plan

We expect to file our eIND for TTX-MC138 in the second half of 2021, and subsequently if permitted to proceed, to initiate a Phase 0 trial shortly thereafter. We received written guidance from FDA in March of 2020 of our planned Phase 0 trial, which we believe provides a roadmap enabling us, subject to submission and FDA clearance of an eIND, to proceed with a single investigator trial with the intention of enrolling up to 30 stage IV breast cancer patients in 3 separate cohorts. Each cohort is anticipated to consist of 10 patients so that we can evaluate 3 different dosing levels of 2.0mg/kg, 5.0mg/kg and 7.0mg/kg of TTX-MC138.

The primary purpose of conducting this Phase 0 trial is to clinically demonstrate delivery of our lead candidate therapeutic to metastatic tumor cells and to engage the intended target, miR-10b. We anticipate that the trial will also include assessments of the safety and tolerability of TTX-MC138 when administered as a single dose, which will further inform the design of our anticipated Phase 1 and Phase 2 clinical trials at a later date. We anticipate that pharmacodynamic endpoints to demonstrate proof of mechanism and proof of biology will include miR-10b levels in patient blood and tissue samples collected prior to dosing, as well as levels of key genetic and proteomic markers, including HOXD10, PTEN, and c-JUN expression and/or amplification.

Phase 0 — First in Human Clinical Study (Exploratory IND)

Single investigator study — Termeer Center for Targeted Therapies

We anticipate selecting the Henri Termeer Center for Targeted Therapies located at the MGH Cancer Center, or MGH, as our single investigator clinical study site for our exploratory IND, or eIND, study. Led by Dejan Juric, MD, a personalized cancer medicine and breast cancer specialist, the Termeer Center offers a comprehensive translational research program to speed the discovery and delivery of new targeted therapies to patients with early and advanced stage cancers.

The goals of our eIND study will be to:

- *Determine the uptake of TTX-MC138 by radiologically confirmed metastases using MR imaging of breast cancer patients.*
- *Perform MRI in breast cancer patients with radiologically confirmed metastases.*
- *Establish delivery of TTX-MC138 to tumor cells in biopsies derived from radiologically confirmed metastases.*
- *Establish target-engagement by analyzing miR-10b expression and the expression of validated miR-10b targets in paired patient serum and biopsy samples.*

We intend to pursue the goals outlined above in an open-label, controlled, single-center Phase 0 clinical study in stage IV metastatic breast cancer patients. The following describes the design of our anticipated Phase 0 clinical trial as currently envisioned. The design of our Phase 0 clinical study may change based upon further evaluation or discussions with the FDA.

We plan to enroll up to 30 patients in the study. The MGH Cancer Center treats 17,000 patients each year, including 9,000 new patients. Patients will receive a single infusion of TTX-MC138 at one of three doses: 2.0, 5.0, and 7.0 mg iron/kg. The delivery of the product candidate will be determined using noninvasive T2-weighted MRI performed the day before and day after infusion. A single metastatic lesion biopsy will be collected one day after the second imaging session. Blood will be collected before infusion and up to seven days after infusion with the therapeutic. Our preclinical MR and optical imaging studies suggest that TTX-MC138 localizes to metastatic lesions after intravenous injection. We have observed that TTX-MC138 is taken up avidly by tumor cells and tumor resident macrophages, as described in our publications. We thus hypothesize that at the proposed injected doses, TTX-MC138 will accumulate in the metastatic lesions of breast cancer patients at a concentration detectable by MRI.

Perform MRI in breast cancer patients with radiologically confirmed metastases.

Subject Recruitment. We plan to enroll patients diagnosed with metastatic breast cancer and who have radiologically confirmed metastatic disease as part of their standard of care. Patients will be recruited from the MGH Cancer Center.

MR Imaging of Metastatic Breast Cancer Subjects and image analysis.

Patients will receive TTX-MC138 intravenously delivered over at least 15 minutes. For determination of TTX-MC138 concentrations in plasma, samples of patient plasma will be placed next to an external phantom and scanned using the same MRI acquisition series as for study patients. Similarly, FMX

concentrations in lesions, tissues, or other regions of interest will be extrapolated from the pre- and post-injection relaxation rates using the nominal relationship observed for the external phantom.

Establish delivery of TTX-MC138 to tumor cells in biopsies derived from radiologically confirmed metastases.

Sample Collection. At the conclusion of imaging, we expect to collect CT-guided core biopsies from the radiologically confirmed metastatic lesions in all 30 patients. We anticipate that all biopsies, tumor specimens, and peripheral blood draws for plasma isolation will be collected and analyzed as part of ongoing studies at the MGH Cancer Center under IRB protocols led by Dr. Dejan Juric, who directs serial biopsy programs at the Center. The samples will be snap frozen immediately following collection.

Immunohistology. The tissue samples will be cut into 10 µm-thick sections. Consecutive tissue sections will be stained using Hematoxylin & Eosin (H&E) to determine tissue morphology, anti-dextran antibody to detect the nanoparticles in TTX-MC138, ELISA for detection of the antagomir, Ki-67 to determine the degree of tumor cell proliferation, and CD68 to identify tumor-resident monocytes. These parameters are of interest because, in addition to tumor cells, tumor resident macrophages are known to avidly take up similar nanoparticles and degrade them rapidly (within 30 min). Examining macrophage uptake at the tissue level would help determine the fraction of probe depleted due to monocyte uptake and degradation. Tumor cell proliferation is another factor that influences the uptake of similar probes. Tumors with a higher proliferation index demonstrate a more rapid uptake than tumors with a lower proliferation index. Therefore, examining Ki-67 expression would have explanatory power for differences in the amount of signal between patients.

Establish target-engagement by analyzing miR-10b expression and the expression of validated miR-10b targets in paired patient serum and biopsy samples.

qRT-PCR will be performed on patient-matched samples, using protocols derived from our prior studies. The miRNeasy Mini kit (Qiagen) will be used for miRNA isolation from biopsies. Prior to use in qRT-PCR and following extraction, the RNA concentration and quality will be determined using the NanoDrop method. This kit is designed to quantitate only mature miRNAs and not their precursors and requires as little as 1 nanogram of total RNA as starting material. This reverse transcription kit is part of the two-step quantitative RT-PCR assay where reverse transcription with miRNA-specific primer is followed by real time PCR using TaqMan probes. Primers and probes specific to miRNA10b and the control miRNA will be used and be the same as used in our prior publications. Analysis of miR-10b expression will be carried out using the standard delta-Ct method.

Detailed Objectives of the Phase 0 Trial:

Primary Objective: The primary objective of this study is to assess delivery of TTX-MC138 to established metastatic lesions, as determined by MRI. Tissue concentration of TTX-MC138 will be measured on days one (before infusion) and three (24 hours. after infusion). Success would be defined as a post-injection increase in R2* of at least 20%.

Secondary Objectives: A key secondary objective is change from baseline of miR-10b expression in liquid biopsies or in situ biopsies. MiR-10b expression will be measured using qRT-PCR or a droplet digital PCR test. Another secondary objective of this study is to assess delivery of TTX-MC138 to established metastatic lesions, as determined by T2-weighted MRI. Tissue concentration of TTX-MC138 will be measured using the R2 parameter (sec-1) on days one (before infusion) and three (24 hrs. after infusion). Success would be defined as a post-injection increase in R2.

Another key secondary objective for this study is to assess safety and preliminary activity (ORR, PFS, DCR) of sequential doxil. Additional secondary objectives include assessment of Health Related Quality of Life (HRQoL) and Overall Survival (OS) in the study patient population.

Validation of methodology to demonstrate target engagement by PCR and diagnostic CDx-miR-10b.

Droplet digital PCR will be validated against qRT-PCR (TaqMan protocol) to demonstrate sensitive, quantitative target detection in core biopsy tissue and serum. We intend to also correlate target antigen

abundance in serum and tissue in order to validate circulating miR-10b as a surrogate for miR-10b expression in tissue. This would permit rapid noninvasive patient stratification and screening during our clinical trials. In parallel, we will evaluate our proprietary microRNA profiling assay, CDx-miR10b against the quantitative or droplet digital PCR methods in order to test its potential value as a diagnostic tool. The three methods, qRT-PCR (gold standard), ddRT-PCR, and CDx will be compared using regression analysis. The rapidity, low cost, and capacity for single cell analysis associated with our proprietary assay would advance current technology for miRNA detection in patients, if it demonstrates sensitivity and specificity comparable to either quantitative or droplet digital PCR technology.

Anticipated Phase I Clinical Trial

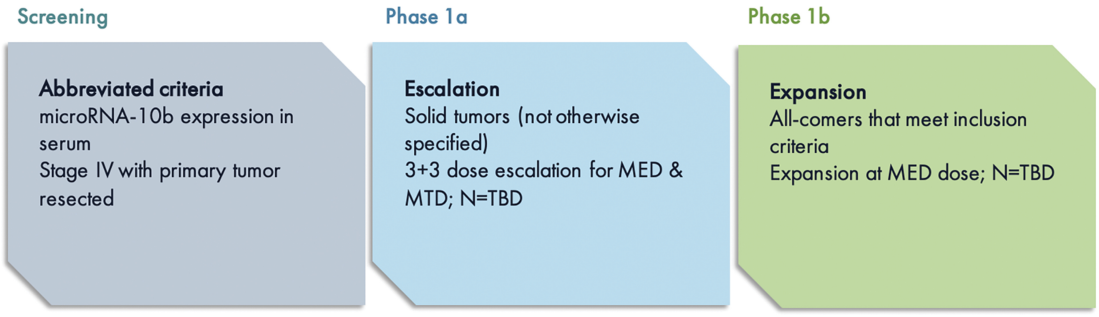
Concurrent with the Phase 0 study, we expect to complete additional IND enabling studies to support an IND for a Phase I clinical trial with TTX-MC138.

Brief description of the anticipated Phase I clinical trial

The anticipated Phase I clinical trial, which is subject to FDA review and clearance, to assess the safety of the drug in humans including observing potential side effects and to determine the optimal dose of TTX-MC138 in treating patients with metastatic cancer. It is anticipated that study subjects will already have been diagnosed with recurrent Stage IV cancer and have had prior surgical resection of the primary tumors.

Anticipated Study Design

- To assess the hypothesis that the drug candidate may demonstrate anti-tumor activity.
- To assess the preliminary efficacy of the drug using key efficacy indicators, such as objective response rate (ORR), clinical benefit rate defined as complete response (CR), partial response (PR), or stable disease (SD) at 24 weeks, and progression free survival (PFS).
- Potential Phase 1a endpoints: dose finding and safety assessment
  - Secondary objectives: Confirm delivery to tumor site using magnetic resonance imaging (MRI) and pharmacokinetics, measure microRNA-10b inhibition using PCR
- Potential Phase 1b endpoints: determine clinical response rate according to RECIST
  - Secondary objectives: ORR according to investigator's assessment, duration of response, safety and additional pharmacokinetic and pharmacodynamic evaluations
- Expect up to three investigative sites
- Follow up expected to be six months



In a "3 + 3" dose escalation design, three patients are initially enrolled into a given dosage cohort. If no dose limiting toxicity (DLT) is observed in any of these subjects, the trial proceeds to enroll additional subjects into the next higher dose cohort. If any one subject develops DLT at a specific dose, an additional three subjects are then enrolled into that same dose cohort. Development of DLTs in more than one of six subjects in a specific dosage cohort suggests that the maximum tolerable dose, or MTD, has been exceeded, and no further dose escalation is pursued. MED refers to minimum effective dose.

TTX-siPDL1

Pancreatic cancer is the fourth-leading cause of cancer-related death in the United States with an overall 5-year survival rate of only 8%. Surgical resection remains the treatment of choice for patients with resectable disease. However, less than 20% of the diagnosed patients qualify for curative resections, 30% of patients present with regional disease, and 50% present with distal metastases with survival rates of 11% and 2%, respectively. The reasons behind such poor prognosis have been postulated to involve the advanced stage at the time of diagnosis, and resistance to standard chemotherapies. However, these therapies are heavily dependent on the patient's overall health, and the overall survival benefit for the latest cytotoxic combination therapies is only approximately two to five months.

In light of the tremendous suffering caused by this disease and the modest progress achieved thus far with cytotoxic treatments, it is clear that we need to explore radical, transformative approaches for therapy that attack the disease from multiple angles. The last decade has seen tremendous progress in the field of cancer immunotherapy. In fact, immunotherapy represents the most promising new cancer treatment approach since the development of the first chemotherapies in the 1940s. Checkpoint inhibitors have worked against lethal cancers such as melanoma and some lung cancers — sometimes with dramatic success — and are being tested in dozens of other cancer types. However, pancreatic cancer has proven difficult to treat with conventional drugs and has been resistant to initial immunotherapy approaches. Partly, the reason for this is the tumor microenvironment that characterizes pancreatic adenocarcinoma, which is both immunosuppressive in nature and a physical barrier for antibody and T lymphocyte infiltration. Consequently, it is important to design alternative approaches that combine innovative checkpoint inhibitors that can be delivered efficiently to tumor cells and tumor resident macrophages, and strategies that enhance the permeation of the tumor by T lymphocytes.

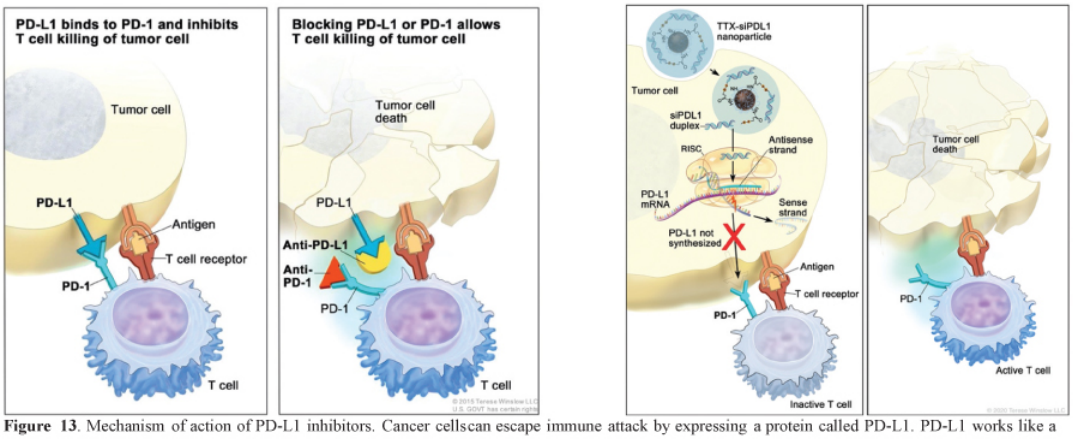


Figure 13. Mechanism of action of PD-L1 inhibitors. Cancer cellscan escape immune attack by expressing a protein called PD-L1. PD-L1 works like a "stop sign" to inactivate T cells. On the far left is a graphic showing how the immune system prevents T-cells from recognizing and killing tumor cells by producing PD-L1. Second from the left is a graphic that shows how current checkpoint inhibitors work to block PD-L1 from binding to PD-1 on T cells. The graphic second from the right shows how our TTX-siPDL1 works – Because TTX-siPDL1 incorporates a siRNA against PD-L1 as its functional component, it inactivates PD-L1 at the post-transcriptional level, i.e. it triggers the degradation and/or translational repression of the PD-L1 mRNA, preventing the cell from expressing the PD-L1 antigen.

Our immune system has T cells that help fight off diseases. T cells are like soldiers that help the body fight infections and other diseases, including cancer. However, cancer cells can escape this attack by expressing a protein called PD-L1. PD-L1 works like a "stop sign" to inactivate T cells. On the far left of (**Fig. 13)** showing how the immune system prevents T-cells from recognizing and killing tumor cells by producing PD-L1 — to the right of the first graphic in **(Fig. 13)** is a graphic that shows how current checkpoint inhibitors work to block PD-L1 expression. On the far right in (**Fig. 13)** is how our therapeutic works — with our approach we prevent the synthesis of PD-L1 all together rather than blocking its function. Because TTX-siPDL1 incorporates a siRNA against PD-L1 as its functional component, it inactivates PD-L1 at the post-transcriptional level, that is, it triggers the degradation and/or translational repression of the PD-L1 mRNA, preventing the cell from expressing the PD-L1 antigen. Since we are utilizing an RNAi approach our therapeutic has the potential to be more efficient, which has the potential to result in increased efficiency

for T cells to recognize and kill tumor cells. At this point in time we believe we are the only company we know of that is currently targeting PD-L1 using RNAi. As our initial therapeutic we are developing an alternative strategy that relies on combining gemcitabine (Gem), the standard of care treatment for pancreatic cancer and a novel PD-L1 inhibitor (termed TTX-siPDL1). TTX-siPDL1 incorporates our proprietary nanoparticle delivery system that is specifically designed to efficiently deliver our therapeutic candidate tumor cells in vivo, where it inhibits PD-L1 expression on tumor cells via the RNA interference mechanism. We believe that this approach is advantageous over small molecules or antibodies because the silencing RNA (siRNA) component inhibits the target antigen at the post-transcriptional level and not at the protein level. Also, the RNA mechanism has been shown to be catalytic and has been observed in in vitro studies to necessitate the delivery of only picomolar amounts of siRNA to the tumor cell for the abolition of the target antigen. By contrast, small molecules or antibodies require the achievement of at least a 1:1 molar ratio of antigen to therapeutic molecule and could be ineffective in the presence of a compensatory increase in the expression of the target antigen by the tumor cell.

In our initial preclinical study, we administered combination therapy consisting of gemcitabine and TTX-siPDL1 in a syngeneic murine pancreatic cancer model over a seven-week treatment period. Specifically, C57Bl/six mice were implanted into the right flank with the murine pancreatic cancer cell line, Pan02 (0.25 x 10^6 cells). 24 mice in total were used in the study. Treatment was initiated once tumor volumes reached 50 mm^3, as estimated using calipers. Thereafter, tumor volume was measured by MRI once mice were enrolled in the study and before and after each weekly treatment. Treatment groups included: six mice administered low-dose TTX-siPDL1 (10 mg kg^{-1} as iron; 520 nmoles/kg siRNA) in solution with gemcitabine (333.3 mg/kg)(n = six), six mice administered high-dose TTX-siPDL1 (10 mg kg^{-1} as iron; 937 nmoles/kg siRNA) in solution with gemcitabine (333.3 mg/kg)(n = six) and two control groups of 6 mice each treated with TTX-siSCR + gemcitabine at the same doses (n = six). This approach was observed to significantly lower morbidity and toxicity, with our study investigators observing tumor regression and a dramatic improvement in survival. In particular, following dose optimization, a 90% reduction in tumor volume was observed by the study investigators after two weeks of treatment. Within the study, 100% of the control animals treated with a low or high dose of the inactive drug, TTX-siSCR, had succumbed to their tumors by week six after the beginning of treatment, none of the experimental animals treated with a high dose of the active drug, TTX-siPDL1, had succumbed at week six of treatment, and 67% of these animals survived for 12 weeks.

We believe an additional key advantage of our approach derives from the fact that it presents the unique opportunity to develop a clinically relevant, image-guided treatment protocol that provides knowledge about therapeutic outcome, expressed both as change in tumor volume and tumor growth rate. The latter capability is made possible by the fact that TTX-siPDL1 incorporates a 20-nm superparamagnetic nanoparticle carrier, designed to ensure highly efficient delivery to tumor cells and whose disposition in tissue over time can be monitored by quantitative noninvasive MRI.

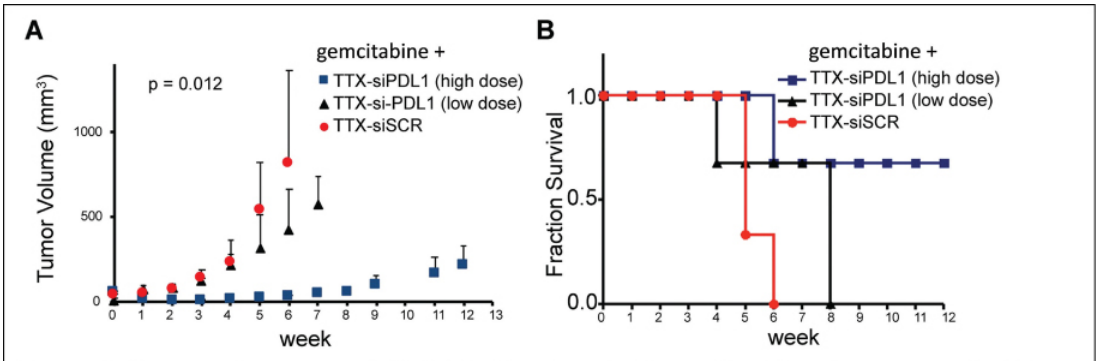


Figure 14. Outcome of treatment with TTX-siPDL1 and gemcitabine, or Gem. The mice were treated with Gem (333.3 mg/kg) in solution with a low dose of TTX-siPDL1 (n=6) or siSCR (n=6) (10mg/kg Fe; 520nmoles/kg siRNA in both groups) or a high dose of TTX-siPDL1 (n=6) or siSCR (n=6) (10 mg/kg Fe, 937nmoles/kg siRNA in both groups).

Results

Our therapeutic studies illustrated the potential of the combination treatment with gemcitabine and TTX-siPDL1 in pancreatic cancer. The mice co-treated with TTX-siPDL1 and gemcitabine showed in the study significant inhibition of tumor growth, relative to the inactive TTX-siSCR controls ($P < 0.05$). This difference observed in the study was evident at week 2 from the beginning of treatment, when tumor volume had decreased from 52.8±6.7 mm^3 in week 0 to 5.3±0.8 mm^3 in week two ($p = 0.012$). The difference persisted for the duration of the study ($p < 0.05$). Tumor volumes in the low-dose group were not different from the TTX-siSCR control until week six **(Fig. 14a)**.

The presumed advantage of the combination treatment was demonstrated in the study when assessing animal survival **(Fig 14b)**. In the study, 67% of the mice treated with gemcitabine and TTX-siPDL1 (high dose) survived until week 12. 67% of the mice treated with gemcitabine and TTX-siPDL1 (low dose) survived until week eight. All of the control mice treated with TTX-siSCR and gemcitabine succumbed by week six. Within the study all of the mice in the group treated with gemcitabine and TTX-siSCR developed large necrotic tumors, presumably due to the high rate of tumor growth. Tumor necrosis and ulceration was not seen in the experimental animals.

TTX-siLIN28b

We recently secured an exclusive option from MGH to license a therapeutic target, LIN28b for treatment of pancreatic cancer and several other cancer types including hepatocellular, breast, colon, and gastric cancers among others. LIN28B is an evolutionarily conserved RNA-binding protein that regulates mRNA translation and miRNA *let-7* maturation in embryonic stem cells and developing tissues. Increasing evidence demonstrates that LIN28B is activated in cancer and serves as a critical oncogene.

We expect to commence animal studies on TTX-siLIN28b in the first half of 2021 and should we achieve positive results, we anticipate adding this product candidate to our exclusive license agreement with MGH.

Alterations in epigenetic control are an important hallmark of cancer. Such alterations are thought to endow cells with the plasticity to override normal differentiation and growth control programs. Due to their poor vascularity and dense stroma, pancreatic ductal adenocarcinoma, or PDAC, cells must acquire multiple metabolic adaptations to grow in a hypoperfused microenvironment. SIRT6 is a nicotinamide adenine dinucleotide (NAD)+-dependent histone deacetylase which removes acetyl groups from histone 3 lysine 9 (H3K9) and histone 3 lysine 56 (H3K56) motifs and has pleiotropic functions including glucose homeostasis, maintenance of genome stability, and suppression of cellular transformation. These functions are exemplified in both Sirt6-deficient mice, which exhibit complete loss of subcutaneous fat and lethal hypoglycemia, as well as SIRT6-deficient cells, which show increased glucose uptake, enhanced glycolysis, anchorage independent growth and tumor formation in an in vivo model of colon cancer. SIRT6 is downregulated in PDAC relative to normal tissue and loss of SIRT6 leads to dysregulation of the PDAC epigenome to drive its growth. By developing novel genetically modified mouse models, we demonstrated that ablation of SIRT6 potently cooperates with activated Kras (which is mutated in >90% of human PDAC) to accelerate PDAC onset and promote metastasis.

Mechanistically, loss of SIRT6 results in hyperacetylation of H3K9 and H3K56 at the promoter of the LIN28B gene, a gene encoding an RNA binding protein (RBP) responsible for the global post-transcriptional downregulation of the let-7 microRNA family observed in many cancers. This hyperacetylation creates a more permissive chromatin state allowing for the Myc transcription factor to drive its expression. This aberrant LIN28b expression is required for the growth of SIRT6-deficient tumor cells, thus identifying LIN28b as a novel oncogenic driver in this distinct subset, representing 30-40% of human PDACs.

The Lin28/let-7 axis is now recognized as central to maintaining proper cell fate and coordinating proliferation, growth, and energy utilization at the cellular level as well as growth, developmental timing, tissue homeostasis and metabolism in whole organisms.

While LIN28b is silenced during embryonic development, it may be aberrantly reactivated in a variety of human cancers by mechanisms that remain poorly understood. Eight loss-of-function tumor-associated

SIRT6 point mutations were recently identified, several of which specifically abrogated SIRT6 deacetylase activity, and many human cancer cell lines demonstrate copy number loss of the SIRT6 locus.

Given the critical roles for LIN28b in stem cell pluripotency, we believe that overexpression of oncofetal proteins reactivates programs of embryonic growth to promote a more “undifferentiated” and thereby aggressive form of pancreatic cancer.

Consistently, upregulated genes downstream of LIN28b, include the oncofetal RNA-binding proteins Igf2bp 1 & 3 that have been associated with poorly differentiated PDAC. Expression of Igf2bps increases progressively with PDAC tumor stage and high levels of Igf2bps in PDAC correlate with increased metastasis and extremely poor survival outcome. In this context, signs of accelerated initiation (increased number of PanIN) as well as increased metastatic potential were observed in mice expressing high levels of LIN28b and Igf2bps. Igf2bps also has functions in binding and stabilizing IGF2 and Myc transcripts, thus increasing their translation. Reinforcing Myc signaling and increasing IGF2 signaling could both serve to encourage proliferation and survival of PDAC cells. Strikingly, knockdown of Igf2bp3 in multiple independent SIRT6^{low} and SIRT6 KO cell lines was sufficient to significantly inhibit their growth, while having no effect on the growth of SIRT6^{high} and SIRT6 WT lines. Similarly, elevated protein expression of HMGA2 in PDAC has been associated with a more advanced tumor grade, epithelial to mesenchymal transition, and lymph node metastases, and this protein also promoted the growth of SIRT6^{low} but not SIRT6^{high} PDAC cells. Thus, LIN28b appears to drive the growth of SIRT6-deficient PDAC through the inhibition of multiple let-7 isoforms, resulting in a coordinated upregulation of a large number of LIN28b/let-7 target genes, including oncofetal proteins like IGF2BPs and HMGA2.

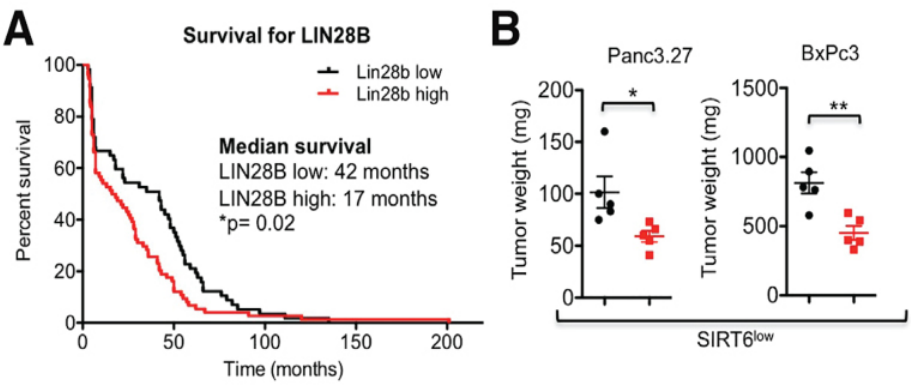


Figure 15. Increased expression of LIN28b Correlates with poor survival in PDAC and is required for the growth and survival of SIRT^{low} PDAC **A.** Kaplan-Meier survival analysis of the PDAC patient samples based on LIN28b IHC score (n=120). **B.** Tumor weights of SIRT6^{low} PDAC lines grown as subcutaneous xenografts (n = 5). *p % 0.05, **p % 0.01, ***p % 0.001.

Results

Researchers at the MGH Cancer Center investigated the relevance of the LIN28b/let-7 pathway to human PDAC. Strikingly, elevated expression of LIN28b correlated with poor prognosis in a cohort of 120 patient samples **(Fig. 15a)**.

They next examined the functional role of LIN28b in SIRT6 KO murine PDAC cells and SIRT6low human PDAC cells. Knocking down LIN28b with both small hairpin RNA (shRNA) and small interfering RNA (siRNA) resulted in potent suppression of cell proliferation and tumor sphere formation in two independent murine SIRT6 KO cell lines. More importantly, both shRNA and siRNA against LIN28b also markedly reduced the proliferation, tumor sphere-forming ability, and in vivo xenograft growth of several human SIRT6low but not SIRT^{high} PDAC lines **(Fig.15b)**. As with restoration of SIRT6 expression, knockdown of LIN28b led to both G1 cell-cycle arrest and induction of apoptosis in two independent SIRT6^{low} lines. Thus, LIN28b is both upregulated and critically required for the growth and survival of this subset of PDAC cancers, as defined by loss of SIRT6 expression.

We have begun the synthesis of a small interfering RNA drug (TTX-siLIN28b) targeting LIN28b and intend to conduct preclinical studies in the first half of 2021 in a pancreatic cancer model in rodents to assess the potential effect of the drug.

TTX-RIGA

Dysregulation of miRNA and messenger RNA, or mRNA, often results in pathological states such as cancer. miRNAs and mRNAs can function as tumor suppressors or oncogenes and play an important role in tumorigenesis, tumor growth, angiogenesis, and metastasis. Hence, inhibition of overexpressed oncogenic miRNAs or mRNAs or restitution of downregulated tumor-suppressor miRNAs or mRNAs provides a highly promising approach to treat cancer. While normal miRNA and mRNA inhibitory functions help regulate gene expression in the cell, dysregulated oncogenic miRNAs and mRNA can lead to suppression of critical pathways that control apoptosis, cell cycle progression, growth, and proliferation. This suppression allows for the upregulation 5 of pro-oncogenic factors that drive cell survival, growth and proliferation.

Retinoic acid-inducible gene I (RIG-I) is a cytosolic nucleic acid sensing Pattern Recognition Receptor (PRR) of the innate immune system. It is essential for recognizing RNA viruses with a 5′ triphosphate signature. RIG-I is ubiquitously expressed in all cell types including tumor cells. RIG-I engagement leads to preferential tumor cell death, and to type I interferon-mediated activation of the innate and adaptive immune systems. These factors make it an attractive therapeutic approach in oncology.

Tumor cell death induced by RIG-I activation has been reported in multiple types of cancer, including pancreatic, prostate, head and neck, gastric, and breast cancer as well as glioblastoma. However, RIG-I-based therapeutic strategies face multiple challenges, such as designing highly specific and stable agonists, and developing efficient agonist delivery modes while avoiding uncontrolled release of pro-inflammatory cytokines.

Our therapeutic candidate, TTX-RIGA, which is in early stages of development, utilizes our delivery system and is intended to activate the RIG-I signaling pathway to elicit an immune response to eliminate and/or reduce the risk of developing disorders associated with abnormal apoptotic or differentiative processes, by triggering an immune response that targets developing cancer cells.

DIAGNOSTIC PROGRAM (CDx)

CDx Mechanism of Action

The scientific founders of TransCode Therapeutics have developed a specific biomarker test designed to measure microRNA expression in single intact live cells, tissues and serum. In this manner, the TransCode's microRNA nanosensor (CDx) has been developed to address a major unmet need in the areas of cancer biology, diagnosis and therapy**.**

Importantly, the nanosensor permits measurement in ***single cells***, e.g. from a biopsy sample or circulating tumor cells, allowing one to capture the heterogeneity of microRNA expression in a patient and to observe individual populations of rare cells, such as cancer stem cells.

- TransCode's predictive biomarker nanosensor is presumed to have the unique capability of microRNA profiling in single intact live cells and tissues.
- The fluorescent read-out generated by the nanosensor is highly specific and has nanomolar sensitivity.
- The nanosensor assay is inexpensive and rapid; could be used to determine microRNA expression in biopsies, serum, and circulating tumor cells.

Biomarker Test Method

The staple of reducing mortality due to cancer has been early detection. One of the most promising features of microRNA-10b is the potential to use its expression as a diagnostic biomarker for the presence of metastases and a predictive biomarker of overall/disease free survival in cancer. Therefore, the CDmiR10b assay has been designed to:

- potentially allow the identification of patients that are at increased risk of progression, an ability not currently available;
- help to stratify tumors based on aggressiveness, which will naturally better inform the need for more aggressive treatment and/or the need for increased surveillance of the patient;
- serve as a diagnostic biomarker for the presence of metastases; and
- better inform therapeutic decisions as evidenced in recent studies showing that microRNA-10b expression is negatively correlated to sensitivity to 5-fluorouracil (5-FU)-based therapies and can induce greater tamoxifen resistance.

We have completed preclinical studies to validate our lead diagnostic and a small pilot using human serum from healthy subjects and patients with metastatic breast cancer, CDmiR10b, for the detection of miR-10b expression. It is being investigated for use in monitoring treatment response with TTX-MC138 in clinical trials. This capability would be instrumental in determining which patients may respond to therapy with TTX in clinical trials and in measuring therapeutic response during treatment in our anticipated clinical trial.

EXCLUSIVE PATENT LICENSE AGREEMENT

In November 2018, we entered into a license agreement with MGH, or the MGH License, pursuant to which MGH granted us an exclusive, royalty-bearing, sub-licensable patent license to support development of our product candidates, which we collectively refer to as the Licensed Patents. The territory covered by the MGH License is worldwide, which we refer to as the Territory.

As initial consideration for the MGH License, we made an upfront payment of $50 thousand and agreed to reimburse MGH for its costs associated with the preparation, filing, prosecution and maintenance of all patent rights. At the time the MGH License was signed, MGH estimated those costs to be approximately $145 thousand, We are also required to pay tiered royalties of a low to mid-single digit percentage on annual net sales of products related to the Licensed Patents, which royalty payments must have a minimum amount of $25,000 prior to the first commercial sale of a product or process covered by the Licensed Patents, and a minimum amount of $50 thousand after the first commercial sale of a product or process covered by the Licensed Patent. At December 31, 2020 and 2019, the Company had accrued $42.3 thousand and $25 thousand, respectively, in license payments under the terms of the license agreement, of which the amount due at December 31, 2019, has been paid.

We are also obligated to make a future payments upon the satisfaction of specific clinical, regulatory and commercial milestones of up to an additional $1.55 million, and to pay MGH royalties in an amount equal to a low single digit percentage of our net sales of any therapeutic products related to the Licensed Patents and an amount equal to a mid single digit percentage of our net sales of clinical diagnostic products and processes related to the Licensed Patents. As of December 31, 2020, no such milestone events had been achieved.

Unless earlier terminated, the MGH License will expire upon the latest of (i) the date on which all issued patents and filed patent applications subject to the License have expired or been abandoned; (ii) expiration of the last to expire regulatory exclusivity covering a covered product or process; or (iii) 10 years after the first commercial sale of a product or process covered by the Licensed Patents.

In the event of a default in our performance of the agreement, MGH may terminate the MGH License with respect to the country or countries in which a default occurs if we fail to cure that default within a certain specified number of days after written notice is provided. MGH may terminate the MGH License immediately upon written notice to us in the event of our bankruptcy, insolvency, dissolution or winding up, or if we fail to maintain the insurance required pursuant to the MGH License. MGH may also terminate the agreement upon written notice if we fail to make payments due under the license agreement within a certain specified number of days after notice is provided. We may terminate the MGH License at any time by providing ninety (90) days written notice to MGH. Any sublicenses granted by us under the MGH License shall be automatically terminated upon the termination of the MGH License, but MGH is required to make a good faith effort to enter into a direct license agreement with any sublicensee who so requests.

Amendment to License Agreement

In November 2020, the company and MGH amended the MGH License. Under the amendment, the intellectual property licensed in 2018 was categorized as “Patent Family 1” and a provisional patent filing related to MGH’s nanoparticle technology was added to Patent Family 1. A second patent family, “Patent Family 2,” was created which includes MGH intellectual property targeting PD-L1.

The minimum annual license fee prior to the first commercial sale of a product or process covered by the MGH License was increased from $25 thousand per year to $30 thousand per year for Patent Family 1 and a minimum annual license fee of $10 thousand per year was added related to Patent Family 2. All other terms of the MGH License including milestone payments, royalties and payment terms related to sublicense income received by the company remain the same as in the original MGH License.

Upon expiration of the MGH License, the licenses granted to us pursuant thereto will be considered fully paid-up and royalty-free.

COMPETITION

The pharmaceutical industry is intensely competitive and constantly evolving. While we believe that our experience, scientific knowledge and intellectual property provide us with certain competitive advantages, we face potential competition from many different sources, including major pharmaceutical, specialty pharmaceutical and biotechnology companies. Most of our potential competitors are larger companies than we are, and they have substantially greater capital and human resources than we do, along with established market positions and expertise and capabilities in sales, marketing, distribution, clinical trials and regulatory matters. Not only must we compete with other companies that are focused on RNA therapeutics, but also any product candidates that we successfully develop and commercialize must compete with existing therapies and new therapies that may become available in the future. There are several companies operating in the “targeted therapy” space, many of which have been around for longer with the advantages described above.

Not only must we compete with other companies that are focused on therapeutics that treat cancer, but also any product candidates that we successfully develop and commercialize will compete with existing and new therapies that may become available in the future. Our competitors may develop more successful products similar to ours sooner than we can commercialize ours, which may negatively impact our results. Companies that we are aware of with targeted therapeutics in the treatment of various cancers include Nurix Therapeutics, Black Diamond Therapeutics and Precision Biosciences, which have product candidates in various stages of preclinical and clinical developments. Other companies focusing on RNA therapeutics include Arrowhead Pharmaceuticals, a clinical stage company, with a pipeline of investigational RNAi therapeutics focus on genetic medicines, cardio-metabolic diseases, hepatic infectious diseases, oncology and central nervous system/ocular diseases. However, we know of no other companies currently in clinical development with miRNA therapeutics targeting metastatic disease.

Targeted therapy

Targeted cancer therapies are drugs or other substances that block the growth and spread of cancer by interfering with specific molecules (“molecular targets”) that are involved in the growth, progression, and spread of cancer. Targeted cancer therapies are sometimes called “molecularly targeted drugs,” “molecularly targeted therapies,” “precision medicines,” or similar names.

Targeted therapies differ from standard chemotherapy in several ways:

- Targeted therapies act on specific molecular targets that are associated with cancer, whereas most standard chemotherapies act on all rapidly dividing normal and cancerous cells.
- Targeted therapies are deliberately chosen or designed to interact with their target, whereas many standard chemotherapies were identified because they kill cells.
- Targeted therapies are often cytostatic (that is, they block tumor cell proliferation), whereas standard chemotherapy agents are cytotoxic (that is, they kill tumor cells).

Targeted therapies are currently the focus of intense anti-cancer drug development. Spending on targeted therapies continues to grow rapidly in all regions of the world and now represents 48% of total oncology spending, up 36% from 2010. As mentioned above, we are focused on targeted therapies for cancer treatment with its novel therapeutics that have been shown in animals to successfully target the master regulator of metastatic progression, microRNA-10b.

Immunotherapy

Immunotherapy has become an established pillar of cancer treatment improving the prognosis of many patients with a broad variety of hematological and solid malignancies. The two main drivers behind this success are checkpoint inhibitors, or CPIs, and chimeric antigen receptor, or CAR, T cells. For checkpoint blockade, current studies focus on combinational approaches, perioperative use, new tumor entities, response prediction, toxicity management and use in special patient populations. Regarding cellular immunotherapy, recent studies confirmed safety and efficacy of CAR T cells in larger cohorts of patients with acute lymphoblastic leukemia or diffuse large B cell lymphoma. Different strategies to translate the striking success of CAR T cells in B cell malignancies to other hematological and solid cancer types are currently under clinical investigation. Regarding the regional distribution of registered clinical immunotherapy trials, a shift from PD-1 / PD-L1 trials (mainly performed in the U.S. and Europe) to CAR T cell trials (majority of trials performed in the United States and China) can be noted.

The importance of immunotherapy is underscored by the fact that the Nobel prize for physiology and medicine in 2018 was awarded to James P. Allison and Tasuku Honjo for the discovery of cytotoxic T-lymphocyte-associated protein (CTLA-4) and programmed cell death protein 1 / programmed cell death protein ligand 1 (PD-1 / PD-L1). Malignant tumors take advantage of the inhibitory PD-1 / PD-L1 or CTLA-4 pathways to evade the immune system. Disruption of this axis by blocking monoclonal antibodies can induce durable remissions in different cancer types and has led to numerous FDA and EMA approvals, among others, for the treatment of melanoma, lung cancer, urothelial cancer, head and neck squamous cell carcinoma (HNSCC), renal cell carcinoma (RCC) and Hodgkin’s disease.

Tyrosine kinase inhibitors

Tyrosine kinase inhibitors are targeted therapies for cancer. Although some tyrosine kinase inhibitors are used to treat other types of cancer, lapatinib (Tykerb) is the only one that is FDA approved for the treatment of breast cancer. Lapatinib is only used to treat HER2-positive metastatic breast cancer.

PARP inhibitors

Poly (ADP-ribose) polymerase, or PARP, inhibitors are a class of drugs under study for many types of cancer, including breast cancer. PARP is an enzyme involved in DNA repair. At this time, PARP inhibitors are only offered in clinical trials for people with metastatic breast cancer. Early findings suggest that PARP inhibitors hold the most promise for people with metastatic breast cancer who have a BRCA1 or BRCA2 gene mutation.

Cyclin dependent kinase 4 and 6 (CDK4/6) inhibitors

CDK4 and CDK6 are enzymes important in cell division. CDK4/6 inhibitors are a new class of drugs designed to interrupt the growth of cancer cells. The CDK4/6 inhibitor palbociclib (Ibrance — Pfizer) in combination with hormone therapy is FDA-approved for the treatment of hormone receptor-positive, HER2-negative metastatic breast cancers.

PI3 kinase inhibitors

PI3 kinase is an enzyme important in cell growth. The PIK3CA gene helps control PI3 kinase enzyme activity. Some breast cancers have a mutation in the PIK3CA gene, and this mutation can affect PI3 kinase and cause the tumor to grow. PI3 kinase inhibitors are a new class of drugs designed to interrupt PI3 kinase signals and stop the growth of cancer cells. PI3 kinase inhibitors are under study for the treatment of metastatic breast cancer.

Competition in the diagnostic space

The currently established methods for microRNA detection rely on PCR and northern blotting, which analyze tissue in bulk, or high-affinity hybridization probes, such as molecular beacons or SmartFlare probes, which demand cumbersome protocols and are cannot be applied to live cells. By contrast our approach:

a. permits measurement in *single cells*, e.g. from a biopsy sample or circulating tumor cells, allowing one to accurately capture the heterogeneity of microRNA expression in a patient and to observe individual populations of rare cells, such as cancer stem cells;

b. allows measurement in *serum samples*, permitting diagnostics based on circulating cell-free microRNA expression;

c. is applicable in *intact live cells* and, therefore, permits longitudinal studies, in which the "evolution" of the tumor cell phenotype is monitored in an intact cellular environment;

d. is very *sensitive*, (nM sensitivity), since each cell can take up over $1x10^6$ nanoparticles with multiple attached sensor oligonucleotides. Each miRNA mediates catalytic cleavage of its substrate, leading to powerful signal amplification resulting from the cleavage of millions of synthetic substrates on the nanoparticles by the cognate miRNA-RISC complex; and

e. is *inexpensive and rapid*, necessitating a simple incubation of the test sample with the sensor and examination using any instrument that produces a fluorescence readout.

INTELLECTUAL PROPERTY

Our intellectual property, or IP, portfolio is directed to our drug candidates and their targeted use and development in specific patient populations and in specific therapeutic indications. Our portfolio currently consists of several patent families comprising issued patents, pending patent applications and new provisional patent applications. Patents for our lead therapeutic candidate, TTX-MC138, and the biomarker test patent (also issued in the UK) have issued, which we license under the MGH License as amended. The MGH patents for TTX-MC138 were filed only in the US, which we believe represents a significant portion of the total market. We intend to pursue new patents with broader coverage outside the U.S.

Therapeutic Patent Rights Assigned to TransCode

Compositions and Methods for Eliciting an Immune Response to Specific RNAs

- Provisional (63/132,315) filed 12/30/20. Anticipate filing PCT.

Therapeutic Patent Rights (Covered under MGH License)

Therapeutic Nanoparticles and Methods of Use Thereof

- US 9,763,891 — Granted (Issued September 2017). Expires 2032.
- US 9,629,812 — Granted (Issued April 2017). Expires 2032.
- US 10,463,627 — Granted (Issued November 2019). Expires 2032.

Compositions and Methods for Tunable Magnetic Nanoparticles

- PCT/US 2020/63635 — Application filed December 7, 2020. PCT filed. Estimated expiration 2040.

Compositions and Methods for Immune Checkpoint Inhibition

- PCT/US 2019/050003 — Application filed September 6, 2019. Corresponding national stage filings pending in Australia, Canada, China, Europe, Japan, Korea, and the United States. Estimated expiration 2039.

Agents and Methods for Treating Pancreatic Ductal Carcinoma

- US 10,588,920 — Granted (Issued March 2020). Expires 2035.

Radiolabeled Therapeutic Nanoparticles and Methods of Using the Same

- Provisional (63/109,298) filed November 3, 2020. Anticipate filing PCT.

Biomarker Patent Requests (Diagnostic test) (Covered under MGH License)

miRNA Profiling Compositions and Methods of Use

- US 10,086,093 — Granted (Issued October 2018). Expires 2034.
- EP 2961386 — Granted (Issued July 2019). Expires 2034

MANUFACTURING

Manufacturing: Chemistry, Manufacturing and Controls (CMC)

CMC is an extensive aspect of the IND enabling process and is critical to setting appropriate timelines and connecting “deliverables” with human trial start dates. The term “deliverables” refers to more than just the drug product itself. It also includes analytical standards and required documentation on drug purity, dose strength, storage, handling and stability. The materials for the analytical development process are produced as part of the CMC process and must be delivered before that work can begin, as are activities that require analytical support which must also be timed accordingly.

The design and manufacture of nanodrugs such as TTX-MC138 for miRNA targeting in tumor cells has gone through extensive research and development optimization at MGH prior to company formation. The basic design of these nanodrugs includes dextran coated iron oxide nanoparticles conjugated to a locked nucleic acid (LNA)-modified antisense oligonucleotide that stably binds and inhibits the complementary mature miRNA. The oligonucleotide drug substance incorporated in the final drug product is expected to be manufactured by BioSpring GbmH, Frankfurt am Main, Germany. We believe BioSpring should be able to meet our needs for oligonucleotide manufacturing. TransCode has been utilizing the manufacturing services of BioSpring since 2017.

We expect to employ Lubrizol Life Science Health (Bethlehem, PA) as our manufacturing partner for the final drug product which will feature the oligonucleotides attached to aminated dextran-coated iron oxide particles. The dextran coated iron oxide particles are analogous in structure and size to those used in the FDA-approved intravenously-administered iron replacement therapy known as Ferraheme®. Lubrizol has indicated it has the capacity to handle the clinical manufacture of sterile and complex drug products which meet cGMP requirements.

COMMERCIALIZATION

We retain worldwide commercialization rights for our key therapeutic and diagnostic candidates. We currently have no sales, marketing or product distribution capabilities. However, once we have product candidates closer to FDA approval, we may explore partnerships with larger pharmaceutical organizations or out-license our drug candidates.

We frequently evaluate out-license opportunities for our product candidates and seek to identify drug candidates for novel indications and/or patient subpopulations with an oncology focus that we might in-license. Our commercial plans and strategy for each particular program may change as programs advance, markets change, and we receive more clinical data, and will depend on availability of capital.

GOVERNMENT REGULATION

The FDA and other regulatory authorities at federal, state and local levels, as well as in foreign countries, extensively regulate, among other things, the research, development, testing, manufacture, quality control, import, export, safety, effectiveness, labeling, packaging, storage, distribution, record keeping, approval, advertising, promotion, marketing, post-approval monitoring and post-approval reporting of drugs. We, along with our vendors, contract research organizations and contract manufacturers, will be required to navigate the various preclinical, clinical, manufacturing and commercial approval requirements of the governing regulatory agencies of the countries in which we wish to conduct studies or seek approval of our product candidates. The process of obtaining regulatory approvals of drugs and ensuring subsequent compliance with appropriate federal, state, local and foreign statutes and regulations requires the expenditure of substantial time and financial resources.

In the United States, where we are initially focusing our drug development, the FDA regulates drug products under the federal Food, Drug and Cosmetic Act, or FD&C Act, its implementing regulations and other laws. Our product candidates are early-stage and none of our product candidates has been approved by the FDA for marketing in the United States. If we fail to comply with applicable FDA or other requirements at any time with respect to product development, clinical testing, approval or any other legal requirements relating to product manufacture, processing, handling, storage, quality control, safety, marketing, advertising,

promotion, packaging, labeling, export, import, distribution, or sale, we may become subject to administrative or judicial sanctions or other legal consequences.

These sanctions or consequences could include, among other things, the FDA's refusal to approve pending applications, issuance of clinical holds for ongoing studies, suspension or revocation of approved applications, warning or untitled letters, product withdrawals or recalls, product seizures, relabeling or repackaging, total or partial suspensions of manufacturing or distribution, injunctions, fines, civil penalties or criminal prosecution.

The process required by the FDA before our product candidates are approved as drugs for therapeutic indications and may be marketed in the United States generally involves the following:

- completion of extensive preclinical studies in accordance with applicable regulations, including studies conducted in accordance with GLP requirements;
- submission to the FDA of an IND application, which must become effective before clinical trials may begin;
- approval by an Institutional Review Board, or IRB, or independent ethics committee at each clinical trial site before each trial may be initiated;
- performance of adequate and well-controlled clinical trials in accordance with applicable IND regulations, good clinical practice, or GCP, requirements and other clinical trial-related regulations to establish the safety and efficacy of the investigational product for each proposed indication;
- submission to the FDA of a New Drug Application, or NDA;
- a determination by the FDA within 60 days of its receipt of an NDA, to accept the filing for review;
- satisfactory completion of one or more FDA pre-approval inspections of the manufacturing facility or facilities where the drug will be produced to assess compliance with cGMP requirements to assure that the facilities, methods and controls are adequate to preserve the drug's identity, strength, quality and purity;
- potential FDA audit of the clinical trial sites that generated the data in support of the NDA;
- payment of user fees for FDA review of the NDA; and
- FDA review and approval of the NDA, including consideration of the views of any FDA advisory committee, prior to any commercial marketing or sale of the drug in the United States.

The testing and approval process requires substantial time, effort and financial resources, and we cannot be certain that any approvals for our product candidates will be granted on a timely basis, if at all.

Preclinical and clinical trials for drugs

Before testing any drug in humans, the product candidate must undergo rigorous preclinical testing. Preclinical studies include laboratory evaluations of drug chemistry, formulation and stability, as well as *in vitro* and animal studies to assess safety and in some cases to establish the rationale for therapeutic use. The conduct of preclinical studies is subject to federal and state regulations and requirements, including GLP requirements for safety/toxicology studies. The results of the preclinical studies, together with manufacturing information and analytical data must be submitted to the FDA as part of an IND. An IND is a request for authorization from the FDA to administer an investigational product to humans, and must become effective before clinical trials may begin. Some long-term preclinical testing may continue after the IND is submitted. The IND automatically becomes effective 30 days after receipt by the FDA, unless the FDA, within the 30-day time period, raises concerns or questions about the conduct of the clinical trial, including concerns that human research subjects will be exposed to unreasonable health risks, and imposes a clinical hold. In such a case, the IND sponsor and the FDA must resolve any outstanding concerns before the clinical trial can begin. Submission of an IND may result in the FDA not allowing clinical trials to commence or not allowing clinical trials to commence on the terms originally specified in the IND. A separate submission to an existing IND must also be made for each successive clinical trial conducted during product development of

a product candidate, and the FDA must grant permission, either explicitly or implicitly by not objecting, before each clinical trial can begin.

The clinical stage of development involves the administration of the product candidate to healthy volunteers or patients under the supervision of qualified investigators, generally physicians not employed by or under the trial sponsor's control, in accordance with GCP requirements, which include the requirements that all research subjects provide their informed consent for their participation in any clinical trial. Clinical trials are conducted under protocols detailing, among other things, the objectives of the clinical trial, dosing procedures, subject selection and exclusion criteria and the parameters and criteria to be used in monitoring safety and evaluating effectiveness. Each protocol, and any subsequent amendments to the protocol, must be submitted to the FDA as part of the IND. Furthermore, each clinical trial must be reviewed and approved by an IRB for each institution at which the clinical trial will be conducted to ensure that the risks to individuals participating in the clinical trials are minimized and are reasonable related to the anticipated benefits. The IRB also approves the informed consent form that must be provided to each clinical trial subject or his or her legal representative, and must monitor the clinical trial until completed. The FDA, the IRB, or the sponsor may suspend or discontinue a clinical trial at any time on various grounds, including a finding that the subjects are being exposed to an unacceptable health risk. There also are requirements governing the reporting of ongoing clinical trials and completed clinical trials to public registries. Information about clinical trials, including clinical trials results, must be submitted within specific timeframes for publication on the www.clinicaltrials.gov website.

A sponsor who wishes to conduct a clinical trial outside of the United States may, but need not, obtain FDA authorization to conduct the clinical trial under an IND. If a foreign clinical trial is not conducted under an IND, the sponsor must submit data from the clinical trial to the FDA in support of an NDA. The FDA will accept a well-designed and well-conducted foreign clinical study not conducted under an IND if the study was conducted in accordance with GCP requirements, and the FDA is able to validate the data through an onsite inspection if deemed necessary.

Clinical trials to evaluate therapeutic indications to support NDAs for marketing approval are typically conducted in three sequential phases, which may overlap.

- *Phase 1* — Phase 1 clinical trials involve initial introduction of the investigational product into healthy human volunteers or patients with the target disease or condition. These studies are typically designed to test the safety, dosage tolerance, absorption, metabolism and distribution of the investigational product in humans, excretion the side effects associated with increasing doses, and, if possible, to gain early evidence of effectiveness.
- *Phase 2* — Phase 2 clinical trials typically involve administration of the investigational product to a limited patient population with a specified disease or condition to evaluate the preliminary efficacy, optimal dosages and dosing schedule and to identify possible adverse side effects and safety risks.
- *Phase 3* — Phase 3 clinical trials typically involve administration of the investigational product to an expanded patient population to further evaluate dosage, to provide statistically significant evidence of clinical efficacy and to further test for safety, generally at multiple geographically dispersed clinical trial sites. These clinical trials are intended to establish the overall risk/benefit ratio of the investigational product and to provide an adequate basis for product approval and physician labelling.

FDA additionally allows for the conduct of exploratory IND studies, which we refer to as Phase 0 trials. Exploratory IND studies are studies conducted under an IND that are conducted early in phase 1 prior to traditional dose escalation, safety and tolerance studies that ordinarily initiate a clinical drug development program. Exploratory IND studies usually involve very limited human exposure and have no therapeutic or diagnostic intent. The goals of an exploratory IND study may include determining of whether a mechanism of action defined in experimental systems can also be observed in humans, providing important information on pharmacokinetics, selecting the most promising lead product from a group of candidates designed to interact with a particular therapeutic target in humans, based on pharmacokinetic or pharmacodynamic properties, or exploring a product's biodistribution characteristics using various imaging technologies.

In August 2018, the FDA released a draft guidance entitled "Expansion Cohorts: Use in First-In-Human Clinical Trials to Expedite Development of Oncology Drugs and Biologics," which outlines how drug

developers can utilize an adaptive trial design commonly referred to as a seamless trial design in early stages of oncology drug development (i.e., the first-in-human clinical trial) to compress the traditional three phases of trials into one continuous trial called an expansion cohort trial. Information to support the design of individual expansion cohorts are included in IND applications and assessed by FDA. Expansion cohort trials can potentially bring efficiency to drug development and reduce developmental costs and time.

Post-approval trials, sometimes referred to as Phase 4 clinical trials, may be conducted after initial marketing approval. These trials are used to gain additional experience from the treatment of patients in the intended therapeutic indication and are commonly intended to generate additional safety data regarding use of the product in a clinical setting. In certain instances, the FDA may mandate the performance of Phase 4 clinical trials as a condition of approval of an NDA.

Progress reports detailing the results of the clinical trials, among other information, must be submitted at least annually to the FDA and written IND safety reports must be submitted to the FDA and the investigators fifteen days after the trial sponsor determines the information qualifies for reporting for serious and unexpected suspected adverse events, findings from other studies or animal or *in vitro* testing that suggest a significant risk for human volunteers and any clinically important increase in the rate of a serious suspected adverse reaction over that listed in the protocol or investigator brochure. The sponsor must also notify the FDA of any unexpected fatal or life-threatening suspected adverse reaction as soon as possible but in no case later than seven calendar days after the sponsor's initial receipt of the information.

Concurrent with clinical trials, companies usually complete additional animal studies and must also develop additional information about the chemistry and physical characteristics of the product candidate and finalize a process for manufacturing the drug product in commercial quantities in accordance with cGMP requirements. The manufacturing process must be capable of consistently producing quality batches of the product candidate and manufacturers must develop, among other things, methods for testing the identity, strength, quality and purity of the final drug product. Additionally, appropriate packaging must be selected and tested, and stability studies must be conducted to demonstrate that the product candidate does not undergo unacceptable deterioration over its shelf life.

U.S. marketing approval for drugs

Assuming successful completion of the required clinical testing, the results of the preclinical studies and clinical trials, together with detailed information relating to the product's chemistry, manufacture, controls and proposed labeling, among other things, are submitted to the FDA as part of an NDA requesting approval to market the product for one or more indications. An NDA is a request for approval to market a new drug for one or more specified indications and must contain proof of the drug's safety and efficacy. The marketing application may include both negative and ambiguous results of preclinical studies and clinical trials, as well as positive findings. Data may come from company-sponsored clinical trials intended to test the safety and efficacy of a product's use 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 and efficacy of the investigational product to the satisfaction of the FDA. FDA approval of an NDA must be obtained before a drug may be marketed in the United States.

The FDA reviews all submitted NDAs before it accepts them for filing, and may request additional information rather than accepting the NDA for filing. The FDA must make a decision on accepting an NDA for filing within 60 days of receipt, and such decision could include a refusal to file by the FDA. Once the submission is accepted for filing, the FDA begins an in-depth substantive review of the NDA. The FDA reviews an NDA to determine, among other things, whether the drug is safe and effective and whether the facility in which it is manufactured, processed, packaged or held meets standards designed to assure the product's continued safety, quality and purity. Under the goals and polices agreed to by the FDA under the Prescription Drug User Fee Act, or PDUFA, the FDA targets ten months, from the filing date, in which to complete its initial review of a new molecular entity NDA and respond to the applicant, and six months from the filing date of a new molecular entity NDA for priority review. The FDA does not always meet its PDUFA goal dates for standard or priority NDAs, and the review process is often extended by FDA requests for additional information or clarification.

Further, under PDUFA, as amended, each NDA must be accompanied by a user fee. FDA adjusts the PDUFA user fees on an annual basis. Fee waivers or reductions are available in certain circumstances, including a waiver of the application fee for the first application filed by a small business. Additionally, no user fees are assessed on NDAs for products designated as orphan drugs, unless the product also includes a non-orphan indication.

The FDA also may require submission of a Risk Evaluation and Mitigation Strategy, or REMS, plan to ensure that the benefits of the drug outweigh its risks. The REMS plan could include medication guides, physician communication plans, assessment plans, and/or elements to assure safe use, such as restricted distribution methods, patient registries, or other risk-minimization tools.

The FDA may refer an application for a novel drug to an advisory committee. An advisory committee is a panel of independent experts, including clinicians and other scientific experts, which 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.

Before approving an NDA, the FDA typically will inspect the facility or facilities where the product is manufactured. The FDA will not approve an application unless it determines that the manufacturing processes and facilities are in compliance with cGMP requirements and adequate to assure consistent production of the Sponsor product within required specifications. Additionally, before approving an NDA, the FDA may inspect one or more clinical trial sites to assure compliance with GCP and other requirements and the integrity of the clinical data submitted to the FDA.

After evaluating the NDA and all related information, including the advisory committee recommendation, if any, and inspection reports regarding the manufacturing facilities and clinical trial sites, the FDA may issue an approval letter, or, in some cases, a complete response letter. A complete response letter generally contains a statement of specific conditions that must be met in order to secure final approval of the NDA and may require additional clinical or preclinical testing in order for the FDA to reconsider the application. Even with submission of this additional information, the FDA ultimately may decide that the application does not satisfy the regulatory criteria for approval. If and when those conditions have been met to the FDA's satisfaction, the FDA will typically issue an approval letter. An approval letter authorizes commercial marketing of the drug with specific prescribing information for specific indications.

Even if the FDA approves a product, depending on the specific risk(s) to be addressed it may limit the approved indications for use of the product, require that contraindications, warnings or precautions be included in the product labeling, require that post-approval studies, including Phase 4 clinical trials, be conducted to further assess a drug's safety after approval, require testing and surveillance programs to monitor the product after commercialization, or impose other conditions, including distribution and use restrictions or other risk management mechanisms under a REMS, which can materially affect the potential market and profitability of the product. The FDA may prevent or limit further marketing of a product based on the results of post-marketing studies or surveillance programs. After approval, some types of changes to the approved product, such as adding new indications, manufacturing changes, and additional labeling claims, are subject to further testing requirements and FDA review and approval.

Orphan drug designation and exclusivity

Under the Orphan Drug Act, the FDA may grant orphan designation to a drug intended to treat a rare disease or condition, which is a disease or condition that affects fewer than 200,000 individuals in the United States, or if it affects more than 200,000 individuals in the United States, there is no reasonable expectation that the cost of developing and making the product available in the United States for the disease or condition will be recovered from sales of the product. Orphan designation must be requested before submitting an NDA. Orphan designation does not convey any advantage in or shorten the duration of the regulatory review and approval process, though companies developing orphan products are eligible for certain incentives, including tax credits for qualified clinical testing and waiver of application fees.

If a product that has orphan designation subsequently receives the first FDA approval for the disease or condition for which it has such designation, the product is entitled to a seven-year period of marketing

exclusivity during which the FDA may not approve any other applications to market the same therapeutic agent for the same indication, except in limited circumstances, such as a subsequent product's showing of clinical superiority over the product with orphan exclusivity or where the original applicant cannot produce sufficient quantities of product. Competitors, however, may receive approval of different therapeutic agents for the indication for which the orphan product has exclusivity or obtain approval for the same therapeutic agent for a different indication than that for which the orphan product has exclusivity. Orphan product exclusivity could block the approval of one of our products for seven years if a competitor obtains approval for the same therapeutic agent for the same indication before we do, unless we are able to demonstrate that our product is clinically superior. If an orphan designated product receives marketing approval for an indication broader than what is designated, it may not be entitled to orphan exclusivity. Further, orphan drug exclusive marketing rights in the United States may be lost if the FDA later determines that the request for designation was materially defective or the manufacturer of the approved product is unable to assure sufficient quantities of the product to meet the needs of patients with the rare disease or condition.

Rare pediatric disease designation and priority review vouchers

Under the FD&C Act, the FDA incentivizes the development of drugs that meet the definition of a "rare pediatric disease," defined to mean a serious or life-threatening disease in which the serious of life-threatening manifestations primarily affect individuals aged from birth to 18 years and the disease affects fewer than 200,000 individuals in the United States or affects more than 200,000 in the United States and for which there is no reasonable expectation that the cost of developing and making in the United States a drug for such disease or condition will be received from sales in the United States of such drug. The sponsor of a product candidate for a rare pediatric disease may be eligible for a voucher that can be used to obtain a priority review for a subsequent human drug application after the date of approval of the rare pediatric disease drug product, referred to as a priority review voucher, or PRV. A sponsor may request rare pediatric disease designation from the FDA prior to the submission of its NDA. A rare pediatric disease designation does not guarantee that a sponsor will receive a PRV upon approval of its NDA. Moreover, a sponsor who chooses not to submit a rare pediatric disease designation request may nonetheless receive a PRV upon approval of their marketing application if they request such a voucher in their original marketing application and meet all of the eligibility criteria. If a PRV is received, it may be sold or transferred an unlimited number of times. Congress has extended the PRV program through September 30, 2026, with the potential for PRVs to be granted through September 30, 2026.

Expedited development and review programs for drugs

The FDA maintains several programs intended to facilitate and expedite development and review of new drugs to address unmet medical needs in the treatment of serious or life-threatening diseases or conditions. These programs include Fast Track designation, Breakthrough Therapy designation, Priority Review and Accelerated Approval, and the purpose of these programs is to either expedite the development or review of important new drugs to get them to patients earlier than under standard FDA development and review procedures.

A new drug is eligible for Fast Track designation if it is intended to treat a serious or life-threatening disease or condition and demonstrates the potential to address unmet medical needs for such disease or condition. Fast Track designation provides increased opportunities for sponsor interactions with the FDA during preclinical and clinical development, in addition to the potential for rolling review once a marketing application is filed, meaning that the agency may review portions of the marketing application before the sponsor submits the complete application, as well as Priority Review, discussed below. In addition, a new drug may be eligible for Breakthrough Therapy designation if it is intended to treat a serious or life-threatening disease or condition and preliminary clinical evidence indicates that the drug may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. Breakthrough Therapy designation provides all the features of Fast Track designation in addition to intensive guidance on an efficient drug development program beginning as early as Phase 1, and FDA organizational commitment to expedited development, including involvement of senior managers and experienced review staff in a cross-disciplinary review, where appropriate.

Any product submitted to the FDA for approval, including a product with Fast Track or Breakthrough Therapy designation, may also be eligible for additional FDA programs intended to expedite the review and approval process, including Priority Review designation and accelerated approval. A product is eligible for Priority Review if it has the potential to provide a significant improvement in safety or effectiveness in the treatment, diagnosis or prevention of a serious disease or condition. Under priority review, the FDA must review an application in six months compared to ten months for a standard review. Additionally, products are eligible for accelerated approval if they can be shown to have an effect on a surrogate endpoint that is reasonably likely to predict clinical benefit, or an effect on a clinical endpoint that can be measured earlier than an effect on irreversible morbidity or mortality which is reasonably likely to predict an effect on irreversible morbidity or mortality or other clinical benefit, taking into account the severity, rarity, or prevalence of the condition and the availability or lack of alternative treatments.

Accelerated approval is usually contingent on a sponsor's agreement to conduct additional post-approval studies to verify and describe the product's clinical benefit. The FDA may withdraw approval of a drug or indication approved under accelerated approval if, for example, the confirmatory trial fails to verify the predicted clinical benefit of the product. In addition, unless otherwise informed by the FDA, the FDA currently requires, as a condition for accelerated approval, that all advertising and promotional materials that are intended for dissemination or publication within 120 days following marketing approval be submitted to the agency for review during the pre-approval review period, and that after 120 days following marketing approval, all advertising and promotional materials must be submitted at least 30 days prior to the intended time of initial dissemination or publication.

Even if a product qualifies for one or more of these programs, the FDA may later decide that the product no longer meets the conditions for qualification or the time period for FDA review or approval may not be shortened. Furthermore, Fast Track designation, Breakthrough Therapy designation, Priority Review and Accelerated Approval do not change the scientific or medical standards for approval or the quality of evidence necessary to support approval but may expedite the development or review process.

Pediatric information and pediatric exclusivity

Under the Pediatric Research Equity Act, or PREA, certain NDAs and certain supplements to an NDA must contain data to assess the safety and efficacy of the drug for the claimed indications in all relevant pediatric subpopulations and to support dosing and administration for each pediatric subpopulation for which the product is safe and effective. The FDA may grant deferrals for submission of pediatric data or full or partial waivers. The Food and Drug Administration Safety and Innovation Act, or FDASIA, amended the FD&C Act to require that a sponsor who is planning to submit a marketing application for a drug that includes a new active ingredient, new indication, new dosage form, new dosing regimen or new route of administration submit an initial Pediatric Study Plan, or PSP, within 60 days of an end-of-Phase 2 meeting or, if there is no such meeting, as early as practicable before the initiation of the Phase 3 or Phase 2/3 study. The initial PSP must include an outline of the pediatric study or studies that the sponsor plans to conduct, including study objectives and design, age groups, relevant endpoints and statistical approach, or a justification for not including such detailed information, and any request for a deferral of pediatric assessments or a full or partial waiver of the requirement to provide data from pediatric studies along with supporting information. The FDA and the sponsor must reach an agreement on the PSP. A sponsor can submit amendments to an agreed-upon initial PSP at any time if changes to the pediatric plan need to be considered based on data collected from preclinical studies, early phase clinical trials and/or other clinical development programs.

A drug can also obtain pediatric market exclusivity in the United States. Pediatric exclusivity, if granted, adds six months to existing exclusivity periods and patent terms. This six-month exclusivity, which runs from the end of other exclusivity protection or patent term, may be granted based on the voluntary completion of a pediatric study in accordance with an FDA-issued "Written Request" for such a study.

U.S. post-approval requirements for drugs

Drugs manufactured or distributed pursuant to FDA approvals are subject to pervasive and continuing regulation by the FDA, including, among other things, requirements relating to recordkeeping, periodic reporting, product sampling and distribution, reporting of adverse experiences with the product, complying

with promotion and advertising requirements, which include restrictions on promoting products for unapproved uses or patient populations (known as "off-label use") and limitations on industry-sponsored scientific and educational activities. Although physicians may prescribe legally available products for off-label uses, manufacturers may not market or promote such uses. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off-label uses, and a company that is found to have improperly promoted off-label uses may be subject to significant liability, including investigation by federal and state authorities. Prescription drug promotional materials must be submitted to the FDA in conjunction with their first use or first publication. Further, if there are any modifications to the drug, including changes in indications, labeling or manufacturing processes or facilities, the applicant may be required to submit and obtain FDA approval of a new NDA or NDA supplement, which may require the development of additional data or preclinical studies and clinical trials.

The FDA may impose a number of post-approval requirements as a condition of approval of an NDA. For example, the FDA may require post-market testing, including Phase 4 clinical trials, and surveillance to further assess and monitor the product's safety and effectiveness after commercialization.

In addition, drug manufacturers and their subcontractors involved in the manufacture and distribution of approved drugs 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, which impose certain procedural and documentation requirements upon us and our contract manufacturers. Failure to comply with statutory and regulatory requirements can subject a manufacturer to possible legal or regulatory action, such as warning letters, suspension of manufacturing, product seizures, injunctions, civil penalties or criminal prosecution. There is also a continuing, annual prescription drug product program user fee.

Later discovery of previously unknown problems with a product, including adverse events of unanticipated severity or frequency, or with manufacturing processes, or failure to comply with regulatory requirements, may result in revisions to the approved labeling to add new safety information, requirements for post-market studies or clinical trials to assess new safety risks, or imposition of distribution or other restrictions under a REMS. 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;
- safety alerts, Dear Healthcare Provider letters, press releases or other communications containing warnings or other safety information about the product;
- fines, warning letters or holds on post-approval clinical trials;
- refusal of the FDA to approve applications or supplements to approved applications, or suspension or revocation of product approvals;
- product seizure or detention, or refusal to permit the import or export of products;
- injunctions or the imposition of civil or criminal penalties; and
- consent decrees, corporate integrity agreements, debarment or exclusion from federal healthcare programs; or mandated modification of promotional materials and labeling and issuance of corrective information.

Other regulatory matters

Manufacturing, sales, promotion and other activities of product candidates following product approval, where applicable, or commercialization are also subject to regulation by numerous regulatory authorities in the United States in addition to the FDA, which may include the Centers for Medicare & Medicaid Services, or CMS, other divisions of the Department of Health and Human Services, or HHS, the Department of Justice, the Drug Enforcement Administration, the Consumer Product Safety Commission, the Federal Trade Commission, the Occupational Safety & Health Administration, the Environmental Protection Agency and state and local governments and governmental agencies.

Other healthcare laws

Healthcare providers, physicians, and third-party payors will play a primary role in the recommendation and prescription of any products for which we obtain marketing approval. Our business operations and any current or future arrangements with third-party payors, healthcare providers and physicians may expose us to broadly applicable fraud and abuse and other healthcare laws and regulations that may constrain the business or financial arrangements and relationships through which we develop, market, sell and distribute any drugs for which we obtain marketing approval. In the United States, these laws include, without limitation, state and federal anti-kickback, false claims, physician transparency, and patient data privacy and security laws and regulations, including but not limited to those described below.

- The federal Anti-Kickback Statute, which prohibits, among other things, persons and entities from knowingly and wilfully soliciting, offering, paying, receiving or providing any remuneration (including any kickback, bride, or certain rebate), directly or indirectly, overtly or covertly, in cash or in kind, to induce or reward, or in return for, either the referral of an individual for, or the purchase, order or recommendation of, any good or service, for which payment may be made, in whole or in part, under a federal healthcare program such as Medicare and Medicaid; a person or entity need not have actual knowledge of the federal Anti-Kickback Statute or specific intent to violate it in order to have committed a violation. Violations are subject to civil and criminal fines and penalties for each violation, plus up to three times the remuneration involved, imprisonment, and exclusion from government healthcare programs. In addition, the government may assert that a claim that includes items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the civil False Claims Act.
- The federal civil and criminal false claims laws, including the civil False Claims Act, or FCA, which prohibit individuals or entities from, among other things, knowingly presenting, or causing to be presented, to the federal government, claims for payment or approval that are false, fictitious or fraudulent; knowingly making, using, or causing to be made or used, a false statement or record material to a false or fraudulent claim or obligation to pay or transmit money or property to the federal government; or knowingly concealing or knowingly and improperly avoiding or decreasing an obligation to pay money to the federal government. Manufacturers can be held liable under the FCA even when they do not submit claims directly to government payors if they are deemed to "cause" the submission of false or fraudulent claims. The FCA also permits a private individual acting as a "whistle-blower" to bring actions on behalf of the federal government alleging violations of the FCA and to share in any monetary recovery. When an entity is determined to have violated the federal civil False Claims Act, the government may impose civil fines and penalties for each false claim, plus treble damages, and exclude the entity from participation in Medicare, Medicaid and other federal healthcare programs.
- The federal civil monetary penalties laws, which impose civil fines for, among other things, the offering or transfer or remuneration to a Medicare or state healthcare program beneficiary if the person knows or should know it is likely to influence the beneficiary's selection of a particular provider, practitioner, or supplier of services reimbursable by Medicare or a state health care program, unless an exception applies.
- The Health Insurance Portability and Accountability Act of 1996, or HIPAA, imposes criminal and civil liability for knowingly and wilfully executing a scheme, or attempting to execute a scheme, to defraud any healthcare benefit program, including private payors, knowingly and wilfully embezzling or stealing from a healthcare benefit program, wilfully obstructing a criminal investigation of a healthcare offense, or falsifying, concealing or covering up a material fact or making any materially false statements in connection with the delivery of or payment for healthcare benefits, items or services. Similar to the U.S. federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the healthcare fraud statute implemented under HIPAA or specific intent to violate it in order to have committed a violation.
- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009, or HITECH, and their respective implementing regulations, imposes, among other things, specified requirements on covered entities and their business associates relating to the privacy and security of individually identifiable health information including mandatory contractual terms and

required implementation of technical safeguards of such information. HITECH also created new tiers of civil monetary penalties, amended HIPAA to make civil and criminal penalties directly applicable to business associates in some cases, and gave state attorneys general new authority to file civil actions for damages or injunctions in federal courts to enforce the federal HIPAA laws and seek attorneys' fees and costs associated with pursuing federal civil actions.

- The Physician Payments Sunshine Act, enacted as part of the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act of 2010, or collectively, the ACA, imposed new annual reporting requirements for certain manufacturers of drugs, devices, biologics, and medical supplies for which payment is available under Medicare, Medicaid, or the Children's Health Insurance Program, for certain payments and "transfers of value" provided 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. Effective January 1, 2022, these reporting obligations will extend to include transfers of value made to certain non-physician providers such as physician assistants and nurse practitioners. In addition, many states also require reporting of payments or other transfers of value, many of which differ from each other in significant ways, are often not pre-empted, and may have a more prohibitive effect than the Sunshine Act, thus further complicating compliance efforts.
- Federal consumer protection and unfair competition laws, which broadly regulate marketplace activities and activities that potentially harm consumers.
- Analogous state and foreign fraud and abuse laws and regulations, such as state anti-kickback and false claims laws, which may be broader in scope and apply regardless of payor. These laws are enforced by various state agencies and through private actions. Some state laws require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant federal government compliance guidance, require drug manufacturers to report information related to payments and other transfers of value to physicians and other healthcare providers, and restrict marketing practices or require disclosure of marketing expenditures and pricing information. State and foreign laws also govern the privacy and security of health information in some circumstances. These data privacy and security laws may differ from each other in significant ways and often are not pre-empted by HIPAA, which may complicate compliance efforts.

State and foreign laws also govern the privacy and security of health information in some circumstances. These data privacy and security laws may differ from each other in significant ways and often are not pre-empted by HIPAA, which may complicate compliance efforts. California recently enacted the California Consumer Privacy Act, or CCPA, which creates new individual privacy rights for California consumers (as defined in the law) and places increased privacy and security obligations on entities handling personal data of consumers or households. The CCPA will require covered companies to provide certain disclosures to consumers about its data collection, use and sharing practices, and to provide affected California residents with ways to opt-out of certain sales or transfers of personal information. The CCPA went into effect on January 1, 2020, and the California Attorney General will commence enforcement actions against violators beginning July 1, 2020. While there is currently an exception for protected health information that is subject to HIPAA and clinical trial regulations, as currently written, the CCPA may impact our business activities. The California Attorney General has proposed draft regulations, which have not been finalized to date, that may further impact our business activities if they are adopted. The uncertainty surrounding the implementation of CCPA exemplifies the vulnerability of our business to the evolving regulatory environment related to personal data and protected health information.

The scope and enforcement of each of these laws is uncertain and subject to rapid change in the current environment of healthcare reform, especially in light of the lack of applicable precedent and regulations. Federal and state enforcement bodies have recently increased their scrutiny of interactions between healthcare companies and healthcare providers, which has led to a number of investigations, prosecutions, convictions and settlements in the healthcare industry. It is possible that governmental authorities will conclude that our business practices do 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 related governmental regulations that may apply to us, we may be subject to significant civil, criminal and administrative penalties, damages, fines,

imprisonment, disgorgement, exclusion from government funded healthcare programs, such as Medicare and Medicaid, reputational harm, additional oversight and reporting obligations if we become subject to a corporate integrity agreement or similar settlement to resolve allegations of non-compliance with these laws and the curtailment or restructuring of our operations. If any of the physicians or other healthcare providers or entities with whom we expect to do business is found to be not in compliance with applicable laws, they may be subject to similar actions, penalties and sanctions. Ensuring business arrangements comply with applicable healthcare laws, as well as responding to possible investigations by government authorities, can be time- and resource-consuming and can divert a company's attention from its business.

Insurance Coverage and Reimbursement

In the United States and markets in other countries, patients who are prescribed treatments for their conditions and providers performing the prescribed services generally rely on third-party payors to reimburse all or part of the associated healthcare costs. Thus, even if a product candidate is approved, 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. In the United States, the principal decisions about reimbursement for new medicines are typically made by the CMS, an agency within HHS. CMS decides whether and to what extent a new medicine will be covered and reimbursed under Medicare and private payors tend to follow CMS to a substantial degree. No uniform policy of coverage and reimbursement for drug products exists among third-party payors. Therefore, coverage and reimbursement for drug products can differ significantly from payor to payor. The process for determining whether a third-party 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 approved. 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 an approved list, also known as a formulary, which might not include all of the approved products for a particular indication.

In order to secure coverage and reimbursement for any product that might be approved 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 regulatory approvals. Additionally, companies may also need to provide discounts to purchasers, private health plans or government healthcare programs. 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 approved and have a material adverse effect on sales, our operations and financial condition. Additionally, a third-party payor's decision to provide coverage for a product does not imply that an adequate reimbursement rate will be approved. 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 healthcare costs 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 approved products. Coverage policies and third-party payor 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 regulatory approval, less favorable coverage policies and reimbursement rates may be implemented in the future.

Current and future healthcare reform legislation

In the United States and some foreign jurisdictions, there have been, and likely will continue to be, a number of legislative and regulatory changes and proposed changes regarding the healthcare system directed at broadening the availability of healthcare, improving the quality of healthcare, and containing or lowering

the cost of healthcare. For example, in March 2010, the United States Congress enacted the Affordable Care Act, which, among other things, includes changes to the coverage and payment for products under government health care programs. The Affordable Care Act includes provisions of importance to our potential product candidates that:

- created an annual, non-deductible fee on any entity that manufactures, or imports specified branded prescription drugs and biologic products, apportioned among these entities according to their market share in certain government healthcare programs;
- expanded eligibility criteria for Medicaid programs by, among other things, allowing states to offer Medicaid coverage to certain individuals with income at or below 133% of the federal poverty level, thereby potentially increasing a manufacturer's Medicaid rebate liability;
- expanded manufacturers' rebate liability under the Medicaid Drug Rebate Program by increasing the minimum rebate for both branded and generic drugs and revising the definition of "average manufacturer price," or AMP, for calculating and reporting Medicaid drug rebates on outpatient prescription drug prices;
- addressed 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;
- expanded the types of entities eligible for the 340B drug discount program;
- established the Medicare Part D coverage gap discount program by requiring manufacturers to provide point-of-sale-discounts off the negotiated price of applicable brand drugs to eligible beneficiaries during their coverage gap period as a condition for the manufacturers' outpatient drugs to be covered under Medicare Part D; and
- created a new Patient-Centered Outcomes Research Institute to oversee, identify priorities in, and conduct comparative clinical effectiveness research, along with funding for such research.

Since its enactment, there have been numerous judicial, administrative, executive, and legislative challenges to certain aspects of the Affordable Care Act, or ACA, and we expect there will be additional challenges and amendments to the ACA in the future. For example, various portions of the ACA are currently undergoing legal and constitutional challenges in the Fifth Circuit Court and the United States Supreme Court, and the Trump Administration has issued various Executive Orders which eliminated cost sharing subsidies and various provisions 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. Additionally, Congress has introduced several pieces of legislation aimed at significantly revising or repealing the ACA. It is unclear whether the ACA will be overturned, repealed, replaced, or further amended. We cannot predict what affect further changes to the ACA would have on our business.

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, included aggregate reductions of Medicare payments to providers of 2% per fiscal year, which went into effect in April 2013 and, due to subsequent legislative amendments to the statute, will remain in effect through 2029 unless additional Congressional action is taken. In January 2013, the American Taxpayer Relief Act of 2012 was signed into law, which, among other things, further 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.

Moreover, payment methodologies may be subject to changes in healthcare legislation and regulatory initiatives. For example, CMS may develop new payment and delivery models, such as bundled payment models. In addition, recently there has been heightened governmental scrutiny over the manner in which manufacturers set prices for their commercial products, which has resulted in several Congressional inquiries and proposed and enacted state and federal legislation designed to, among other things, bring more transparency to product pricing, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for pharmaceutical products. For example, at the federal level, the Trump administration's budget for fiscal year 2020 contains further drug price control measures that could be enacted during the 2020 legislative session, or in other future legislation,

including, for example, measures to permit Medicare Part D plans to negotiate the price of certain drugs under Medicare Part B, to allow some states to negotiate drug prices under Medicaid, and to eliminate cost sharing for generic drugs for low-income patients. Additionally, the Trump administration released a "Blueprint" to lower drug prices and reduce out of pocket costs of drugs that contains additional proposals to increase drug manufacturer competition, increase the negotiating power of certain federal healthcare programs, incentivize manufacturers to lower the list price of their products, and reduce the out of pocket costs of drug products paid by consumers. HHS has already started the process of soliciting feedback on some of these measures and, at the same time, is immediately implementing others under its existing authority. For example, in May 2019, CMS issued a final rule to allow Medicare Advantage Plans the option of using step therapy, a type of prior authorization, for Part B drugs beginning January 1, 2020. Congress and the Trump administration have each indicated that it will continue to seek new legislative and/or administrative measures to control drug costs. For example, on October 1, 2020, FDA published a final rule that allows for the importation of certain prescription drugs from Canada. Under the final rule, States and Indian Tribes, and in certain future circumstances pharmacists and wholesalers, may submit importation program proposals to the FDA for review and authorization. On September 25, 2020, CMS stated drugs imported by States under this rule will not be eligible for federal rebates under Section 1927 of the Social Security Act and manufacturers would not report these drugs for "best price" or Average Manufacturer Price purposes. Since these drugs are not considered covered outpatient drugs, CMS further stated it will not publish a National Average Drug Acquisition Cost for these drugs. Separately, the FDA also issued a final guidance document outlining a pathway for manufacturers to obtain an additional National Drug Code, or NDC, for an FDA-approved drug that was originally intended to be marketed in a foreign country and that was authorized for sale in that foreign country. The market implications of the final rule and guidance are unknown at this time. Proponents of drug reimportation may attempt to pass legislation that would directly allow reimportation under certain circumstances. Legislation or regulations allowing the reimportation of drugs, if enacted, could decrease the price we receive for any products that we may develop and adversely affect our future revenues and prospects for profitability. Individual states in the United States have also increasingly passed legislation and implemented regulations designed to control pharmaceutical 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.

On May 30, 2018, the Right to Try Act was signed into law. The law, among other things, provides a federal framework for certain patients to access certain investigational new drug products that have completed a Phase 1 clinical trial and that are undergoing investigation for FDA approval. Under certain circumstances, eligible patients can seek treatment without enrolling in clinical trials and without obtaining FDA permission under the FDA expanded access program. There is no obligation for a drug manufacturer to make its drug products available to eligible patients as a result of the Right to Try Act, but the manufacturer must develop an internal policy and respond to patient requests according to that policy.

Outside the United States, ensuring coverage and adequate payment for a product also involves challenges. Pricing of prescription pharmaceuticals is subject to government control in many countries. Pricing negotiations with government authorities can extend well beyond the receipt of regulatory approval for a product and may require a clinical trial that compares the cost-effectiveness of a product to other available therapies. The conduct of such a clinical trial could be expensive and result in delays in commercialization.

In the European Union, or 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. EU member states may approve a specific price for a product, or it may instead adopt a system of direct or indirect controls on the profitability of the company placing the product on the market. 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 healthcare expenditures, especially in light of the severe fiscal and debt crises experienced by many countries in the EU. The downward pressure on healthcare 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 European Union member states, and parallel trade, i.e., 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.

Compliance with other federal and state laws or requirements; changing legal requirements

If any products that we may develop are made available to authorized users of the Federal Supply Schedule of the General Services Administration, additional laws and requirements apply. Products must meet applicable child-resistant packaging requirements under the U.S. Poison Prevention Packaging Act. Manufacturing, labeling, packaging, distribution, sales, promotion and other activities also are potentially subject to federal and state consumer protection and unfair competition laws, among other requirements to we may be subject.

The distribution of pharmaceutical products is subject to additional requirements and regulations, including extensive record-keeping, licensing, storage and security requirements intended to prevent the unauthorized sale of pharmaceutical products.

The failure to comply with any of these laws or regulatory requirements subjects firms to possible legal or regulatory action. Depending on the circumstances, failure to meet applicable regulatory requirements can result in criminal prosecution, fines or other penalties, injunctions, exclusion from federal healthcare programs, requests for recall, seizure of products, total or partial suspension of production, denial or withdrawal of product approvals, relabeling or repackaging, or refusal to allow a firm to enter into supply contracts, including government contracts. Any claim or 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. Prohibitions or restrictions on marketing, sales or withdrawal of future products marketed by us could materially affect our business in an adverse way.

Changes in regulations, statutes or the interpretation of existing regulations could impact our business in the future by requiring, for example: (i) changes to our manufacturing arrangements; (ii) additions or modifications to product labeling or packaging; (iii) the recall or discontinuation of our products; or (iv) additional record-keeping requirements. If any such changes were to be imposed, they could adversely affect the operation of our business.

Other U.S. environmental, health and safety laws and regulations

We may be 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. From time to time and in the future, our operations may involve the use of hazardous and flammable materials, including chemicals and biological materials, and may also produce hazardous waste products. Even if we contract with third parties for the disposal of these materials and waste products, we cannot completely eliminate the risk of contamination or injury resulting from these materials. In the event of contamination or injury resulting from the use or disposal of our 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 for failure to comply with such laws and regulations.

We maintain workers' compensation insurance to cover us for costs and expenses we may incur due to injuries to our employees, but this insurance may not provide adequate coverage against potential liabilities. However, we do not maintain insurance for environmental liability or toxic tort claims that may be asserted against us.

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

Government regulation of drugs outside of the United States

To market any product outside of the United States, we would need to comply with numerous and varying regulatory requirements of other countries regarding safety and efficacy and governing, among other things, clinical trials, marketing authorization or identification of an alternate regulatory pathway, manufacturing, commercial sales and distribution of our products. For instance, in the United Kingdom and the European Economic Area, or the EEA (comprised of the 27 EU Member States plus Iceland, Liechtenstein and Norway), medicinal products must be authorized for marketing by using either the centralized authorization procedure or national authorization procedures.

- *Centralized procedure* — If pursuing marketing authorization of a product candidate for a therapeutic indication under the centralized procedure, following the opining of the European Medicines Agency's, or EMA, Committee for Medicinal Products for Human Use, or, CHMP, the European Commission issues a single marketing authorization valid across the EEA. The centralized procedure is compulsory for human medicines derived from biotechnology processes or advanced therapy medicinal products (such as gene therapy, somatic cell therapy and tissue engineered products), products that contain a new active substance indicated for the treatment of certain diseases, such as HIV/AIDS, cancer, neurodegenerative disorders, diabetes, autoimmune diseases and other immune dysfunctions, viral diseases, and officially designated orphan medicines. For medicines that do not fall within these categories, an applicant has the option of submitting an application for a centralized marketing authorization to the EMA, as long as the medicine concerned contains a new active substance not yet authorized in the EEA, is a significant therapeutic, scientific or technical innovation, or if its authorization would be in the interest of public health in the EEA. Under the centralized procedure the maximum timeframe for the evaluation of an MAA by the EMA is 210 days, excluding clock stops, when additional written or oral information is to be provided by the applicant in response to questions asked by the CHMP. Accelerated assessment might be granted by the CHMP in exceptional cases, when a medicinal product is expected to be of a major public health interest, particularly from the point of view of therapeutic innovation. The timeframe for the evaluation of an MAA under the accelerated assessment procedure is 150 days, excluding clock stops.
- *National authorization procedures* — There are also two other possible routes to authorize products for therapeutic indications in several countries, which are available for products that fall outside the scope of the centralized procedure:
- *Decentralized procedure* — Using the decentralized procedure, an applicant may apply for simultaneous authorization in more than one EU country of medicinal products that have not yet been authorized in any EU country and that do not fall within the mandatory scope of the centralized procedure.
- *Mutual recognition procedure* — In the mutual recognition procedure, a medicine is first authorized in one EU Member State, in accordance with the national procedures of that country. Following this, additional marketing authorizations can be sought from other EU countries in a procedure whereby the countries concerned recognize the validity of the original, national marketing authorization.

In the EEA, new products for therapeutic indications that are authorized for marketing (i.e., reference products) qualify for eight years of data exclusivity and an additional two years of market exclusivity upon marketing authorization. The data exclusivity period prevents generic or biosimilar applicants from relying on the preclinical and clinical trial data contained in the dossier of the reference product when applying for a generic or biosimilar marketing authorization in the EU during a period of eight years from the date on which the reference product was first authorized in the EU. The market exclusivity period prevents a successful generic or biosimilar applicant from commercializing its product in the EU until ten years have elapsed from the initial authorization of the reference product in the EU. The ten-year market exclusivity period can be extended to a maximum of eleven years if, during the first eight years of those ten years, the marketing

authorization holder obtains an authorization for one or more new therapeutic indications which, during the scientific evaluation prior to their authorization, are held to bring a significant clinical benefit in comparison with existing therapies.

The criteria for designating an "orphan medicinal product" in the EEA are similar in principle to those in the United States. In the EEA a medicinal product may be designated as orphan if (1) it is intended for the diagnosis, prevention or treatment of a life-threatening or chronically debilitating condition; (2) either (a) such condition affects no more than five in 10,000 persons in the EU when the application is made, or (b) the product, without the benefits derived from orphan status, would not generate sufficient return in the EU to justify investment; and (3) there exists no satisfactory method of diagnosis, prevention or treatment of such condition authorized for marketing in the EU, or if such a method exists, the product will be of significant benefit to those affected by the condition. Orphan medicinal products are eligible for financial incentives such as reduction of fees or fee waivers and are, upon grant of a marketing authorization, entitled to ten years of market exclusivity for the approved therapeutic indication. During this ten-year orphan market exclusivity period, no marketing authorization application shall be accepted, and no marketing authorization shall be granted for a similar medicinal product for the same indication. An orphan product can also obtain an additional two years of market exclusivity in the EU for pediatric studies. The ten-year market exclusivity may be reduced to six years if, at the end of the fifth year, it is established that the product no longer meets the criteria for orphan designation, for example, if the product is sufficiently profitable not to justify maintenance of market exclusivity. Additionally, marketing authorization may be granted to a similar product for the same indication at any time if (i) the second applicant can establish that its product, although similar, is safer, more effective or otherwise clinically superior; (ii) the applicant consents to a second orphan medicinal product application; or (iii) the applicant cannot supply enough orphan medicinal product.

Similar to the United States, the various phases of non-clinical and clinical research in the European Union are subject to significant regulatory controls.

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 European Union. 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. It is expected that the new Clinical Trials Regulation (EU) No 536/2014 will apply following confirmation of full functionality of the Clinical Trials Information System (CTIS), the centralized European Union portal and database for clinical trials foreseen by the regulation, through an independent audit. The regulation becomes applicable six months after the European Commission publishes notice of this confirmation. The Clinical Trials Regulation will be directly applicable in all the EU Member States, repealing the current Clinical Trials Directive 2001/20/EC. Conduct of all clinical trials performed in the European Union will continue to be bound by currently applicable provisions until the new Clinical Trials Regulation becomes applicable. The extent to which ongoing 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 European Union. The main characteristics of the regulation include: a streamlined application procedure via a single-entry point, the "EU portal"; 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 competent authorities of all EU Member States in which an application for

authorization of a clinical trial has been submitted (Member States concerned). Part II is assessed separately by each Member State concerned. 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 EU Member State. However, overall related timelines will be defined by the Clinical Trials Regulation.

The collection and use of personal health data in the European Union, previously governed by the provisions of the Data Protection Directive, is now governed by the General Data Protection Regulation, or the GDPR, which became effective on May 25, 2018. While the Data Protection Directive did not apply to organizations based outside the EU, the GDPR has expanded its reach to include any business, regardless of its location, that provides goods or services to residents in the EU. This expansion would incorporate any clinical trial activities in EU members states. The GDPR imposes strict requirements on controllers and processors of personal data, including special protections for "sensitive information" which includes health and genetic information of data subjects residing in the EU. GDPR grants individuals the opportunity to object to the processing of their personal information, allows them to request deletion of personal information in certain circumstances, and provides the individual with an express right to seek legal remedies in the event the individual believes his or her rights have been violated. Further, the GDPR imposes strict rules on the transfer of personal data out of the European Union to the United States or other regions that have not been deemed to offer "adequate" privacy protections. Failure to comply with the requirements of the GDPR and the related national data protection laws of the European Union Member States, which may deviate slightly from the GDPR, may result in fines of up to 4% of global revenues, or €20,000,000, whichever is greater. As a result of the implementation of the GDPR, we may be required to put in place additional mechanisms ensuring compliance with the new data protection rules.

There is significant uncertainty related to the manner in which data protection authorities will seek to enforce compliance with GDPR. For example, it is not clear if the authorities will conduct random audits of companies doing business in the EU, or if the authorities will wait for complaints to be filed by individuals who claim their rights have been violated. Enforcement uncertainty and the costs associated with ensuring GDPR compliance are onerous and may adversely affect our business, financial condition, results of operations and prospects.

Should we utilize third party distributors, compliance with such foreign governmental regulations would generally be the responsibility of such distributors, who may be independent contractors over whom we have limited control.

Brexit and the Regulatory Framework in the United Kingdom

In June 2016, the electorate in the United Kingdom voted in favor of leaving the EU (commonly referred to as "Brexit"). Thereafter, in March 2017, the country formally notified the European Union of its intention to EU withdraw pursuant to Article 50 of the Lisbon Treaty. The United Kingdom formally left the EU on January 31, 2020. A transition period began on February 1, 2020, during which EU pharmaceutical law remains applicable to the United Kingdom. This transition period is due to end on December 31, 2020. 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 European Union directives and regulations, Brexit could materially impact the future regulatory regime which applies to products and the approval of product candidates in the United Kingdom. It remains to be seen how, if at all, Brexit will impact regulatory requirements for product candidates and products in the United Kingdom.

EMPLOYEES AND HUMAN CAPITAL RESOURCES

As of March 31, 2021, we had six employees, two of whom are full-time and three of whom have Ph.D. degrees. Only our Chief Scientist has received cash compensation prior to this offering. Three employees are engaged part-time primarily in research and development and quality systems, and three are engaged in business development, finance, legal, and general management and administration. We supplement the efforts of our employees by use of consultants and advisors. We have identified additional management and professionals that are expected to join us upon completion of this offering. None of our employees is represented by labor unions or covered by collective bargaining agreements. We consider our relationship with our employees to be good.

Our human capital is integral to helping us achieve our goal to change how cancer is treated both as a therapeutic modality and in terms of improving patient outcomes. Our human capital resources objectives include, as applicable, identifying, recruiting, retaining, incentivizing and integrating our existing and additional employees. The principal purposes of our equity incentive plans are to attract, retain and motivate selected employees, consultants and directors through the granting of stock-based compensation awards and cash-based performance bonus awards.

FACILITIES

Our corporate address is 6 Liberty Square, #2382, Boston, Massachusetts. As of March 1, 2021, we commenced leasing approximately 2,500 square feet of laboratory space from Massachusetts Biomedical Initiatives, Inc. in Worcester, Massachusetts.

LITIGATION

We are not involved in any litigation, and we are not aware of any threatened legal actions against us.

MANAGEMENT

Directors, Executive Officers and Significant Employees

The following table and text set forth the names and ages of our current directors, executive officers and significant employees as of March 31, 2021. Our board of directors comprises only one class. All directors serve until the next annual meeting of stockholders or until their successors are elected and qualified, or until their earlier death, retirement, resignation or removal. There are no family relationships among any of the directors and executive officers.

Name	Age	Position	Committees *
Executive Officers			
Robert Michael Dudley	71	Co-Founder, President, Chief Executive Officer, Director	3
Thomas A. Fitzgerald, MBA	70	Vice President, Chief Financial Officer, Director	
Key Employees and Advisors			
Zdravka Medarova, PhD	46	Co-Founder and Vice President Drug Discovery	
Judy Carmody, PhD	54	Vice President of Operations	
Qiyong Peter Liu, PhD	57	Chief Scientist	
Anna Moore, PhD	59	Co-Founder, Scientific Advisor	
Non-Employee Directors			
Philippe P. Calais, PhD	61	Independent Director, Chairman of the Board of Directors	1, 2
Erik Manting, PhD	49	Independent Director	1, 2, 3
Magda Marquet, PhD	61	Independent Director	1, 2, 3

(1) Member of the Audit Committee

(2) Member of the Compensation Committee

(3) Member of the Nomination and Corporate Governance Committee

Executive Officers

Robert Michael Dudley has served as Co-Founder, Chief Executive Officer and Director of TransCode since January 2016. Prior to founding TransCode, Mr. Dudley co-founded and was CEO and Chairman of Artemes Technologies, Inc. a Boston-based drug delivery technology company that specialized in customized drug delivery systems for injectable medications, from June 2012 to October 2015. Previously, he held executive level leadership positions with industry leaders in medical devices for imaging, drug delivery, and surgical applications. He has additional experience in the diagnostic industry and web based clinical trial applications as well as patient monitoring and information systems for hospitals. Mr. Dudley began his career as a Cancer Research Associate at Harvard Medical School conducting immunology and biochemistry research in the field of tumor-associated blocking factors in breast cancer from April 1973 to December 1975. Mr. Dudley obtained a B.S. degree in Biological Sciences with a concentration in Immunology and Chemistry from Kent State University in Kent, Ohio. We believe Mr. Dudley is qualified to serve on our board of directors because of the perspective and experience he brings as our Chief Executive Officer, his educational background and his strong scientific knowledge.

Thomas A. Fitzgerald, MBA has served as Chief Financial Officer and Director of TransCode since July 2018 (initially part-time and substantially full-time since January 2020). From August 2006 to December 2018 (the last 15 months on a half-time basis), he served as Chief Financial Officer of Velico Medical, Inc. Prior to Velico Medical, his experience included serving as founding Managing Director of the Corporate Finance/Investment Banking unit of SVB Leerink LLC (f/k/a Leerink Swann & Company),

a healthcare investment banking firm. Mr. Fitzgerald served in the U.S. Army, including nearly two years as an airborne-qualified infantry officer. He received an A.B. in Economics with Honors from Stanford University and an M.B.A. from the Harvard University Graduate School of Business Administration. We believe Mr. Fitzgerald is qualified to serve on our board of directors because he brings extensive experience as a senior financial executive in the life sciences industry.

Key Employees and Advisors

Zdravka Medarova, PhD has served as Scientific Co-Founder and a member of the advisory board of TransCode since January 2016 and is anticipated to join the company full-time as Vice President — Drug Discovery upon completion of this offering. Dr. Medarova has been on the Faculty of Harvard Medical School and MGH since June 2007 and will continue in that capacity on a part time basis after joining TransCode. She has served as an Associate Professor of Radiology at Harvard Medical School from April 2016 and as an Assistant in Neuroimaging at the Athinoula A. Martinos Center for Biomedical Imaging at MGH since June 2007. After the public offering has been completed, Dr. Medarova intends to join TransCode fulltime as the Chief Technology Officer. Dr. Medarova is a geneticist/cancer biologist by training. Dr. Medarova is internationally recognized for her work on non-coding RNA for cancer therapy. She is one of the first to describe the design and application of nanoparticles as carriers of siRNA to tumors. Since then, her research has focused on developing nanotechnology and imaging tools to better understand cancer initiation and progression and applying this knowledge to design clinically relevant therapeutic and diagnostic agents against cancer. Dr. Medarova obtained a B.A. in pre-medicine from the University of Southern Maine in September 1998 and a Ph.D. in Genetics from the University of New Hampshire in December 2002.

Judy Carmody, PhD has served as Vice President of Operations of TransCode since August 2019. Previously, Dr. Carmody was the founder and Principal Consultant of Carmody Quality Solutions, LLC (CQS) from August 2015 to present. Prior to CQS, Dr. Carmody held top leadership positions at several pharma/biopharma companies where she established corporate quality culture and provided quality oversight of internal and external operations. Previously, she was the Director of CMC and Quality by Design at Vertex Pharmaceuticals from June 2010 to November 2011. Dr. Carmody holds a Ph.D. in Analytical Chemistry from Clark University in Worcester, Massachusetts.

Qiyong Peter Liu, PhD has served as our Chief Scientist since May 2020. Dr. Liu earned his doctoral degree in organic chemistry at Brown University and has over 20 years of R&D experience & leadership in the biopharma industry. He has in-depth knowledge and expertise in bioconjugation chemistry, nucleic acid chemistry, and blood product development. His scientific achievements include the co-discovery and development of novel enzymes for the production of universal red blood cells. He has co-invented over 20 US patents and applications on novel enzymes, xenotransplantation, platelet, plasma, and universal red blood cells. From October 2000 until October 2020, Dr. Liu was employed in various scientific positions at Velico Medical, Inc. His post-doctoral training was at Harvard University in the Department of Molecular and Cellular Biology focusing on biochemistry and molecular biology.

Anna Moore, PhD has served as our Co-Founder and Scientific Advisor since January 2016. Dr. Moore has served as a Professor of Radiology and Physiology; Director, Precision Health Program and Assistant Dean, College of Human Medicine at Michigan State University since January 1, 2018. Prior to joining Michigan State University, Dr. Moore was Professor of Radiology at Harvard Medical School from September 1991 to December 2017 and the Director of the Molecular Imaging Laboratory at the Athinoula A. Martinos Center for Biomedical Imaging at Massachusetts General Hospital from September 1991 to December 2017. She is a past member of the Board of Trustees of the World Molecular Imaging Society (WMIS) and a past member of the Executive Committee of WMIS. She has served as the Regional (US) Editor for Molecular Imaging and Biology, the official journal of WMIS, since July 2015. Dr. Moore holds a Ph.D. in Bioorganic Chemistry from the Russian Academy of Sciences, Moscow, Russia.

Non-Employee Directors

Philippe P. Calais, Pharm D, PhD has served as a member of our board of directors since October 2018 and was elected chairman of the board in January 2021. Dr. Calais has over 30 years of biotech and pharmaceutical industry experience both in North America and Europe, and is the President, Chief Executive

Officer and Director at MatriSys Bioscience, Inc. He is Chairman of the Board of Directors of Phileas Pharma, Inc., an oligonucleotide company he founded in May 2019. Previously, Dr. Calais served as the president and chief executive officer of Isarna Therapeutics B.V., a developer of oligonucleotide therapeutics in Germany, the Netherlands and the United States from March 2012 to June 2018. Dr. Calais was a director of CohBar, Inc. (Nasdaq: CWBR) from June 2018 to June 2020 and was the company's interim CEO from December 2019 to May 2019. Prior to Isarna Therapeutics, Dr. Calais was the President and CEO of Univalor, a Canadian technology transfer organization, from April 2011 to February 2012. He is also an Economic Advisor to the French government since 2013. Dr. Calais served as Chief Executive Officer, President and Director of Ambrilia Biopharma, Inc., (TSE: AMB) from January 2008 to July 2009. He served as President Global Business of Neurochem Inc from January 2003 to December 2007, focusing on corporate strategic positioning and company deployment. He served as Chairman of the Board of Neurochem International, a wholly owned subsidiary of Neurochem inc. (Nasdaq: NRMX) from March 2003 to December 2007. He was an Independent Director at Marina Biotech, Inc. (OTCBB: MRNX) from January 2017 until May 2018, and its Lead Independent Director since October 2017. He served as a board member of Autotelic Inc. from June 2016 to June 2018. He served as Director of Canada's Research Based Pharmaceutical Companies from 2002 to 2011; the Cité des Biotechs de Laval from February 2002 to February 2012; Cognisense from December 2010 to February 2012 and Medpharmgene from January 2011 to February 2012. Dr. Calais holds a bachelor's degree in pharmacy and a Doctor of Pharmacy from the Universite Francois-Rabelais in Tours, France. We believe that Dr. Calais is qualified to serve on our board of directors due to his management experience in the pharmaceutical and biotherapeutics industries and his experience as an executive officer and board member of several biotechnology companies.

Erik Manting, PhD has served on our board of directors since December 2020. Dr. Manting served as Managing Director and Chief Executive Officer of DCPrime BV, an immuno-oncology company based in the Netherlands, from March 2018 until DCPrime's December 2020 merger with Immunicum AB, a listed Swedish biotechnology company. Dr. Manting currently serves as Chief Executive Officer of Immunicum. He has also served as a supervisory board member of Synerkine Pharma BV, a biopharmaceutical company, since March 2019 and as founder of BioEntrepreneur BV, a consulting company, since September 2017. Prior to that, he served as executive director of life sciences and healthcare at Kempen & Co, an investment bank, from October 2012 to September 2017. We believe that Dr. Manting is qualified to serve on our board of directors due to his extensive commercial and managerial experience in banking and as an executive officer and board member of several biotechnology companies.

Magda Marquet, PhD has served on our board of directors since January 2021. Dr. Marquet is an experienced life sciences entrepreneur who has built, led and commercialized multiple life sciences companies. She has served as co-founder and co-chief executive officer of ALMA Life Sciences LLC, an early-stage healthcare investment firm, since 2013. Dr. Marquet also has been a co-founder of AltheaDx, a biotechnology company, since 2009. Dr. Marquet previously served as the co-founder and chairman of Althea Technologies, a biotechnology company, from 2009 to 2019, and previously served as its co-president and co-chief executive officer from 1998 to 2009. Prior to starting Althea Technologies, Dr. Marquet held several positions in product development and pharmaceutical development in companies such as Vical and Amylin Pharmaceuticals. She currently serves on the board of directors of Arcturus Therapeutics (Nasdaq: ARCT) and AnaptysBio (Nasdaq: ANAB) and several private companies. She also served on the board of Pfenex Inc. (Nasdaq: PFNX) from March 2019 until its acquisition by Ligand Pharmaceuticals in October 2020. In addition, she is the chairperson of the boards of Micronoma, Matrisys Biosciences and ProciseDx. Dr. Marquet holds a Ph.D in Biochemical Engineering from INSA/University of Toulouse, France. We believe that Dr. Marquet is qualified to serve on our board of directors due to her significant experience as an executive and director of a number of companies in the life sciences sector, and because of her management and clinical expertise.

Board Structure and Role in Risk Oversight

The authorized number of our board of directors is set at five, and currently contains five members. Our board of directors has determined that Drs. Calais, Manting and Marquet do not have a relationship that would interfere with the exercise of independent judgment in carrying out the responsibilities of the director and that each of these directors is "independent" as that term is defined under the rules of the Nasdaq Capital Market. There are no family relationships among any of our directors or executive officers.

In accordance with our restated certificate of incorporation and amended and restated bylaws that will go into effect upon the closing of this offering, our board of directors will be elected once a year.

Our restated certificate of incorporation that will go into effect upon the closing of this offering will provide that the authorized number of directors may be changed only by resolution of the board of directors.

In selecting board members, our board may consider many factors, such as personal and professional integrity, ethics and values; experience in corporate management, such as serving as an officer or former officer of a publicly held company or a company comparable to ours; experience as a board member or executive officer of another publicly held company or a company comparable to ours; diversity of expertise and experience in substantive matters pertaining to our business relative to other board members; and diversity of background and perspective, including, but not limited to, with respect to age, gender, race, place of residence and specialized experience.

Our board of directors does not have a policy as to whether the roles of our chairman and chief executive officer should be separate. Instead, our board of directors makes this determination based on what best serves our company's needs at any given time. Currently, Mr. Dudley serves as our President and Chief Executive Officer while Dr. Calais serves as Chair of our board of directors.

In its governance role, and particularly in exercising its duty of care and diligence, the board of directors is responsible for ensuring that appropriate risk management policies and procedures are in place to protect the company's assets and business. Our board of directors has broad and ultimate oversight responsibility for our risk management processes and programs and executive management is responsible for the day-to-day evaluation and management of risks to the company.

Board Composition, Committees, and Independence

Under the Nasdaq rules, "independent" directors must make up a majority of a listed company's board of directors. In addition, applicable rules require that, subject to specified exceptions, each member of a listed company's audit and compensation committees be independent within the meaning of applicable rules. Audit committee members must also satisfy the independence criteria set forth in Rule 10A-3 under the Exchange Act.

Our board of directors has undertaken a review of the independence of each director and considered whether any director has a material relationship with us that could compromise his ability to exercise independent judgment in carryout out his responsibilities. As a result of this review, our board of directors determined that Drs. Calais, Manting and Marquet are independent directors as defined in the Nasdaq listing standards and SEC rules and regulations. A majority of our directors are independent, as required under applicable Nasdaq rules. As required under applicable Nasdaq rules, our independent directors will meet in regularly scheduled executive sessions at which only independent directors are present. Upon the completion of this offering, we expect that the composition and functioning of our board of directors and each of our committees will comply with all applicable requirements of The Nasdaq Capital Market and the rules and regulations of the SEC, subject to applicable phase-in periods. Under Nasdaq listing rule 5615(b)(1), a company listing in connection with its initial public offering is permitted to phase in its compliance with the independent committee requirements, the committee composition requirements and the majority independent board requirement. We intend to rely on the phase-in schedules set forth in Nasdaq listing rule 5615(b)(1) with respect to certain of our committees as set forth below. There are no family relationships among any of our directors or executive officers. Robert Michael Dudley is not an independent director under these rules because he is an executive officer of our company.

Board Committees

Our board of directors will establish an audit committee, a compensation committee and a nominating and corporate governance committee, each of which will operate pursuant to a charter to be adopted by our board of directors and will be effective upon the effectiveness of the registration statement of which this prospectus forms a part. 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.

Following the consummation of this offering, the full text of our audit committee charter, compensation committee charter and nominating and corporate governance charter will be posted on the investor relations portion of our website at www.transcodetherapeutics.com. We do not incorporate the information contained on, or accessible through, our corporate website into this prospectus, and you should not consider it a part of this prospectus.

Audit Committee

Upon the effectiveness of the registration statement of which this prospectus forms a part, our audit committee will consist of Philippe Calais, Erik Manting and Magda Marquet and will be chaired by Philippe Calais. Our board of directors has determined that each member of the audit committee is "independent" for audit committee purposes as that term is defined in the rules of the SEC and the applicable Nasdaq rules, and each of the committee members has sufficient knowledge in financial and auditing matters to serve on the audit committee. The functions of the audit committee will 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 financial statements;
- reviewing and discussing with management and our independent registered public accounting firm our annual and quarterly 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 and enterprise-wide risk management;
- 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 financial statements shall be included in our Annual Report on Form 10-K;
- monitoring the integrity of our financial statements and our compliance with legal and regulatory requirements as they relate to our 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 person 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 listing rules. Our board of directors has determined that Dr. Calais qualifies as an "audit committee financial expert" within the meaning of applicable SEC regulations. In making this determination, our board of directors considered the nature and scope of experience that Dr. Calais has previously had with public reporting companies and experience in financial transactions. Our board of directors has determined that all of the directors that will become members of our audit committee upon the effectiveness of the registration statement of which this prospectus forms a part satisfy the relevant independence requirements for service on the audit committee set forth in the rules of the SEC and the listing rules. Both our independent registered public accounting firm and management will periodically meet privately with our audit committee.

Compensation Committee

Upon the effectiveness of the registration statement of which this prospectus forms a part, our compensation committee will consist of Magda Marquet, Erik Manting and Philippe Calais and will be chaired by Magda Marquet. Our board of directors has determined that each member of the compensation committee is "independent" as defined in the applicable Nasdaq rules. The functions of the compensation committee will 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 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 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 advisor 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).

Nominating and Corporate Governance Committee

Upon the effectiveness of the registration statement of which this prospectus forms a part, our nominating and corporate governance committee will consist of Erik Manting, Magda Marquet, and Robert Michael Dudley and will be chaired by Erik Manting. Our board of directors has determined that each of Dr. Marquet and Dr. Manting is "independent" as defined in the applicable Nasdaq rules. Mr. Dudley is not "independent" and we are relying on the phase-in schedules set forth in Nasdaq listing rule 5615(b)(1) with respect to Mr. Dudley's service on the nominating and corporate governance committee. The functions of the nominating and corporate governance committee will 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.

Our board of directors may from time to time establish other committees.

Compensation Committee Interlocks and Insider Participation

None of the members of our compensation committee is, or has at any time during the prior three years been, one of our officers or employees. None of our executive officers currently serves, or has in the past fiscal year served, as a member of the board of directors or compensation committee of any entity that has one or more of its executive officers serving as a member of our board of directors or our compensation committee.

Code of Business Conduct and Ethics

Our board of directors has adopted a Code of Business Conduct and Ethics, or Code, that applies to all of our directors, officers and employees, including our principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions, agents, representatives and consultants. Any waivers of any provision of this Code for our directors or officers may be granted only by the board of directors or a committee appointed by the board of directors. Any waivers of any provisions of this Code for an employee or a representative may be granted only by our chief executive officer or principal accounting officer. Upon our listing on the Nasdaq Capital Market, our code of business conduct and ethics will be available under the Corporate Governance section of our website at www.transcodetherapeutics.com.

Limitations on Liability and Indemnification Agreements

We intend to execute a standard form of indemnification agreement ("Indemnification Agreement") with each of our board members and executive officers (each, an "Indemnitee"). Pursuant to and subject to the terms, conditions and limitations set forth in the Indemnification Agreement, we intend to indemnify each Indemnitee, against any and all expenses incurred in connection with the Indemnitee's service as our officer, director and or agent, or is or was serving at our request as a director, officer, employee, agent or advisor of another corporation, partnership, joint venture, trust, limited liability company, or other entity or enterprise but only if the Indemnitee acted in good faith and in a manner he reasonably believed to be in or not opposed to our best interest, and in the case of a criminal proceeding, had no reasonable cause to believe that his conduct was unlawful. In addition, the indemnification provided in the indemnification agreement will be applicable whether or not negligence or gross negligence of the Indemnitee is alleged or proven. Additionally, the Indemnification Agreement will establish processes and procedures for indemnification claims, advancement of expenses and costs and contribution obligations.

As permitted by Delaware law, provisions in our amended and restated certificate of incorporation and amended and restated bylaws, both of which will become effective upon the closing of this offering, 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 with the company from which the director derived an improper personal benefit.

These limitations of liability do not limit or eliminate our rights or rights of any stockholder 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 that will become effective upon the closing of this offering 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 to be effective upon the consummation of this offering will 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.

In addition to the indemnification to be provided in our amended and restated certificate of incorporation and amended and restated bylaws, we plan to enter into separate 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 or her 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 the registration statement of which this prospectus forms a part.

Insofar as indemnification for liabilities arising under 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.

Legal Proceedings

We are not aware of any of our directors or officers being involved in any legal proceedings in the past 10 years relating to bankruptcy, insolvency or criminal proceedings (other than traffic and other minor offenses) or being subject to any of the items set forth under Item 401(f) of Regulation S-K.

Advisory team

We have recruited an Advisory Board and consultants with expertise in key aspects of oncology therapeutics. We believe our advisors and consultants are widely recognized experts in their fields. They provide guidance with respect to Regulatory Affairs, CMC (Oligonucleotides, Nanoparticles), Clinical Trial design and implementation, Legal, Human Resources, Finance, Business Strategy as well as Marketing/ Public Relations.

EXECUTIVE COMPENSATION

Executive Compensation Overview

As an emerging growth company under the JOBS Act, we have opted to comply with the executive compensation disclosure rules applicable to "smaller reporting companies."

Since inception, we have not paid salary or bonus to our executive officers, members of our board of directors or any of our employees other than our Chief Scientist nor have we sponsored any health, welfare or retirement benefit plans. We have provided these individuals with the opportunity to purchase shares of restricted stock generally at fair value as of the date of issuance and, beginning in 2020, have awarded stock options as discussed elsewhere in this prospectus. 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.

This section discusses the material components of the executive compensation program for our executive officers who in the year ended December 31, 2020, comprised our "named executive officers." The individuals and their positions were:

- Robert Michael Dudley, President and Chief Executive Officer
- Thomas A. Fitzgerald, Vice President and Chief Financial Officer

This discussion may contain forward-looking statements that are based on our current plans, considerations, expectations and determinations regarding future compensation programs. Actual compensation programs that we adopt following the completion of this offering may differ materially from the currently planned programs summarized in this discussion.

Proposed Compensation Arrangements Following Completion of this Offering

Base Salaries

We use base salaries to recognize the experience, skills, knowledge and responsibilities required of all our employees, including the named executive officers employed by the company. Our named executive officers were not paid base salary in the fiscal year ended December 31, 2020, or in any period prior to the date of this prospectus. Beginning with the closing of this offering, the annual base salaries for Mr. Dudley and Mr. Fitzgerald have been set at $480,000 and $360,000, respectively. We anticipate that we will generally review base salaries annually in connection with our annual performance review process, and they may be adjusted from time to time to realign salaries with market levels after taking into account individual responsibilities, performance and experience.

Annual Bonuses

Our named executive officers were not paid bonuses for the fiscal year ended December 31, 2020, or for any period prior to the date of this prospectus. Beginning with the closing of this offering, bonus targets as a percentage of their base salaries for Mr. Dudley and Mr. Fitzgerald are 50% and 35%, respectively, with the actual amount of such bonuses to be based on achievement of company and individual performance metrics.

Equity Compensation

Although we do not yet have a formal policy with respect to the grant of equity incentive awards to our executive officers, we believe that equity grants provide our executives with a strong link to our long-term performance, create an ownership culture and help to further align the interests of our executives and our stockholders. In addition, we believe that equity grants with a time-based vesting feature promote executive retention because this feature incentivizes 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 named executive officers and from time to time may grant equity incentive awards to them. During

2020, we adopted our 2020 Stock Option and Incentive Plan under which we granted stock options to purchase shares of our common stock as described in more detail elsewhere in this prospectus.

Employment Arrangements with our Named Executive Officers

We have entered into written employment agreements with our named executive officers, each of whom has also executed our standard form of confidential information and invention assignment agreement. The employment agreements become effective upon the company's receipt of gross proceeds of $5 million or more from issuances of equity or convertible debt or from partnering arrangements, which we expect to occur upon completion of this offering. The term of each agreement is for three years with automatic renewal on each anniversary of the agreement unless terminated by either party as provided in the agreement. If termination of the agreement is by the company for any reason other than for cause, death or disability or by the executive other than for good reason, upon receipt by the company from the executive of an unrevoked release agreement, then (i) the company shall pay the executive's base salary for a period of 18 months, bonus for the same period (or an amount equal to the bonus payment in the year prior to termination, if greater) and health insurance premiums for a period of 12 months, and (ii) vesting of the executive's unvested shares and options shall cease as of the date of termination. If such termination by the company for any reason other than for cause, death or disability or by the executive other than for good reason occurs within 18 months following or three months preceding a change of control transaction, then (i) the company shall pay (w) the executive's base salary for a period of 24 months, (x) bonus for the same period, (y) health insurance premiums for the same period and (z) an amount equal to any bonus award previously accrued, allocated, earned or awarded, or that would have accrued for that number of months (not to exceed 24) since the most recently paid bonus, if any, but which amount has not yet been paid, and (ii) vesting of the executive's unvested shares and options shall accelerate as of the date of termination such that such shares and options shall be fully vested.

Outstanding Equity Awards at 2020 Fiscal Year-End

The following table sets forth information regarding outstanding equity awards held by our named executive officers as of December 31, 2020. It assumes an initial public offering price of $9.00 per share (the midpoint of the price range set forth on the cover page of this prospectus).

			Option Awards					Stock Awards	
Name	Grant Date	Vesting Commencement Date	Number of Securities Underlying Unexercised Options (#) Exercisable	Number of Securities Underlying Unexercised Options (#) Unexercisable	Equity Incentive Plan Awards: Number of Securities Underlying Unexercised Unearned Options (#)	Option Exercise Price ($)	Option Expiration Date	Number of Shares or Units of Stock That Have Not Vested	Market Value of Shares or Units of Stock That Have Not Vested ($)
Robert Michael Dudley[1]	2/01/2016	2/1/2016	—	—	—	—	—	—	—
Co-Founder, President and Chief Executive Officer	8/17/2016	8/17/2016	—	—	—	—	—	—	—
	6/12/2017	6/12/2017	—	—	—	—	—	—	—
	6/19/2020	1/1/2020	272,950[2]	545,901[2]	545,901	$0.09	6/18/2025	—	—
Thomas A. Fitzgerald	7/01/2018	7/1/2018	—	—	—	—	—	21,229	$191,061
Vice President and Chief Financial Officer	6/19/2020	1/1/2020	80,874[2]	161,749[2]	161,749	$0.08	6/18/2030	—	—

(1) As of December 31, 2020, all shares of restricted stock held by Mr. Dudley were completely vested.

(2) Of the shares subject to this stock option, thirty-three percent (33%) vested as of the Vesting Commencement Date and the remainder vest in twenty-four (24) equal monthly installments on the

last day of each month beginning with the month of the first anniversary of the Vesting Commencement Date, subject to the named executive officer's continued service with us through the applicable vesting date.

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.

Employee Benefit and Equity Compensation Plans

2020 Stock Option and Incentive Plan

Our 2020 Stock Option and Incentive Plan, or the 2020 Plan, was adopted by the Board of Directors and approved by the stockholders on April 15, 2020. The company reserved 3,032,787 shares of common stock for issuance under the Plan, of which options to purchase 1,792,672 shares of our common stock are outstanding. The number of shares of common stock reserved for issuance is subject to adjustment in the event of any merger, consolidation, sale of all or substantially all of our assets, reorganization, recapitalization, reclassification, stock dividend, stock split, reverse stock split or other similar transaction.

The shares of common stock underlying awards that are forfeited, canceled, reacquired by us prior to vesting, satisfied without the issuance of stock or otherwise terminated (other than by exercise) and shares of common stock that are withheld upon exercise of an option or settlement of an award to cover the exercise price or tax withholding are currently added back to the shares of common stock available for issuance under the 2020 Plan. Following this offering, no additional options will be awarded from the 2020 Plan.

Our board of directors has acted as administrator of the 2020 Plan. The administrator has full power to select, from among the individuals eligible for awards, the individuals to whom awards will be granted, and to determine the specific terms and conditions of each award, subject to the provisions of the 2020 Plan. Persons eligible to participate in the 2020 Plan are those employees, officers and directors of, and consultants and advisors to, our company as selected from time to time by the administrator in its discretion.

The 2020 Plan permits the granting of (1) options to purchase common stock intended to qualify as incentive stock options under Section 422 of the Code and (2) options that do not so qualify. The per share exercise price of each option is determined by the administrator but may not be less than 100% of the fair market value of the common stock on the date of grant. The term of each option is fixed by the administrator but may not exceed 10 years from the date of grant. The administrator determines at what time or times each option may be exercised. In addition, the 2020 Plan permits the granting of restricted shares of common stock, unrestricted shares of common stock, and restricted stock units.

The 2020 Plan provides that upon the occurrence of a "sale event," as defined in the 2020 Plan, all outstanding stock options will terminate at the effective time of such sale event unless the parties to the sale event agree that such awards will be assumed or continued by the successor entity. In the event of a termination of the 2020 Plan and all options issued thereunder in connection with a sale event, optionees will be provided an opportunity to exercise options that are then exercisable or will become exercisable as of the effective time of the sale event prior to the consummation of the sale event. In addition, we have the right to provide for cash payment to holders of options, in exchange for the cancellation thereof, in an amount per share equal to the difference between the value of the consideration payable per share of common stock in the sale event and the per share exercise price of such options. In the event of, and subject to the consummation of, a sale event, restricted stock and restricted stock units (other than those becoming vested as a result of the sale event) will be forfeited immediately prior to the effective time of a sale event unless such awards are assumed or continued by the successor entity. In the event that shares of restricted stock are forfeited in connection with a sale event, such shares of restricted stock shall be repurchased at a price per share equal to the original per share purchase price of such shares. We have the right to provide for cash

payment to holders of restricted stock or restricted stock units, in exchange for the cancellation thereof, in an amount per share equal to the value of the consideration payable per share of common stock in the sale event.

The board of directors may amend or discontinue the 2020 Plan at any time, subject to stockholder approval where such approval is required by applicable law. The administrator of the 2020 Plan may also amend or cancel any outstanding award, provided that no amendment to an award may adversely affect a participant's rights without his or her consent. The administrator of the 2020 Plan is specifically authorized to exercise its discretion to reduce the exercise price of outstanding stock options or effect the repricing of such awards through cancellation and re-grants.

The 2020 Plan will terminate automatically upon the earlier of 10 years from the date on which the 2020 Plan was initially adopted by our board of directors or 10 years from the date the 2020 Plan was initially approved by our stockholders. Our board of directors has determined not to make any further awards under the 2020 Plan following the closing of this offering.

2021 Stock Option and Incentive Plan

Our 2021 Stock Option and Incentive Plan, or the 2021 Plan, was adopted by our board of directors on March 22, 2021, approved by our stockholders on March 22, 2021 and will become effective upon the date immediately preceding the date on which the registration statement of which this prospectus is part is declared effective by the SEC. The 2021 Plan will replace the 2020 Plan as our board of directors has determined not to make additional awards under the 2020 Plan following the closing of our initial public offering. However, the 2020 Plan will continue to govern outstanding equity awards granted thereunder. The 2021 Plan allows the us to make equity-based and cash-based incentive awards to our officers, employees, directors and consultants.

We have initially reserved 2,500,000 shares of our common stock for the issuance of awards under the 2021 Plan, or the Initial Limit. The 2021 Plan provides that the number of shares reserved and available for issuance under the 2021 Plan will automatically increase on January 1, 2022 and each January 1 thereafter, by 5% of the outstanding number of shares of our common stock on the immediately preceding December 31, or such lesser number of shares as determined by our compensation committee, or the Annual Increase. These limits are subject to adjustment in the event of a stock split, stock dividend or other change in our capitalization.

The shares we issue under the 2021 Plan will be authorized but unissued shares or shares that we reacquire. The shares of common stock underlying any awards under the 2021 Plan and the 2020 Plan that are forfeited, cancelled, held back upon exercise or settlement of an award to satisfy the exercise price or tax withholding, reacquired by us prior to vesting, satisfied without the issuance of stock, expire or are otherwise terminated (other than by exercise) will be added back to the shares of common stock available for issuance under the 2021 Plan.

The maximum aggregate number of shares that may be issued under the 2021 Plan in the form of incentive stock options shall not exceed the Initial Limit, cumulatively increased on January 1, 2022 and on each January 1 thereafter by the lesser of the Annual Increase for such year or 2,500,000 shares of common stock.

The grant date fair value of all awards made under our 2021 Plan and all other cash compensation paid by us to any non-employee director in any calendar year for services as a non-employee director shall not exceed $750,000; provided, however, that such amount shall be $1,000,000 for the calendar year in which the applicable non-employee director is initially elected or appointed to the board of directors.

The 2021 Plan will be administered by our compensation committee. Our compensation committee has full power to select, from among the individuals eligible for awards, the individuals to whom awards will be granted and the number of shares subject to such awards, to make any combination of awards to participants, to accelerate at any time the exercisability or vesting of any award and to determine the specific terms and conditions of each award, subject to the provisions of the 2021 Plan. Persons eligible to participate in the 2021 Plan will be those full or part-time officers, employees, non-employee directors and consultants as selected from time to time by our compensation committee in its discretion.

The 2021 Plan permits the granting of both options to purchase common stock intended to qualify as incentive stock options under Section 422 of the Code and options that do not so qualify. The option exercise price of each option will be determined by our compensation committee but may not be less than 100% of the fair market value of our common stock on the date of grant unless the option is granted (i) pursuant to a transaction described in, and in a manner consistent with, Section 424(a) of the Code or (ii) to individuals who are not subject to U.S. income tax. The term of each option will be fixed by our compensation committee and may not exceed 10 years from the date of grant. Our compensation committee will determine at what time or times each option may be exercised.

Our compensation committee may award stock appreciation rights under the 2021 Plan subject to such conditions and restrictions as it may determine. Stock appreciation rights entitle the recipient to shares of common stock, or cash, equal to the value of the appreciation in our stock price over the exercise price. The exercise price of each stock appreciation right may not be less than 100% of the fair market value of our common stock on the date of grant. The term of each stock appreciation right will be fixed by our compensation committee and may not exceed 10 years from the date of grant. Our compensation committee will determine at what time or times each stock appreciation right may be exercised.

Our compensation committee may award restricted shares of common stock and restricted stock units to participants subject to such conditions and restrictions as it may determine. These conditions and restrictions may include the achievement of certain performance goals and/or continued employment with us through a specified vesting period. Our compensation committee may also grant shares of common stock that are free from any restrictions under the 2021 Plan. Unrestricted stock may be granted to participants in recognition of past services or for other valid consideration and may be issued in lieu of cash compensation due to such participant.

Our compensation committee may grant dividend equivalent rights to participants that entitle the recipient to receive credits for dividends that would be paid if the recipient had held a specified number of shares of our common stock.

Our compensation committee may grant cash bonuses under the 2021 Plan to participants, subject to the achievement of certain performance goals.

The 2021 Plan provides that upon the effectiveness of a “sale event,” as defined in the 2021 Plan, an acquirer or successor entity may assume, continue or substitute outstanding awards under the 2021 Plan. To the extent that awards granted under the 2021 Plan are not assumed or continued or substituted by the successor entity, upon the effective time of the sale event, such awards shall terminate. In such case, except as may be otherwise provided in the relevant award certificate, all awards with time-based vesting, conditions or restrictions shall become fully vested and nonforfeitable as of the effective time of the sale event, and all awards with conditions and restrictions relating to the attainment of performance goals may become vested and nonforfeitable in connection with a sale event in the administrator’s discretion or to the extent specified in the relevant award certificate. In the event of such termination, individuals holding options and stock appreciation rights will be permitted to exercise such options and stock appreciation rights (to the extent exercisable) within a specified period of time prior to the sale event. In addition, in connection with the termination of the 2021 Plan upon a sale event, we may make or provide for a payment, in cash or in kind, to participants holding vested and exercisable options and stock appreciation rights equal to the difference between the per share consideration payable to stockholders in the sale event and the exercise price of the options or stock appreciation rights and we may make or provide for a payment, in cash or in kind, to participants holding other vested awards.

Our board of directors may amend or discontinue the 2021 Plan and our compensation committee may amend or cancel outstanding awards for purposes of satisfying changes in law or any other lawful purpose, but no such action may adversely affect rights under an award without the holder’s consent. Certain amendments to the 2021 Plan require the approval of our stockholders. The administrator of the 2021 Plan is specifically authorized to exercise its discretion to reduce the exercise price of outstanding stock options and stock appreciation rights or effect the repricing of such awards through cancellation and re-grants without stockholder consent. No awards may be granted under the 2021 Plan after the date that is 10 years from the effective date of the 2021 Plan. No awards under the 2021 Plan have been made prior to the date of this prospectus.

2021 Employee Stock Purchase Plan

Our 2021 Employee Stock Purchase Plan, or the ESPP, was adopted by our board of directors on March 22, 2021, approved by our stockholders on 2021 and will become effective on the date immediately preceding the date on which the registration statement of which this prospectus is part is declared effective by the SEC. The ESPP is intended to qualify as an "employee stock purchase plan" within the meaning of Section 423 of the Code. The ESPP initially reserves and authorizes the issuance of up to a total of 150,000 shares of common stock to participating employees. The ESPP provides that the number of shares reserved and available for issuance will automatically increase on January 1, 2022 and each January 1 thereafter through January 1, 2031, by the least of (i) 90,000 shares of common stock, (ii) 1% of the outstanding number of shares of our common stock on the immediately preceding December 31 or (iii) such lesser number of shares of common stock as determined by the administrator of the ESPP. The number of shares reserved under the ESPP is subject to adjustment in the event of a stock split, stock dividend or other change in our capitalization.

All employees whose customary employment is for 20 hours or more per week are eligible to participate in the ESPP. However, any employee who owns 5% or more of the total combined voting power or value of all classes of stock will not be eligible to purchase shares under the ESPP.

We may make one or more offerings each year to our employees to purchase shares under the ESPP. Offerings will usually begin on each January 1 and July 1 and will continue for six-month periods, referred to as offering periods. Each eligible employee may elect to participate in any offering by submitting an enrollment form at least 15 business days before the relevant offering date.

Each employee who is a participant in the ESPP may purchase shares by authorizing payroll deductions of up to 15% of his or her eligible compensation during an offering period. Unless the participating employee has previously withdrawn from the offering, his or her accumulated payroll deductions will be used to purchase shares of common stock on the last business day of the 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, provided that no more than $25,000 worth of common stock (or such other lesser maximum number of shares as may be established by the administrator) may be purchased by any one employee during any offering period. Under applicable tax rules, an employee may purchase no more than $25,000 worth of shares of common stock, valued at the start of the purchase period, under the ESPP in any calendar year.

The accumulated payroll deductions of any employee who is not a participant on the last day of an offering period will be refunded. An employee's rights under the ESPP terminate upon voluntary withdrawal from the plan or when the employee ceases employment with us for any reason.

The ESPP may be terminated or amended by our board of directors at any time. An amendment that increases the number of shares of common stock authorized under the ESPP and certain other amendments require the approval of our stockholders.

Senior Executive Cash Incentive Bonus Plan

On March 22, 2021, our board of directors adopted the Senior Executive Cash Incentive Bonus Plan, or the Bonus Plan. The Bonus Plan provides for annual cash bonus payments based upon the attainment of company and individual performance targets established by our compensation committee. The payment targets will be related to financial, clinical and operational measures or objectives with respect to our company, or the Corporate Performance Goals, as well as individual performance objectives.

Our compensation committee may select Corporate Performance Goals from among the following: cash flow (including, but not limited to, operating cash flow and free cash flow); research and development, publication, clinical and/or regulatory milestones; revenue; corporate revenue; earnings before interest, taxes, depreciation and amortization; net income (loss) (either before or after interest, taxes, depreciation and/or amortization); changes in the market price of our common stock; economic value-added; acquisitions or strategic transactions; operating income (loss); return on capital, assets, equity, or investment; stockholder returns; return on sales; gross or net profit levels; productivity; expense efficiency; margins; operating efficiency; working capital; earnings (loss) per share of our common stock; sales or market shares; operating

income and/or net annual recurring revenue, any of which may be measured in absolute terms, as compared to any incremental increase, in terms of growth, or as compared to results of a peer group, against the market as a whole, compared to applicable market indices and/or measured on a pre-tax or post-tax basis.

Each executive officer who is selected to participate in the Bonus Plan will have a target bonus opportunity set for each performance period. The bonus formulas will be adopted in each performance period by the compensation committee and communicated to each executive. The Corporate Performance Goals will be measured at the end of each performance period after our financial reports have been published or such other appropriate time as the compensation committee determines. If the Corporate Performance Goals and individual performance objectives are met, payments will be made as soon as practicable following the end of each performance period, but not later than 74 days after the end of the fiscal year in which such performance period ends. Subject to the rights contained in any agreement between the executive officer and us, an executive officer must be employed by us on the bonus payment date to be eligible to receive a bonus payment. The Bonus Plan also permits the compensation committee to approve additional bonuses to executive officers in its sole discretion.

DIRECTOR COMPENSATION

The following table presents the total compensation for each person who served as a non-employee member of our board of directors during the year ended December 31, 2020. Other than as set forth in the table and described more fully below, we did not pay any compensation, make any equity awards or non-equity awards to, or pay any other compensation to any of the non-employee members of our board of directors in 2020 for their services as members of the board of directors. Directors who also serve as employees receive no additional compensation for their service as directors.

2020 Director Compensation Table

Name	Fees Earned or Paid in Cash ($)	Option Awards ($)[1]	Total ($)
Philippe P. Calais[2]	—	109,490.25	109,490.25
Erik Manting[2]	—	109,490.25	109,490.25

(1) The amounts reported represent the aggregate grant date fair value of the stock options awarded to our non-employee directors during the fiscal year ended December 31, 2020, calculated in accordance with FASB, ASC Topic 718. Such grant date fair values do not take into account any estimated forfeitures. The assumptions used in calculating the grant date fair value of the stock options reported in this column are set forth in Note 9 of our financial statements included elsewhere in this prospectus. The amounts reported in this column reflect the accounting cost for these stock options and do not correspond to the actual economic value that may be received by our non-employee directors upon the exercise of the stock options or any sale of the underlying shares of common stock.

(2) As of December 31, 2020, Drs. Calais and Manting each held stock options to purchase 36,393 shares of common stock.

Non-Employee Director Compensation Policy

Currently we provide non-employee directors with options to purchase 36,393 shares of our common stock upon their joining our board (“Initial Grant”).

Each Initial Grant vests as follows: 33% vests on the first anniversary of the Vesting Commencement Date (essentially the award date) with the balance of 67% vesting in equal monthly installments beginning the first month after the first anniversary of the Vesting Commencement Date, subject to continued service as a director through the applicable vesting date. Such awards are subject to full accelerated vesting upon a change in control of the company.

Following this offering we intend to adopt a non-employee director compensation policy. We expect this policy will be comprised of an annual cash retainer and equity compensation awards on at least an annual basis.

The grant date fair value of all equity awards and all other cash compensation paid by us to any non-employee director in any calendar year for services as a non-employee director shall not exceed $750,000; provided, however, that such amount shall be $1,000,000 for the calendar year in which the applicable non-employee director is initially elected or appointed to the board of directors.

We will reimburse all reasonable out-of-pocket expenses incurred by non-employee directors in attending meetings of the board of directors and committees thereof and for other company business.

CERTAIN RELATIONSHIPS AND RELATED PARTY TRANSACTIONS

In addition to the compensation arrangements, including employment, termination of employment and change in control arrangements discussed in the sections titled "Management" and "Executive Compensation" and "Director Compensation" the following is a description of each transaction since January 1, 2017, to which we were a party or will be a party, in which:

- the amounts involved exceeded or will exceed the lesser of (i) $120,000 or (ii) one percent of the average of our total assets for the last two completed fiscal years; and
- any of our directors, executive officers or holders of more than 5% of our capital stock, or any member of the immediate family of, or person sharing the household with, the foregoing persons, had or will have a direct or indirect material interest.

Expenses Incurred by Related Parties

Between inception and mid-2018, our major shareholders and co-founders funded certain expenses of the company. The aggregate amount of these expenses remaining unreimbursed at the date of this prospectus is $35,685. We intend to reimburse these amounts shortly after completion of this offering.

Conditional Offer of Employment to Zdravka Medarova

In March 2021 we made a conditional offer of employment to Zdravka Medarova to serve as our Chief Technology Officer at an annualized salary of $345,000 per year. The conditional offer of employment will become effective upon the closing of this offering. Dr. Medarova is our scientific co-founder, serves as our Vice President — Drug Discovery and is the beneficial owner of more than 5% of our outstanding shares of common stock.

Conditional Offer of Employment to Judy Carmody

In March 2021 we made a conditional offer of employment to Judy Carmody to serve as our Senior Vice President of Operations at an annualized salary of $275,000 per year. The conditional offer of employment will become effective upon the closing of this offering. Dr. Carmody and her husband hold a convertible promissory note that will convert into shares of our common stock upon completion of this offering as a result of which they are expected to hold more than 5% of our outstanding shares of common stock.

Indemnification Agreements

In connection with this offering, we intend to enter into new agreements to indemnify our directors and executive officers. These agreements will, among other things, require us to indemnify these individuals for certain expenses (including attorneys' fees), judgments, fines and settlement amounts reasonably incurred by such person in any action or proceeding, including any action by or in our right, on account of any services undertaken by such person on behalf of our company or that person's status as a member of our board of directors to the maximum extent allowed under Delaware law.

Policies and Procedures for Related Party Transactions

Following the completion of this offering, our audit committee will have 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 the lesser of $120,000 or one percent of the average of our total assets at year end for the last two completed fiscal years, and in which a related person has or will have a direct or indirect material interest. Upon completion of this offering, our policy regarding transactions between us and related persons will provide that a related person is 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 any of their immediate family members. Our audit committee charter that we expect to adopt upon completion of this offering is expected to provide that our audit committee will review and approve or disapprove any related party transaction.

PRINCIPAL STOCKHOLDERS

As used in this section, the term "beneficial ownership" with respect to a security is defined by Rule 13d-3 under the Securities Exchange Act of 1934, as amended, as consisting of sole or shared voting power (including the power to vote or direct the vote) and/or sole or shared investment power (including the power to dispose of or direct the disposition of) with respect to the security through any contract, arrangement, understanding, relationship or otherwise, subject to community property laws where applicable.

The following table sets forth, as of March 31, 2021, information concerning the beneficial ownership of shares of our common stock held by our directors, our named executive officers, our directors and executive officers as a group, and each person known by us to be a beneficial owner of more than 5% of our outstanding common stock. Unless otherwise indicated, the business address of each of our directors, executive officers and beneficial owners of more than 5% of our outstanding common stock is c/o TransCode Therapeutics, Inc., 6 Liberty Square, #2382, Boston, Massachusetts 02109. Each person has sole voting and investment power with respect to the shares of our common stock, except as otherwise indicated. Beneficial ownership consists of a direct interest in the shares of common stock, except as otherwise indicated.

The data for Shares Beneficially Owned Prior to Offering comprise 5,707,306 shares of our common stock outstanding as of March 31, 2021, after giving effect to the conversion of all our convertible promissory notes into 1,058,475 shares of our common stock immediately prior to the closing of this offering, and the exercise of warrants to purchase 12,615 shares of our common stock immediately prior to the closing of this offering. The data for Shares Beneficially Owned After Offering comprise Shares Beneficially Owned Prior to Offering and the addition of 2,777,778 shares to be sold in this offering, assuming no exercise by the underwriters of their over-allotment option to purchase additional shares. We have determined beneficial ownership in accordance with the rules of the SEC, which include shares of our common stock issuable upon stock options and other securities convertible into or exercisable for common stock that are currently exercisable or convertible or will be exercisable or convertible within 60 days of March 31, 2021, to be outstanding and to be beneficially owned by the person holding the stock option for the purpose of computing the percentage ownership of that person. We did not deem these shares outstanding, however, for the purpose of computing the percentage ownership of any other person.

	Shares Beneficially Owned Prior to Offering		Shares Beneficially Owned After Offering	
Name and Address of Beneficial Owner(*)	Number	Percent	Number	Percent
5% of Greater Stockholders				
Anna Moore, PhD, Co-Founder, Advisor(1)	1,575,533	27.5%	1,575,533	18.5%
Judy and Patrick Carmody(2)	514,546	8.9%	514,546	6.0%
Named Executive Officers and Directors				
Robert Michael Dudley, Chief Executive Officer, President, and Director(3)	1,250,493	20.5%	1,250,493	14.1%
Zdravka Medarova, PhD, Vice President, Drug Discovery(4)	1,598,279	27.8%	1,598,279	18.7%
Thomas A. Fitzgerald, Vice President, Chief Financial Officer(5)	248,081	4.3%	248,081	2.9%
Philippe Calais, PhD, Director(6)	127,377	2.2%	127,377	1.5%
Erik Manting, PhD, Director(7)	—	—	—	—
Magda Marquet, PhD, Director(7)	—	—	—	—
All Directors and Named Executive Officers as a group (6 persons)	3,224,230	51.3%	3,224,230	35.6%

* Address for all security holders is 6 Liberty Square, #2382, Boston MA 02109

(1) Consists of (i) 1,552,787 shares of common stock and (ii) 22,746 shares of common stock underlying options exercisable within 60 days of March 31, 2021.

(2) Represents the conversion of a convertible promissory note into 457,681 shares of our common stock

upon completion of this offering assuming a closing date of April 30, 2021, and 56,865 shares of common stock underlying options exercisable within 60 days of March 31, 2021.

(3) Consists of (i) 843,114 shares of common stock and (ii) 407,379 shares of common stock underlying options exercisable within 60 days of March 31, 2021.

(4) Consists of (i) 1,552,787 shares of common stock and (ii) 45,492 shares of common stock underlying options exercisable within 60 days of March 31, 2021.

(5) Consists of (i) 127,377 shares of common stock (which includes 10,615 unvested shares of restricted stock subject to time-based vesting) and (ii) 120,704 shares of common stock underlying options exercisable within 60 days of March 31, 2021.

(6) Consists of 127,377 shares of common stock (which includes 31,846 unvested shares of restricted stock subject to time-based vesting); excludes options to purchase 36,393 shares of common stock not exercisable within 60 days of February 15, 2021.

(7) Excludes options to purchase 36,393 shares of common stock not exercisable within 60 days of March 31, 2021.

DESCRIPTION OF CAPITAL STOCK

General

The following description summarizes important terms of our capital stock, the rights of such stock, certain provisions of our Amended and Restated Certificate of Incorporation, our Amended and Restated Bylaws, and certain provisions of Delaware General Corporation Law. This summary does not purport to be complete and is qualified in its entirety by the provisions of our Amended and Restated Certificate of Incorporation, our Amended and Restated Bylaws, and applicable provisions of the Delaware General Corporation Law.

Capital Stock

Upon completion of this offering, our authorized capital stock will consist of 290 million shares of common stock, par value $0.0001 per share, and 10 million shares of preferred stock, par value $0.0001 per share, all of which shares of preferred stock will be undesignated.

As of March 31, 2021, 4,636,216 shares of our common stock (which includes 67,403 shares of unvested restricted stock) were outstanding and held by 14 stockholders of record. This amount does not take into account the conversion of all outstanding convertible promissory notes into common stock simultaneous with the closing of this offering or the exercise of warrants held by one individual. If not exercised prior to completion of this offering, these warrants terminate.

Common Stock

The holders of our common stock are entitled to one vote for each share held on all matters submitted to a vote of our stockholders. The holders of our common stock do not have any cumulative voting rights. Holders of our common stock are entitled to receive ratably any dividends declared by our board of directors out of funds legally available for that purpose, subject to any preferential dividend rights of any outstanding preferred stock. Our common stock has no preemptive rights, conversion rights or other subscription rights or redemption or sinking fund provisions.

In the event of our liquidation, dissolution or winding up, holders of our common stock will be entitled to share ratably in all assets remaining after payment of all debts and other liabilities and any liquidation preference of any outstanding convertible preferred stock. The shares to be issued by us in this offering will be, when issued and paid for, validly issued, fully paid and non-assessable.

Restricted Stock

Shares of our restricted stock are common voting shares that we have issued to directors, officers, employees and advisors as incentive-based equity. Restricted shares generally vest over a period of time of up to four years. Until July 2018, the fair value of our common stock as of the date of grant was determined by the board of directors who considered, among other things, anticipated cash flows, the lack of marketability of the shares, our uncertain business prospects, our current and anticipated operating losses, and the market value of equity interests in companies engaged in businesses similar to ours. In November 2018, we obtained an independent appraisal of the fair value of the common stock as of June 30, 2018, and in March 2020, an independent appraisal as of December 31, 2019. In December 2020, we obtained an independent appraisal as of October 1, 2020.

Treasury Stock

In June 2017, we repurchased 594,426 shares of common stock from two co-founders, who were also directors, for subsequent issue, along with other shares, to our President and Chief Executive Officer. In December 2017, we repurchased 1,024,778 shares from two different directors who had resigned from our board in November 2017. Repurchased shares were added to the treasury pending reissuance.

Preferred Stock

Upon the consummation of this offering, our board of directors will have the authority, without further action by our stockholders, to issue up to 10 million shares of preferred stock in one or more series

and to fix the rights, preferences, privileges and restrictions thereof. These rights, preferences and privileges could include dividend rights, conversion rights, voting rights, terms of redemption, liquidation preferences, sinking fund terms and the number of shares constituting, or the designation of, such series, any or all of which may be greater than the rights of common stock. The issuance of our preferred stock could adversely affect the voting power of holders of common stock and the likelihood that such holders will receive dividend payments and payments if we liquidate. In addition, the issuance of preferred stock could have the effect of delaying, deferring or preventing a change in control of our company or other corporate action. Immediately after consummation of this offering, no shares of preferred stock will be outstanding, and we have no present plan to issue any shares of preferred stock.

Stock Options

In April 2020, the company adopted the 2020 Plan which provided for awards to purchase up to 3,032,787 shares of our common stock. The purpose of the 2020 Plan has been to encourage and enable our officers, employees, directors, consultants and other key persons (including prospective employees, but conditioned on their employment) upon whose judgment, initiative and efforts the company largely depends for the successful conduct of its business, to acquire a proprietary interest in the company. As of March 31, 2021, options to purchase an aggregate of 1,792,672 shares of our common stock were outstanding of which 636,942 were exercisable at that date.

Warrants

In 2018, we agreed to issue warrants to purchase shares of our common stock in consideration for finder's services in connection with a sale of one of our convertible promissory notes. The number of shares of common stock subject to the warrants is equal to five percent of the number of shares of common stock into which the related note converts. The exercise price is the conversion price applicable to conversion of such note. The number of shares of common stock to be issued to the holder of such note on conversion of such note is equal to the then-outstanding principal amount of such note, plus accrued but unpaid interest to the date of conversion, divided by the applicable conversion price. The applicable conversion price is equal to the price paid for the company's equity securities in a Qualified Financing (as defined in the applicable note) less a discount. The discount ranges from 20% to 30% depending on the length of time after the investor's purchase of the note to complete the Qualified Financing. Exercise of the purchase rights represented by the warrant may be made, in whole or in part, at any time or from time to time until May 2, 2028, except that the warrant terminates on an initial public offering of the company's common stock or a change in control.

Upon closing of this offering, we have agreed to issue as compensation to the representative warrants, or the representative's warrants, to purchase up to 138,888 shares of common stock (5% of the aggregate number of shares of common stock sold in this offering exclusive of the over-allotment option). The representative's warrants will be exercisable at a per share exercise price equal to 125% of the public offering price per share in this offering. The representative's warrants are exercisable at any time and from time to time, in whole or in part, during the four and one half year period commencing 180 days from the effective date of the registration statement of which this prospectus is a part.

Convertible Promissory Notes Payable

At various times between May 2018 and May 2020, we sold $2,240,000 of interest-bearing, unsecured convertible promissory notes, or Notes, to nine investors. The interest rate on the Notes is 6% per annum. Upon the consummation of a Qualified Financing (as defined in the Notes documents), all of the outstanding principal together with accrued but unpaid interest on the Notes shall be automatically converted into shares of the class or series of our capital stock sold in the Qualified Financing. We expect this offering to comprise a Qualified Financing and that the Notes will therefore automatically convert into 1,058,475 shares of our common stock simultaneous with the closing of this offering assuming such closing occurs on April 30, 2021.

Anti-Takeover Effects of our Certificate of Incorporation and Bylaws and Delaware Law

Our certificate of incorporation and bylaws that will be in effect on the completion of this offering will include a number of provisions that may have the effect of delaying, deferring or preventing another party

from acquiring control of us and encouraging persons considering unsolicited tender offers or other unilateral takeover proposals to negotiate with our board of directors rather than pursue non-negotiated takeover attempts. These provisions include the items described below.

Board Composition and Filling Vacancies

Our certificate of incorporation also provides that directors may be removed only for cause and then only by the affirmative vote of the holders of at least two-thirds or more of the shares then entitled to vote at an election of directors. Furthermore, any vacancy on our board of directors, however occurring, including a vacancy resulting from an increase in the size of our board, may only be filled by the affirmative vote of a majority of our directors then in office even if less than a quorum. The limitations on removal of directors and treatment of vacancies has the effect of making it more difficult for stockholders to change the composition of our board of directors.

No Written Consent of Stockholders

Our certificate of incorporation will provide that all stockholder actions are required to be taken by a vote of the stockholders at an annual or special meeting, and that stockholders may not take any action by written consent in lieu of a meeting. This limit may lengthen the amount of time required to take stockholder actions and would prevent amendment of our bylaws or removal of directors by our stockholders without holding a meeting of stockholders.

Meetings of Stockholders

Our certificate of incorporation and bylaws will provide that only a majority of the members of our board of directors then in office may call special meetings of stockholders and only those matters set forth in the notice of the special meeting may be considered or acted upon at a special meeting of stockholders. Our bylaws will limit the business that may be conducted at an annual meeting of stockholders to those matters properly brought before the meeting.

Advance Notice Requirements

Our bylaws will establish advance notice procedures with regard to stockholder proposals relating to the nomination of candidates for election as directors or new business to be brought before meetings of our stockholders. These procedures provide that notice of stockholder proposals must be timely given in writing to our corporate secretary prior to the meeting at which the action is to be taken. Generally, to be timely, notice must be received at our principal executive offices not less than 90 days nor more than 120 days prior to the first anniversary date of the annual meeting for the preceding year. Our bylaws specify the requirements as to form and content of all stockholders' notices. These requirements may preclude stockholders from bringing matters before the stockholders at an annual or special meeting.

Amendment to Certificate of Incorporation and Bylaws

Any amendment of our certificate of incorporation must first be approved by a majority of our board of directors, and if required by law or our certificate of incorporation, must thereafter be approved by a majority of the outstanding shares entitled to vote on the amendment and a majority of the outstanding shares of each class entitled to vote thereon as a class, except that amendment of the provisions relating to stockholder action, board composition, and limitation of liability must be approved by not less than two-thirds of the outstanding shares entitled to vote on the amendment, and not less than two-thirds of the outstanding shares of each class entitled to vote thereon as a class. Our bylaws may be amended by the affirmative vote of a majority of the directors then in office, subject to any limitations set forth in the bylaws; and may also be amended by the affirmative vote of a majority of the outstanding shares entitled to vote on the amendment, voting together as a single class, except that the amendment of the provisions relating to notice of stockholder business and nominations and special meetings must be approved by not less than two-thirds of the outstanding shares entitled to vote on the amendment, and not less than two-thirds of the outstanding shares of each class entitled to vote thereon as a class, or, if our board of directors recommends that the stockholders approve the amendment, by the affirmative vote of the majority of the outstanding shares entitled to vote on the amendment, in each case voting together as a single class.

Undesignated Preferred Stock

Our certificate of incorporation will provide for 10 million authorized shares of preferred stock. The existence of authorized but unissued shares of preferred stock may enable our board of directors to discourage an attempt to obtain control of our company by means of a merger, tender offer, proxy contest or otherwise. For example, if in the due exercise of its fiduciary obligations, our board of directors were to determine that a takeover proposal is not in the best interests of our stockholders, our board of directors could cause shares of preferred stock to be issued without stockholder approval in one or more private offerings or other transactions that might dilute the voting or other rights of the proposed acquirer or insurgent stockholder or stockholder group. In this regard, our certificate of incorporation grants our board of directors broad power to establish the rights and preferences of authorized and unissued shares of preferred stock. The issuance of shares of preferred stock could decrease the amount of earnings and assets available for distribution to holders of shares of common stock. The issuance may also adversely affect the rights and powers, including voting rights, of these holders and may have the effect of delaying, deterring or preventing a change in control of us.

Choice of forum

Pursuant to our amended and restated bylaws that will become effective upon the completion of this offering, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware will be the sole and exclusive forum for any state law claims 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, employees or agents 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 and our amended and restated bylaws, (iv) any action to interpret, apply, enforce or determine the validity of our certificate of incorporation or by-laws or (v) 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, or the Delaware Forum Provision. The Delaware Forum Provision will not apply to any causes of action arising under the Securities Act or the Exchange Act or any other claim for which the federal courts have exclusive jurisdiction. Unless we consent in writing to the selection of an alternate forum, the United Stated District Court for the District of Massachusetts shall be the sole and exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act, or the Federal Forum Provision, as the address of our corporate office is in Boston, Massachusetts. These forum provisions may impose additional costs on stockholders, may limit our stockholders' ability to bring a claim in a forum they find favorable, and the designated courts may reach different judgments or results than other courts. In addition, there is uncertainty as to whether the Federal Forum Provision will be enforced, which may impose additional costs on us and stockholders.

Section 203 of the Delaware General Corporation Law

Upon completion of this offering, we will be subject to the provisions of Section 203 of the Delaware General Corporation Law. In general, Section 203 prohibits a publicly held Delaware corporation from engaging in a "business combination" with an "interested stockholder" for a three-year period following the time that this stockholder becomes an interested stockholder, unless the business combination is approved in a prescribed manner. Under Section 203, a business combination between a corporation and an interested stockholder is prohibited unless it satisfies one of the following conditions:

- before the stockholder became interested, our board of directors approved either the business combination or the transaction which resulted in the stockholder becoming an interested stockholder;
- upon consummation of the transaction which resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, excluding for purposes of determining the voting stock outstanding, shares owned by persons who are directors and also officers, and employee stock plans, in some instances, but not the outstanding voting stock owned by the interested stockholder; or
- at or after the time the stockholder became interested, the business combination was approved by our board of directors and authorized at an annual or special meeting of the stockholders by the

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

Section 203 defines a business combination to include:

- any merger or consolidation involving the corporation and the interested stockholder;
- any sale, transfer, lease, pledge or other disposition involving the interested stockholder of 10% or more of the assets of the corporation;
- subject to exceptions, any transaction that results in the issuance or transfer by the corporation of any stock of the corporation to the interested stockholder;
- subject to exceptions, any transaction involving the corporation that has the effect of increasing the proportionate share of the stock of any class or series of the corporation beneficially owned by the interested stockholder; and
- the receipt by the interested stockholder of the benefit of any loans, advances, guarantees, pledges or other financial benefits provided by or through the corporation.

In general, Section 203 defines an interested stockholder as any entity or person beneficially owning 15% or more of the outstanding voting stock of the corporation and any entity or person affiliated with or controlling or controlled by the entity or person.

Market Listing

We have applied to list our common stock on the Nasdaq Capital Market under the trading symbol "RNAZ."

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is Vstock Transfer, LLC.

SHARES ELIGIBLE FOR FUTURE SALE

Prior to this offering, there has been no public market for our common stock. Future sales of substantial amounts of our common stock, including shares issued on the exercise of outstanding options and warrants, in the public market after this offering, or the possibility of these sales or issuances occurring, could adversely affect the prevailing market price for our common stock or impair our ability to raise equity capital.

Based on our shares outstanding as of March 31, 2021, (assuming the automatic conversion of all our convertible promissory notes as described herein into 1,058,475 shares of common stock and exercise of all warrants to purchase shares of our common stock, representing 12,615 shares, immediately prior to the closing of this offering), upon the completion of this offering, a total of 8,485,084 shares of common stock will be outstanding. Of these shares, all of the common stock sold in this offering by us, plus any shares sold by us on exercise of the underwriter's option to purchase additional common stock, will be freely tradable in the public market without restriction or further registration under the Securities Act, unless these shares are held by "affiliates," as that term is defined in Rule 144 under the Securities Act.

The remaining shares of common stock will be, and shares of common stock subject to stock options will be on issuance, "restricted securities," as that term is defined in Rule 144 under the Securities Act. These restricted securities are eligible for public sale only if they are registered under the Securities Act or if they qualify for an exemption from registration under the Securities Act's Rules 144 or 701, which Rules are summarized below. Restricted securities may also be sold outside of the U.S. to non-U.S. persons in accordance with Rule 904 of Regulation S.

Subject to the lock-up agreements described below and the provisions of Rule 144 and 701 or Regulation S under the Securities Act, as well as our insider trading policy, these restricted securities will be available for sale in the public market after the date of this prospectus.

Rule 144

In general, under Rule 144 as currently in effect, once we have been subject to public company reporting requirements of Section 13 or Section 15(d) of the Exchange Act for at least 90 days, an eligible stockholder is entitled to sell such shares without complying with the manner of sale, volume limitation, or notice provisions of Rule 144, subject to compliance with the public information requirements of Rule 144. To be an eligible stockholder under Rule 144, such stockholder must not be deemed to have been one of our affiliates for purposes of the Securities Act at any time during the 90 days preceding a sale and must have beneficially owned the shares proposed to be sold for at least six months, including the holding period of any prior owner other than our affiliates. If such a person has beneficially owned the shares proposed to be sold for at least one year, including the holding period of any prior owner other than our affiliates, then such person is entitled to sell such shares without complying with any of the requirements of Rule 144, subject to the expiration of the lock-up agreements described below.

In general, under Rule 144, as currently in effect, our affiliates or persons selling shares on behalf of our affiliates are entitled to sell shares upon the expiration of the lock-up agreements described below. Beginning 90 days after the date of this prospectus and subject to any lock-up agreement, within any three-month period, such stockholders may sell a number of shares that does not exceed the greater of:

- one percent of the number of shares of common stock then outstanding, which will equal approximately 84,850 shares immediately after this offering, assuming no exercise of the underwriter's option to purchase additional shares of common stock from us; or
- the average weekly trading volume of our common stock on the Nasdaq Capital Market during the four calendar weeks preceding the filing of a notice on Form 144 with respect to such sale.

Sales under Rule 144 by our affiliates or persons selling shares on behalf of our affiliates are also subject to certain manner of sale provisions and notice requirements and to the availability of current public information about us.

Rule 701

Rule 701 generally allows a stockholder who was issued shares under a written compensatory plan or contract and who is not deemed to have been an affiliate of our company during the immediately preceding 90 days, to sell these shares in reliance on Rule 144, but without being required to comply with the public information, holding period, volume limitation, or notice provisions of Rule 144. Rule 701 also permits affiliates of our company to sell their Rule 701 shares under Rule 144 without complying with the holding period requirements of Rule 144. All holders of Rule 701 shares, however, are required by that rule to wait until 90 days after the date of this prospectus before selling those shares under Rule 701, and any such proposed sales shall remain subject to the expiration of the lock-up agreements described below.

Form S-8 Registration Statements

We intend to file one or more registration statements on Form S-8 under the Securities Act with the SEC to register the offer and sale of shares of our common stock that are issuable under our existing or planned stock option and incentive plans. These registration statements will become effective immediately on filing with the SEC. Shares covered by these registration statements will then be eligible for sale in the public markets, subject to vesting restrictions, any applicable lock-up agreements described below, and Rule 144 limitations applicable to affiliates.

Lock-up Arrangements

Pursuant to “lock-up” agreements, we, our executive officers, directors and our stockholders (including holders of our common stock to be received on conversion of our Notes) have agreed, without the prior written consent of the representative of the underwriters, not to directly or indirectly offer to sell, sell, pledge or otherwise transfer or dispose of any of shares of (or enter into any transaction or device that is designed to, or could be expected to, result in the transfer or disposition by any person at any time in the future of) our common stock, enter into any swap or other derivatives transaction that transfers to another, in whole or in part, any of the economic benefits or risks of ownership of shares of our common stock, make any demand for or exercise any right or cause to be filed a registration statement, including any amendments thereto, with respect to the registration of any shares of common stock or securities convertible into or exercisable or exchangeable for common stock or any other securities of ours or publicly disclose the intention to do any of the foregoing, subject to customary exceptions, for a period of six months after the date of this prospectus (twelve months in the case of our officers and directors). The representative may, in its sole discretion, release any of the securities subject to these lock-up agreements at any time.

MATERIAL U.S. FEDERAL INCOME TAX CONSIDERATIONS TO NON-U.S. HOLDERS

The following discussion is a summary of certain U.S. federal income tax considerations applicable to non-U.S. holders (as defined below) with respect to their ownership and disposition of shares of our common stock issued pursuant to this offering. For purposes of this discussion, a non-U.S. holder means a beneficial owner of our common stock that is for U.S. federal income tax purposes:

- a non-resident alien individual;
- a foreign corporation or any other foreign organization taxable as a corporation for U.S. federal income tax purposes; or
- a foreign estate or trust, the income of which is not subject to U.S. federal income tax on a net income basis.

This discussion does not address the tax treatment of partnerships or other entities that are pass-through entities for U.S. federal income tax purposes or persons that hold their common stock through partnerships or other pass-through entities. A partner in a partnership or other pass-through entity that will hold our common stock should consult his, her or its tax advisor regarding the tax consequences of holding and disposing of our common stock through a partnership or other pass-through entity, as applicable.

This discussion is based on current provisions of the Code, existing and proposed U.S. Treasury Regulations promulgated thereunder, current administrative rulings and judicial decisions, all as in effect as of the date of this prospectus and, all of which are subject to change or to differing interpretation, possibly with retroactive effect. Any such change or differing interpretation could alter the tax consequences to non-U.S. holders described in this prospectus. There can be no assurance that the IRS will not challenge one or more of the tax consequences described herein. We assume in this discussion that a non-U.S. holder holds shares of our common stock as a capital asset within the meaning of Section 1221 of the Code, which is generally property held for investment.

This discussion does not address all aspects of U.S. federal income taxation that may be relevant to a particular non-U.S. holder in light of that non-U.S. holder's individual circumstances including the alternative minimum tax, or the Medicare tax on net investment income, the timing of income accruals required under Section 451(b) of the Code, the rules regarding qualified small business stock within the meaning of Section 1202 of the Code and any election to apply Section 1400Z-2 of the Code to gains recognized with respect to shares of our common stock. This discussion also does not address any U.S. state, local or non-U.S. taxes or any other aspect of any U.S. federal tax other than the income tax. This discussion also does not consider any specific facts or circumstances that may apply to a non-U.S. holder and does not address the special tax rules applicable to particular non-U.S. holders, such as:

- insurance companies;
- tax-exempt or governmental organizations;
- financial institutions;
- brokers or dealers in securities;
- regulated investment companies;
- pension plans;
- "controlled foreign corporations," "passive foreign investment companies," and corporations that accumulate earnings to avoid U.S. federal income tax;
- "qualified foreign pension funds," or entities wholly-owned by a "qualified foreign pension fund";
- partnerships or other entities or arrangements treated as partnerships for U.S. federal income tax purposes (and partners and investors therein);
- persons deemed to sell our common stock under the constructive sale provisions of the Code;
- persons that hold our common stock as part of a straddle, hedge, conversion transaction, synthetic security or other integrated investment;

- persons who have elected to mark securities to market;
- persons who have a functional currency other than the U.S. dollar;
- persons that own, or have owned, actually or constructively, more than 5% of our common stock;
- persons who hold or receive our common stock pursuant to the exercise of any employee stock option or otherwise as compensation; and
- certain U.S. expatriates.

This discussion is for general information only and is not tax advice. Accordingly, all prospective non-U.S. holders of our common stock should consult their tax advisors with respect to the U.S. federal, state, local and non-U.S. tax consequences of the purchase, ownership and disposition of our common stock.

Distributions on our common stock

Distributions, if any, on our common stock will constitute dividends for U.S. federal income tax purposes to the extent paid from our current or accumulated earnings and profits, as determined under U.S. federal income tax principles. If a distribution exceeds our current and accumulated earnings and profits, the excess will be treated as a tax-free return of the non-U.S. holder's investment, up to such holder's tax basis in the common stock. Any remaining excess will be treated as capital gain, subject to the tax treatment described below in "Gain on sale or other taxable disposition of our common stock." Any such distributions will also be subject to the discussions below under the sections titled "Backup withholding and information reporting" and "Withholding and information reporting requirements — FATCA."

Subject to the discussion in the following two paragraphs in this section, dividends paid to a non-U.S. holder generally will be subject to withholding of U.S. federal income tax at a 30% rate or such lower rate as may be specified by an applicable income tax treaty between the United States and such holder's country of residence. If we or another withholding agent apply over-withholding or if a non-U.S. holder does not timely provide us with the required certification, the non-U.S. holder may be entitled to a refund or credit of any excess tax withheld by timely filing an appropriate claim with the IRS.

Dividends that are treated as effectively connected with a trade or business conducted by a non-U.S. holder within the United States and, if an applicable income tax treaty so provides, that are attributable to a permanent establishment or a fixed base maintained by the non-U.S. holder within the United States, are generally exempt from the 30% withholding tax if the non-U.S. holder satisfies applicable certification and disclosure requirements. However, such U.S. effectively connected income, net of specified deductions and credits, is taxed at the same graduated U.S. federal income tax rates applicable to United States persons (as defined in the Code). Any U.S. effectively connected income received by a non-U.S. holder that is a corporation may also, under certain circumstances, be subject to an additional "branch profits tax" at a 30% rate or such lower rate as may be specified by an applicable income tax treaty between the United States and such holder's country of residence.

A non-U.S. holder of our common stock who claims the benefit of an applicable income tax treaty between the United States and such holder's country of residence generally will be required to provide a properly executed IRS Form W-8BEN or W-8BEN-E (or successor form) to the applicable withholding agent and satisfy applicable certification and other requirements. Non-U.S. holders are urged to consult their tax advisors regarding their entitlement to benefits under a relevant income tax treaty. A non-U.S. holder that is eligible for a reduced rate of U.S. withholding tax under an income tax treaty may obtain a refund or credit of any excess amounts withheld by timely filing a U.S. tax return with the IRS.

Gain on sale or other taxable disposition of our common stock

Subject to the discussions below under "Backup withholding and information reporting" and "Withholding and information reporting requirements — FATCA," a non-U.S. holder generally will not be subject to any U.S. federal income tax on any gain realized upon such holder's sale or other taxable disposition of shares of our common stock unless:

- the gain is effectively connected with the non-U.S. holder's conduct of a U.S. trade or business and, if an applicable income tax treaty so provides, is attributable to a permanent establishment or a

fixed-base maintained by such non-U.S. holder in the United States, in which case the non-U.S. holder generally will be taxed on a net income basis at the graduated U.S. federal income tax rates applicable to United States persons (as defined in the Code) and, if the non-U.S. holder is a foreign corporation, the branch profits tax described above in "Distributions on our common stock" also may apply;

- the non-U.S. holder is a nonresident alien individual who is present in the United States for a period or periods aggregating 183 days or more in the taxable year of the disposition and certain other conditions are met, in which case the non-U.S. holder will be subject to a 30% tax (or such lower rate as may be specified by an applicable income tax treaty between the United States and such holder's country of residence) on the net gain derived from the disposition, which may be offset by certain U.S. source capital losses of the non-U.S. holder, if any (even though the individual is not considered a resident of the United States), provided that the non-U.S. holder has timely filed U.S. federal income tax returns with respect to such losses; or
- we are, or have been, at any time during the five-year period preceding such sale or other taxable disposition (or the non-U.S. holder's holding period, if shorter) a "U.S. real property holding corporation," unless our common stock is regularly traded on an established securities market and the non-U.S. holder holds no more than 5% of our outstanding common stock, directly or indirectly, actually or constructively, during the shorter of the 5-year period ending on the date of the disposition or the period that the non-U.S. holder held our common stock. Generally, a corporation is a U.S. real property holding corporation only if the fair market value of its U.S. real property interests equals or exceeds 50% of the sum of the fair market value of its worldwide real property interests plus its other assets used or held for use in a trade or business. Although there can be no assurance, we do not believe that we are, or have been, a U.S. real property holding corporation, or that we are likely to become one in the future. No assurance can be provided that our common stock will be regularly traded on an established securities market for purposes of the rules described above.

Backup withholding and information reporting

We must report annually to the IRS and to each non-U.S. holder the gross amount of the distributions on our common stock paid to such holder and the tax withheld, if any, with respect to such distributions. Non-U.S. holders may have to comply with specific certification procedures to establish that the holder is not a United States person (as defined in the Code) in order to avoid backup withholding at the applicable rate with respect to dividends on our common stock. Dividends paid to non-U.S. holders subject to withholding of U.S. federal income tax, as described above in "Distributions on our common stock," generally will be exempt from U.S. backup withholding.

Information reporting and backup withholding will generally apply to the proceeds of a disposition of our common stock by a non-U.S. holder effected by or through the U.S. office of any broker, U.S. or foreign, unless the holder certifies its status as a non-U.S. holder and satisfies certain other requirements, or otherwise establishes an exemption. Generally, information reporting and backup withholding will not apply to a payment of disposition proceeds to a non-U.S. holder where the transaction is effected outside the United States through a non-U.S. office of a broker. However, for information reporting purposes, dispositions effected through a non-U.S. office of a broker with substantial U.S. ownership or operations generally will be treated in a manner similar to dispositions effected through a U.S. office of a broker. Non-U.S. holders should consult their tax advisors regarding the application of the information reporting and backup withholding rules to them. Copies of information returns may be made available to the tax authorities of the country in which the non-U.S. holder resides or is incorporated under the provisions of a specific treaty or agreement. Backup withholding is not an additional tax. Any amounts withheld under the backup withholding rules from a payment to a non-U.S. holder can be refunded or credited against the non-U.S. holder's U.S. federal income tax liability, if any, provided that an appropriate claim is filed with the IRS in a timely manner.

Withholding and information reporting requirements — FATCA

Provisions of the Code commonly referred to as the Foreign Account Tax Compliance Act, or FATCA, generally imposes a U.S. federal withholding tax at a rate of 30% on payments of dividends on our

common stock paid to a foreign entity unless (i) if the foreign entity is a “foreign financial institution,” such foreign entity undertakes certain due diligence, reporting, withholding, and certification obligations, (ii) if the foreign entity is not a “foreign financial institution,” such foreign entity identifies certain of its U.S. investors, if any, or (iii) the foreign entity is otherwise exempt under FATCA. Under applicable U.S. Treasury regulations, withholding under FATCA currently applies to payments of dividends on our common stock. Currently proposed U.S. Treasury Regulations provide that FATCA withholding does not apply to gross proceeds from the disposition of property of a type that can produce U.S. source dividends or interest; however, prior versions of the rules would have made such gross proceeds subject to FATCA withholding. Taxpayers (including withholding agents) can generally rely on the proposed Treasury Regulations until final Treasury Regulations are issued. Under certain circumstances, a non-U.S. holder may be eligible for refunds or credits of this withholding tax. An intergovernmental agreement between the United States and an applicable foreign country may modify the requirements described in this paragraph. Non-U.S. holders should consult their tax advisors regarding the possible implications of this legislation on their investment in our common stock and the entities through which they hold our common stock, including, without limitation, the process and deadlines for meeting the applicable requirements to prevent the imposition of the 30% withholding tax under FATCA.

UNDERWRITING

ThinkEquity, a division of Fordham Financial Management, Inc., is the representative of the several underwriters of this offering, or the representative. We entered into an underwriting agreement on , 2021, with the underwriters named below. Subject to the terms and conditions of the underwriting agreement, we have agreed to sell to the underwriters, and each underwriter has agreed to purchase, at the public offering price less the underwriting discounts set forth on the cover page of this prospectus, the number of shares of common stock listed next to its name in the following table:

Underwriters	Number of Shares
ThinkEquity, a division of Fordham Financial Management, Inc.	2,777,778
Total	2,777,778

The underwriting agreement provides that the obligations of the underwriters to pay for and accept delivery of the shares of common stock offered by this prospectus are subject to various conditions and representations and warranties, including the approval of certain legal matters by their counsel and other conditions specified in the underwriting agreement. The shares of common stock are offered by the underwriters, subject to prior sale, when, as and if issued to and accepted by them.

We have agreed to indemnify the underwriters against specified liabilities, including liabilities under the Securities Act, and to contribute to payments the underwriters may be required to make in respect thereof.

Over-Allotment Option

We have granted a 45-day option to the representative of the underwriters to purchase up to an aggregate of 416,666 additional shares of our common stock (equal to 15% of the common stock sold in this offering) at the public offering price per share, less underwriting discounts and commissions, set forth on the cover page of this prospectus, solely to cover over-allotments, if any. If the underwriters exercise this option in whole or in part, then the underwriters will be committed, subject to the conditions described in the underwriting agreement, to purchase the additional shares of common stock.

Discounts, Commissions and Reimbursement

The underwriters have advised us that the underwriters propose to offer the shares of common stock to the public at the initial public offering price set forth on the cover page of this prospectus. The underwriters may offer shares to dealers at that price less a concession not in excess of $ per share of which up to $ per share may be reallowed to other dealers. After the initial offering to the public, the underwriters may change the offering price and other selling terms.

The following table summarizes the underwriting discounts and commissions and proceeds to us before deducting our other offering expenses. This information assumes either no exercise or full exercise of the over-allotment option we granted to the representative of the underwriters.

	Per Share	With No Over-Allotment	With Full Over-Allotment
Public offering price	$	$	$
Underwriting discount (7%)	$	$	$
Proceeds, before expenses, to us	$	$	$
Non-accountable expense allowance (1%)	$	$	$

We have paid $50,000 to the representative as a deposit which will be applied against out-of-pocket accountable expenses of the underwriters in connection with this offering which we have agreed to pay. This deposit will be repaid to us to the extent not fully utilized. We have also agreed to pay a non-accountable expense allowance to the representative of the underwriters equal to 1% of the gross proceeds received at the closing of the offering. The non-accountable expense allowance is not payable with respect to shares sold upon exercise of the underwriters' over-allotment option, if any. We have also agreed to pay certain expenses

of the underwriters relating to this offering as set forth in the underwriting agreement, including up to $125,000 for the fees and expenses of the underwriters' legal counsel, not to exceed $202,500.

Our total estimated expenses of the offering, including registration, filing and listing fees, printing fees and legal and accounting expenses, but excluding underwriting discounts, commissions and expenses, will be approximately $.

Representative's Warrants

Upon closing of this offering, we have agreed to issue as additional compensation to the representative warrants, or the representative's warrants, to purchase up to 138,888 shares of our common stock (5% of the aggregate number of shares of common stock sold in the initial closing of this offering). The representative's warrants will be exercisable at a per share exercise price equal to 125% of the public offering price per share in this offering. The representative's warrants are exercisable at any time and from time to time, in whole or in part, during the four and one half year period commencing 180 days from the effective date of the registration statement of which this prospectus is a part.

The representative's warrants have been deemed compensation by FINRA and are therefore subject to a 180-day lock-up pursuant to Rule 5110(g)(1) of FINRA. The representative (or permitted assignees under Rule 5110(g)(1)) will not sell, transfer, assign, pledge, or hypothecate these warrants or the securities underlying these warrants, nor will they engage in any hedging, short sale, derivative, put, or call transaction that would result in the effective economic disposition of the warrants or the underlying securities for a period of 180 days from the effective date of the registration statement. In addition, the warrants provide for registration rights upon request in certain cases. The demand registration right provided will not be greater than five years from the effective date of the registration statement in compliance with FINRA Rule 5110(f)(2)(G)(iv) and the demand registration right may only be exercised once at the issuer's expense in compliance with FINRA Rule 5110(g)(8)(D). The piggyback registration right provided will not be greater than seven years from the effective date of the registration statement in compliance with FINRA Rule 5110(f)(2)(G)(v). We will bear all fees and expenses attendant to registering the securities issuable on exercise of the warrants other than underwriting commissions incurred and payable by the selling holders. The exercise price and number of shares issuable upon exercise of the warrants may be adjusted in certain circumstances including in the event of a stock dividend or our recapitalization, reorganization, merger or consolidation. However, the warrant exercise price or underlying shares will not be adjusted for issuances of shares of common stock at a price below the warrant exercise price.

Discretionary Accounts

The underwriters do not intend to confirm sales of the securities offered hereby to any accounts over which they have discretionary authority.

Lock-Up Agreements

We, each of our directors, officers and certain of our stockholders, have agreed for a period of six months after the date of this prospectus (12 months for directors and officers) without the prior written consent of the representative, not to directly or indirectly:

- issue (in the case of us), offer, pledge, assign, encumber, announce the intention to sell, sell, contract to sell, sell any option or contract to purchase, purchase any option or contract to sell, grant any option, right or warrant to purchase, lend, or otherwise transfer or dispose of, directly or indirectly, any shares of capital stock of the company or any securities convertible into or exercisable or exchangeable for shares of capital stock of the company; or
- in the case of us, file or cause the filing of any registration statement under the Securities Act with respect to any shares of common stock or other capital stock or any securities convertible into or exercisable or exchangeable for our common stock or other capital stock; or
- complete any offering of debt securities of the company, other than entering into a line of credit, term loan arrangement or other debt instrument with a traditional bank; or

- enter into any swap or other agreement that transfers, in whole or in part, any of the economic consequences of ownership of the company's securities, whether any such transaction is to be settled by delivery of shares of our common stock or such other securities, in cash or otherwise;
- sell, agree to sell, offer or sell, solicit offers to purchase, grant any call option, warrant or other right to purchase, purchase any put option or other right to sell, pledge, borrow or otherwise dispose of company's securities
- establish or increase any "put equivalent position" or liquidate or decrease any "call equivalent position" (in each case within the meaning of Section 16 of the Exchange Act) with respect to any company security;
- make any demand for or exercise any right with respect to, the registration of any company security;
- otherwise enter into any swap, derivative or other transaction or arrangement that transfers to another, in whole or in part, any economic consequence of ownership of a company security, whether or not such transaction is to be settled by delivery of company securities, other securities, cash or other consideration; or
- publicly announce an intention to do any of the foregoing.

Right of First Refusal

Until 18 months from the closing date of this offering, the representative will have an irrevocable right of first refusal, in its sole discretion, to act as sole investment banker, sole book-runner, and/or sole placement agent, for each and every future public and private equity and debt offering, including all equity-linked financings, of the company, or any successor to or any subsidiary of the company, on terms customary to the representative. The representative will have the sole right to determine whether or not any other broker-dealer will have the right to participate in any such offering and the economic terms of any such participation. The representative will not have more than one opportunity to waive or terminate the right of first refusal in consideration of any payment or fee.

Market Listing

We have applied to list our common stock on the Nasdaq Capital Market under the symbol "RNAZ."

Determination of offering price

The public offering price of the securities we are offering was negotiated between us and the underwriters. Factors considered in determining the public offering price of the shares include the history and prospects of the company, the stage of development of our business, our business plans for the future and the extent to which they have been implemented, an assessment of our management, general conditions of the securities markets at the time of the offering and such other factors as were deemed relevant.

Price Stabilization, Short Positions and Penalty Bids

In connection with this offering, the underwriters may engage in stabilizing transactions, over-allotment transactions, syndicate-covering transactions, penalty bids and purchase to cover positions created by short sales. Stabilizing transactions permit bids to purchase shares so long as the stabilizing bids do not exceed a specified maximum, and are engaged in for the purpose of preventing or retarding a decline in the market price of the shares while this offering is in progress.

Over-allotment transactions involve sales by underwriters of shares in excess of the number of shares the underwriters are obligated to purchase. This creates a syndicate short position in our common stock which may be either a covered short position or a "naked" short position. In a covered short position, the number of shares of common stock over-allotted by the underwriters is not greater than the number of shares of common stock that they may purchase through exercise of the over-allotment option. In a naked short position, the number of shares of common stock involved is greater than the number of shares common stock in the over-allotment option. To close out a short position, the underwriters may elect to exercise all or

part of the over-allotment option. The underwriters may also elect to stabilize the price of our common stock or reduce any short position by bidding for, and purchasing, common stock in the open market.

Syndicate covering transactions involve purchases of shares in the open market after the distribution has been completed in order to cover syndicate short positions. In determining the source of shares to close out the short position, the underwriters will consider, among other things, the price of shares available for purchase in the open market as compared with the price at which it may purchase shares through exercise of the over-allotment option. If the underwriters sell more shares than could be covered by exercise of the over-allotment option and, therefore, have a naked short position, the position can be closed out only by buying shares in the open market. A naked short position is more likely to be created if the underwriters are concerned that after pricing there could be downward pressure on the price of the shares in the open market that could adversely affect investors who purchase in this offering.

The underwriters may also impose a penalty bid. Penalty bids permit an underwriter to reclaim a selling concession from a syndicate member when the shares originally sold by that syndicate member are purchased in stabilizing or syndicate covering transactions to cover syndicate short positions.

These stabilizing transactions, syndicate covering transactions and penalty bids may have the effect of raising or maintaining the market price of our common stock or preventing or retarding a decline in the market price of our common stock. As a result, the price of our common stock in the open market may be higher than the price that might otherwise exist absent these activities. Neither we nor the underwriters make any representation or prediction as to the effect that the transactions described above may have on the price of our common stock. These transactions may be effected in the over-the-counter market and otherwise and, if commenced, may be discontinued at any time.

Other Relationships

From time to time, certain of the underwriters and/or their affiliates may in the future provide various investment banking, commercial banking and other financial services for us for which they may receive customary fees. In the course of their businesses, the underwriters and their affiliates may actively trade our securities or loans for their own account or for the accounts of customers, and, accordingly, the underwriters and their affiliates may at any time hold long or short positions in such securities or loans. Except for services provided in connection with this offering, no underwriter has provided any investment banking or other financial services to us during the 180-day period preceding the date of this prospectus and we do not expect to retain any underwriter to perform any investment banking or other financial services for at least 90 days after the date of this prospectus.

Indemnification

We have agreed to indemnify the underwriters against liabilities relating to this offering arising under the Securities Act and the Exchange Act, liabilities arising from breaches of some or all of the representations and warranties contained in the underwriting agreement, and to contribute to payments that the underwriters may be required to make for these liabilities.

Electronic Offer, Sale and Distribution of Securities

This prospectus in electronic format may be made available on websites or through other online services maintained by one or more of the underwriters or selling group members. The underwriters may agree to allocate a number of securities to selling group members for sale to its online brokerage account holders. Internet distributions will be allocated by the underwriters and selling group members that will make internet distributions on the same basis as other allocations. Other than this prospectus in electronic format, the information on the website of any underwriter or selling group member and any information contained in any other website maintained by an underwriter or selling group member is not part of, nor incorporated by reference into, this prospectus or the registration statement of which this prospectus forms a part, has not been approved and/or endorsed by us or any underwriter in its capacity as underwriter, and should not be relied upon by investors.

Selling Restrictions

No action has been taken in any jurisdiction (except in the United States) that would permit a public offering of our common stock or the possession, circulation or distribution of this prospectus or any other material relating to us or our common stock in any jurisdiction where action for that purpose is required. Accordingly, our common stock may not be offered or sold, directly or indirectly, and this prospectus or any other offering material or advertisements in connection with our common stock may not be distributed or published, in or from any country or jurisdiction except in compliance with any applicable rules and regulations of any such country or jurisdiction.

European Economic Area

In relation to each Member State of the European Economic Area which has implemented the Prospectus Directive, each a "Relevant Member State", with effect from and including the date on which the Prospectus Directive is implemented in that Relevant Member State, or the "Relevant Implementation Date", our securities will not be offered to the public in that Relevant Member State prior to the publication of a prospectus related to those securities that has been approved by the competent authority in that Relevant Member State or, where appropriate, approved in another Relevant Member State and notified to the competent authority in that Relevant Member State, all in accordance with the Prospectus Directive, except that, with effect from and including the Relevant Implementation Date, an offer of our securities may be made to the public in that Relevant Member State at any time:

- to any legal entity that is a qualified investor as defined in the Prospectus Directive;
- to fewer than 100 or, if the Relevant Member State has implemented the relevant provision of the 2010 PD Amending Directive, 150 natural or legal persons (other than qualified investors as defined in the Prospectus Directive), as permitted under the Prospectus Directive, subject to obtaining the prior consent of the underwriters for any such offer; or
- in any other circumstances which do not require the publication by the issuer of a prospectus pursuant to Article 3(2) of the Prospectus Directive, provided that no such offer of the securities shall require the issuer or any underwriter to publish a prospectus pursuant to Article 3 of the Prospectus Directive.

For the purposes of this provision, the expression an "offer of securities to the public" in relation to any securities in any Relevant Member State means the communication in any form and by any means of sufficient information on the terms of the offer and securities to be offered so as to enable an investor to decide to purchase or subscribe for securities, as the same may be varied in that Relevant Member State by any measure implementing the Prospectus Directive in that Relevant Member State and the expression "Prospectus Directive" means Directive 2003/71/EC (and amendments thereto, including the 2010 PD Amending Directive, to the extent implemented in the Relevant Member State), and includes any relevant implementing measure in each Relevant Member State and the expression "2010 PD Amending Directive" means Directive 2010/73/EU.

United Kingdom

In the United Kingdom, this document is being distributed only to, and is directed only at, and any offer subsequently made may only be directed at persons who are "qualified investors" (as defined in the Prospectus Directive) (i) who have professional experience in matters relating to investments falling within Article 19 (5) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005, as amended (the Order), and/or (ii) who are high net worth companies (or persons to whom it may otherwise be lawfully communicated) falling within Article 49(2)(a) to (d) of the Order (all such persons together, the relevant persons). This document must not be acted on or relied on in the United Kingdom by persons who are not relevant persons. In the United Kingdom, any investment or investment activity to which this document relates may be made or taken exclusively by relevant persons.

Canada

The offering of our common stock in Canada is being made on a private placement basis in reliance on exemptions from the prospectus requirements under the securities laws of each applicable Canadian province

and territory where our common stock may be offered and sold, and therein may only be made with investors that are purchasing, or deemed to be purchasing, as principal and that qualify as both an "accredited investor" as such term is defined in National Instrument 45-106 *Prospectus Exemptions* or subsection 73.3(1) of the *Securities Act* (Ontario) and as a "permitted client" as such term is defined in National Instrument 31-103 *Registration Requirements, Exemptions and Ongoing Registrant Obligations.* Any offer and sale of our common stock in any province or territory of Canada may only be made through a dealer that is properly registered under the securities legislation of the applicable province or territory wherein our common stock is offered and/or sold or, alternatively, where such registration is not required.

Any resale of our common stock by an investor resident in Canada must be made in accordance with applicable Canadian securities laws, which require resales to be made in accordance with an exemption from, or in a transaction not subject to, prospectus requirements under applicable Canadian securities laws. These resale restrictions may under certain circumstances apply to resales of the common stock outside of Canada.

Securities legislation in certain provinces or territories of Canada may provide a purchaser with remedies for rescission or damages if this prospectus (including any amendment hereto) contains a misrepresentation, provided that the remedies for rescission or damages are exercised by the purchaser within the time limit prescribed by the securities legislation of the purchaser's province or territory. The purchaser should refer to any applicable provisions of the securities legislation of the purchaser's province or territory for particulars of these rights or consult with a legal advisor.

Pursuant to section 3A.3 (or, in the case of securities issued or guaranteed by the government of a non-Canadian jurisdiction, section 3A.4) of National Instrument 33-105 *Underwriting Conflicts* ("NI 33-105"), the underwriters are not required to comply with the disclosure requirements of NI 33-105 regarding underwriter conflicts of interest in connection with this offering.

Upon receipt of this prospectus, each Québec investor hereby confirms that it has expressly requested that all documents evidencing or relating in any way to the sale of the securities described herein (including for greater certainty any purchase confirmation or any notice) be drawn up in the English language only. *Par la réception de ce document, chaque investisseur québecois confirme par les présentes qu'il a expressément exigé que tous les documents faisant foi ou se rapportant de quelque manière que ce soit à la vente des valeurs mobilières décrites aux présentes (incluant, pour plus de certitude, toute confirmation d'achat ou tout avis) soient rédigés en anglais seulement.*

LEGAL MATTERS

The validity of the shares of common stock offered by this prospectus will be passed upon for us by Goodwin Procter LLP. Certain legal matters will be passed upon for the underwriters by McGuireWoods LLP.

EXPERTS

The financial statements of TransCode Therapeutics, Inc. as of December 31, 2020 and 2019, and for the years then ended have been included in this prospectus in reliance upon the report (which report includes an explanatory paragraph about the existence of substantial doubt concerning the company's ability to continue as a going concern) of Withum Smith+Brown, PC, independent registered public accounting firm, appearing elsewhere in the registration statement, upon the authority of said firm as experts in accounting and auditing.

No expert named in the registration statement of which this prospectus forms a part as having prepared or certified any part thereof (or named as having prepared or certified a report or valuation for use in connection with such registration statement) or counsel named in this prospectus as having given an opinion upon the validity of the securities being offered pursuant to this prospectus or upon other legal matters in connection with the registration or offering of such securities was employed for such purpose on a contingency basis. At the time of such preparation, certification or opinion or at any time thereafter, through the date of effectiveness of such registration statement or that part of such registration statement to which such preparation, certification or opinion relates, no such person had, or is to receive, in connection with the offering, a substantial interest, direct or indirect, in our company or any of its parents or subsidiaries as may exist in the future. Nor was any such person connected with our company as a promoter, managing or principal underwriter, voting trustee, director, officer or employee.

WHERE YOU CAN OBTAIN MORE INFORMATION

We have filed with the SEC a registration statement on Form S-1 under the Securities Act with respect to the common stock offered by this prospectus. This prospectus, which constitutes a part of the registration statement, does not contain all the information set forth in the registration statement, some of which is contained in exhibits to the registration statement as permitted by the rules and regulations of the SEC. For further information with respect to us and our common stock, we refer you to the registration statement, including the exhibits filed as a part of the registration statement. Statements contained in this prospectus concerning the contents of any contract or any other documents are not necessarily complete. If a contract or document has been filed as an exhibit to the registration statement, please see the copy of the contract or document that has been filed. Each statement in this prospectus relating to a contract or document filed as an exhibit is qualified in all respects by the filed exhibit. The SEC maintains an Internet site that contains reports, proxy and information statements, and other information regarding issuers, like us, that file electronically with the SEC. The address of that website is www.sec.gov.

Beginning on the closing of this offering, we will be subject to the information reporting requirements of the Exchange Act, and we will file reports, proxy statements and other information with the SEC. These reports, proxy statements and other information will be available for inspection and copying at the public reference room and website of the SEC referred to above.

We also maintain a website at www.transcodetherapeutics.com. Information contained in, or accessible through, our website is not a part of this prospectus, and the inclusion of our website address in this prospectus is only as an inactive textual reference.

TRANSCODE THERAPEUTICS, INC.

Table of Contents

	Page
Report of Independent Registered Public Accounting Firm	F-2
Balance Sheets as of December 31, 2020 and 2019	F-3
Statements of Operations for the Years ended December 31, 2020 and 2019	F-4
Statements of Stockholders' Equity (Deficit) for the Years ended December 31, 2020 and 2019	F-5
Statements of Cash Flows for the Years ended December 31, 2020 and 2019	F-6
Notes to Financial Statements	F-7

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders of TransCode Therapeutics, Inc.

Opinion on the Financial Statements

We have audited the accompanying balance sheets of TransCode Therapeutics, Inc. (the "Company"), as of December 31, 2020 and 2019, and the related statements of operations, stockholders' equity (deficit) and cash flows for each of the two years in the period ended December 31, 2020, and the related notes (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2020 and 2019, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2020, in conformity with accounting principles generally accepted in the United States of America.

Substantial Doubt Regarding Going Concern

The accompanying financial statements have been prepared assuming that the entity will continue as a going concern. As discussed in Note 1 to the financial statements, the entity has suffered recurring losses from operations, has experienced cash used from operations in excess of its current cash position, and has an accumulated deficit, that raise substantial doubt about its ability to continue as a going concern. Management's plans in regard to these matters are also described in Note 1. The financial statements do not include any adjustments that might result from the outcome of this uncertainty. Our opinion is not modified with respect to this matter.

Basis for Opinion

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

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

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

/s/ WithumSmith+Brown, PC

We have served as the Company's auditor since 2020.
East Brunswick, New Jersey
February 26, 2021, except for the effects of the reverse stock split described in Note 2(m), as to which the date is March 24, 2021

TRANSCODE THERAPEUTICS, INC.

BALANCE SHEETS
December 31, 2020 and 2019

	2020	2019
Assets		
Current assets:		
Cash and cash equivalents	$ 828,016	$ 204,471
Prepaid expenses and other current assets	3,199	—
Total current assets	831,215	204,471
Deferred offering costs	224,153	—
Total assets	$ 1,055,368	$ 204,471
Liabilities and Stockholders' Equity (Deficit)		
Current liabilities:		
Accounts payable and accrued expenses	$ 369,177	$ 27,257
Due to related parties	35,685	35,685
Total current liabilities	404,862	62,942
Convertible promissory notes, net of debt issuance costs and debt discount	2,086,675	927,810
Accrued interest – convertible promissory notes	191,687	69,978
Derivative liabilities	1,751,000	239,000
Warrant liability	29,376	14,524
Total liabilities	4,463,600	1,314,254
Stockholders' equity (deficit):		
Preferred stock – $0.0001 par value; 5,000,000 and -0- shares authorized at December 31, 2020 and 2019, respectively; -0- shares issued or outstanding at December 31, 2020	—	—
Common stock – $0.0001 par value, 20,000,000 shares authorized at December 31, 2020 and 2019; 4,636,216 shares issued and outstanding at December 31, 2020 and 2019	464	464
Additional paid-in capital	65,949	20,014
Subscription receivable	(12,763)	(12,272)
Accumulated deficit	(3,461,882)	(1,117,989)
Total stockholders' equity (deficit)	(3,408,232)	(1,109,783)
Total liabilities and stockholders' equity (deficit)	$ 1,055,368	$ 204,471

See accompanying notes to financial statements.

TRANSCODE THERAPEUTICS, INC.

STATEMENTS OF OPERATIONS
Years ended December 31, 2020 and 2019

	2020	2019
Operating expenses:		
Research and development	$ 284,459	$ 226,309
General and administrative	442,145	230,556
Total operating expenses	726,604	456,865
Operating loss	(726,604)	(456,865)
Other income (expense):		
Change in fair value of derivative liabilities	(1,208,000)	4,000
Change in fair value of warrant liability	(14,852)	2,584
Interest expense	(394,573)	(156,965)
Interest income	136	34
Total other income (expense)	(1,617,289)	(150,347)
Loss before income taxes	(2,343,893)	(607,212)
Income tax expense (benefit)	—	—
Net loss	$(2,343,893)	$ (607,212)
Basic and diluted loss per common share	$ (0.51)	$ (0.13)
Weighted average number of common shares outstanding, basic and diluted	4,636,216	4,636,216

See accompanying notes to financial statements.

TRANSCODE THERAPEUTICS, INC.

STATEMENTS OF STOCKHOLDERS' EQUITY (DEFICIT)
Years ended December 31, 2020 and 2019

	Common Stock		Additional Paid-In Capital	Subscription Receivable	Accumulated Deficit	Total Stockholders' Equity (Deficit)
	Shares	Amount				
Balance, December 31, 2018	4,636,216	$464	$18,145	$(11,800)	$ (510,777)	$ (503,968)
Interest on subscription receivable	—	—	472	(472)	—	—
Share-based compensation expense	—	—	1,397	—	—	1,397
Net loss	—	—	—	—	(607,212)	(607,212)
Balance, December 31, 2019	4,636,216	$464	$20,014	$(12,272)	$(1,117,989)	$(1,109,783)
Interest on subscription receivable	—	—	491	(491)	—	—
Share-based compensation expense	—	—	45,444	—	—	45,444
Net loss	—	—	—	—	(2,343,893)	(2,343,893)
Balance, December 31, 2020	4,636,216	$464	$65,949	$(12,763)	$(3,461,882)	$(3,408,232)

See accompanying notes to financial statements.

TRANSCODE THERAPEUTICS, INC.

STATEMENTS OF CASH FLOWS
Years ended December 31, 2020 and 2019

	2020	2019
Cash flows from operating activities:		
Net loss	$(2,343,893)	$(607,212)
Adjustments to reconcile net loss to net cash used in operating activities:		
Share-based compensation expense	45,444	1,397
Change in fair market value of derivative liabilities	1,208,000	(4,000)
Change in fair market value of warrant liability	14,852	(2,584)
Non-cash interest expense	272,864	108,595
Changes in operating assets and liabilities:		
Prepaid expenses and other current assets	(3,199)	1,667
Accounts payable and accrued expenses	191,253	(54,741)
Accrued interest on convertible promissory notes	121,709	48,370
Net cash used in operating activities	(492,971)	(508,508)
Cash flows from financing activities:		
Proceeds from convertible promissory notes	1,190,000	500,000
Payments of deferred offering costs	(73,484)	—
Net cash provided by financing activities	1,116,516	500,000
Net change in cash and cash equivalents	623,545	(8,508)
Cash and cash equivalents, beginning of year	204,471	212,979
Cash and cash equivalents, end of year	$ 828,016	$ 204,471
Supplemental disclosure of cash flow		
Cash paid during the year for		
Interest	$ —	$ —
Income taxes	$ —	$ —
Supplemental disclosure of non-cash investing and financing activities		
Accrued interest on subscriptions receivable	$ (491)	$ (472)
Debt discounts associated with derivative liabilities of convertible promissory notes	$ 304,000	$ 117,000
Deferred offering costs included in accounts payable and accrued expenses	$ 150,669	$ —

See accompanying notes to financial statements.

TRANSCODE THERAPEUTICS, INC.

NOTES TO FINANCIAL STATEMENTS
December 31, 2020 and 2019

(1) Nature of Business and Liquidity

TransCode Therapeutics, Inc. (the "Company" or "TransCode") was incorporated on January 11, 2016, under the laws of the State of Delaware. TransCode is a biopharmaceutical company focused on developing and commercializing innovative drugs for treating metastatic disease. TransCode is preparing for its first clinical study. The Company's lead therapeutic candidate, TTX-MC138, is an oligonucleotide conjugated to an iron oxide nanoparticle designed to be administered by infusion to inhibit the ability of metastatic tumor cells to survive. The goal of the therapy, if approved, is to achieve lifelong regression and long-term patient survival.

Since its founding, the Company has been engaged in organizational activities, including raising capital, and research and development activities. The Company has not generated revenues and has not yet achieved profitable operations, nor has it ever generated positive cash flows from operations. There is no assurance that profitable operations, if achieved, could be sustained on a continuing basis. The Company is subject to those risks associated with any early stage biopharmaceutical company that requires substantial expenditures for research and development. There can be no assurance that the Company's research and development projects will be successful, that products developed will obtain necessary regulatory approvals, or that any approved product will be commercially viable. In addition, the Company operates in an environment of rapid technological change and is largely dependent on the services of its employees and consultants. Further, the Company's future operations are dependent on the success of the Company's efforts to raise additional capital.

Going Concern

To date, the Company has incurred substantial losses and negative cash flows from operations. It expects to continue to incur operating losses for the foreseeable future as it pursues development of its lead therapeutic candidate. Operating losses are expected to continue until such time, if ever, that the Company can generate significant revenue from product candidates currently in development.

For the year ended December 31, 2020, net cash used in operating activities was $492,971 and the Company's net loss was $2,343,893. As of December 31, 2020, the Company had an accumulated deficit of $3,461,882, total outstanding debt of $2,240,000 (before deduction of debt issuance costs and debt discounts), and total accrued interest expense of $191,687. As of December 31, 2020, the Company had $828,016 in cash and cash equivalents.

The Company plans to expand development of its lead therapeutic candidate and possibly explore strategic partnerships. Management believes that current cash and cash equivalents are sufficient to fund minimal operations and capital requirements through 2021. To support its planned expanded operations, the Company will require additional capital; however, the Company cannot be certain that additional funding will be available on acceptable terms, or at all. To the extent the Company raises additional funds by issuing equity securities, its stockholders may experience significant dilution. Any debt financing, if available, may include potentially dilutive features and include restrictive covenants that impact the Company's ability to conduct business. If the Company is unable to raise additional capital when required or on acceptable terms, the Company may have to (i) significantly scale back its planned operations or (ii) relinquish or otherwise dispose of rights to technologies on unfavorable terms.

The Company has historically funded its operations through issuances of convertible promissory notes, and, for the foreseeable future, the Company plans to fund its operations by continuing to raise additional capital through sales of equity or additional debt. In 2020, the Company raised $1,190,000 from the issuance of Convertible Promissory Notes (see Note 6). The Company is not in default of any covenants required by its lenders; however, if such default should occur, the outstanding debt could become due and payable immediately. The Company is unable to predict the extent of any future losses or when the Company will become profitable, if ever.

(1) Nature of Business and Liquidity (Continued)

These financial statements have been prepared under the assumption that the Company will continue as a going concern which contemplates the continuation of operations, realization of assets and liquidation of liabilities in the ordinary course of business. Due to the Company's recurring and expected continuing losses from operations, the Company has concluded there is substantial doubt concerning its ability to continue as a going concern within one year of the issuance of these financial statements without additional capital becoming available. These financial statements do not include any adjustments that might result from the outcome of this uncertainty.

(2) Summary of Significant Accounting Policies

(a) Basis of Presentation

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

(b) Use of Estimates

The preparation of financial statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, including disclosure of contingent assets and liabilities, at the date of the financial statements, and the reported amounts of revenues and expenses during the reporting period. Due to the uncertainty of factors surrounding the estimates or judgments used in the preparation of the financial statements, actual results may materially vary from these estimates.

Significant items subject to such estimates and assumptions include the valuation of share-based compensation, derivative liabilities, and warrant liability. Future events and their effects cannot be predicted with certainty; accordingly, accounting estimates require the exercise of judgment. Accounting estimates used in the preparation of these financial statements change as new events occur, as more experience is acquired, as additional information is obtained and as the operating environment changes.

(c) Basic and Diluted Earnings (Loss) per Share

Basic net earnings (loss) per share is determined by dividing the net income (loss) attributable to common stockholders by the weighted average number of shares of common stock outstanding during the period. Diluted net earnings (loss) per share includes the effect, if any, from the potential conversion, vesting or exercise of securities, such as convertible promissory notes and stock options, which would result in the issuance of incremental shares of common stock. The computation of diluted net earnings (loss) per shares does not include the conversion of securities that would have an antidilutive effect. The basic and dilutive computations of net earnings (loss) per share for the Company for the years ended December 31, 2020 and 2019, are the same because the dilutive effects of the Company's convertible notes and warrants would be antidilutive.

(d) Cash and Cash Equivalents

The Company classifies deposits in banks, money market funds and cash invested temporarily in various instruments with original maturities of three months or less as cash and cash equivalents. At times, the Company's cash balances may exceed the current insured amounts under the Federal Deposit Insurance Corporation (FDIC). The Company's cash balances at December 31, 2020, were $828,016.

(2) Summary of Significant Accounting Policies (Continued)

(e) Research and Development

Research and development costs are expensed as incurred and primarily comprise expenses to discover, research and develop therapeutic candidates. These expenses may include personnel costs, stock-based compensation expense, allocated facility-related and depreciation expenses, third-party license fees, and costs of outside vendors under arrangements with third parties, such as contract research organizations ("CROs"), contract manufacturing organizations ("CMOs"), and consultants. Non-refundable prepayments for goods or services that will be used or rendered for future research and development activities are recorded as prepaid expenses. Such amounts are recognized as an expense as the goods are delivered or the related services are performed, or until it is no longer expected that the goods will be delivered or the services rendered. At December 31, 2020 and 2019, the Company's outstanding payables to CROs or CMOs were $31,346 and $0, respectively.

The Company has entered into various research and development-related contracts with companies both inside and outside of the United States. The related costs are recorded as research and development expenses as incurred. The Company records accruals for estimated ongoing research costs. When evaluating the adequacy of the accrued liabilities, the Company analyzes progress of the studies, including the phase or completion of events, invoices received and contracted costs. Significant judgments and estimates are made in determining the accrued balances at the end of any reporting period. Actual results could differ materially from the Company's estimates.

Patent Costs

All legal fees and expenses and costs related to patent-related filings with governmental authorities incurred in connection with filing and prosecuting patent applications are expensed as incurred due to the uncertainty about the recovery of the expenditure. Amounts incurred are classified as general and administrative expenses.

(f) Share-Based Compensation

Share based compensation, if any, for employees and non-employees is measured at the grant date based on the fair value of the award. The Company recognizes compensation expense, if any, for awards to employees and directors over the requisite service period, which is generally the vesting period of the respective award, and for awards to nonemployees over the period during which services are rendered by such nonemployees until completed. Generally, the Company issues awards with only service-based vesting conditions and records the expense for these awards using the straight-line method. 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. Forfeitures are accounted for as they occur.

As there is no public market for the Company's common stock, the estimated fair value of the common stock has been determined by the Company's board of directors (the "Board") as of the date of each award, with input from management, considering, when available, third-party valuations of the Company's common stock as well as the Board's assessment of additional objective and subjective factors that it believed were relevant and which may have changed between the date of the most recent third-party valuation and the date of the grant. The assumptions used in calculating the fair value of share-based awards represent management's best estimates and involve inherent uncertainties and the application of management's judgment. As a result, if factors change and management uses different assumptions, share-based compensation expense could be materially different.

Certain stock appraisal methodologies utilize, among other variables, the volatility of the stock price. As an historically private company, the Company lacks company-specific historical and implied volatility

(2) Summary of Significant Accounting Policies (Continued)

information for its stock. Therefore, it estimates its expected stock price volatility based on the historical volatility of publicly traded peer companies and expects to continue to do so until such time, if ever, as it has adequate historical data regarding the volatility of its own traded stock price. The expected life of options awarded was estimated using the simplified method because the Company has limited historical information on which to base reasonable expectations about future exercise patterns and post-vesting employment. The risk-free interest rate is determined by reference to the U.S. Treasury yield curve in effect at the time of grant of the award for time periods approximately equal to the expected term of the award. Expected dividend yield is based on the fact that the Company has never paid cash dividends on its common stock and does not expect to pay cash dividends in the foreseeable future.

(g) Income Taxes

The Company provides for income taxes using the asset and liability approach. Deferred tax assets and liabilities are recorded based on the differences between the financial statement and tax bases of assets and liabilities and the tax rates in effect when these differences are expected to reverse. Deferred tax assets are reduced by a valuation allowance if, based on the weight of available evidence, it is more likely than not that some or all of the deferred tax assets will not be realized. As of December 31, 2020 and 2019, the Company had a full valuation allowance against deferred tax assets.

The Company is subject to the provisions of ASC 740-10-25, Income Taxes (ASC 740). ASC 740 prescribes a more likely-than-not threshold for the financial statement recognition of uncertain tax positions. ASC 740 clarifies the accounting for income taxes by prescribing a minimum recognition threshold and measurement attribute for the financial statement recognition and measurement of a tax position taken or expected to be taken in a tax return.

There are currently no open Federal or State tax audits. The Company has not recorded any liability for uncertain tax positions at December 31, 2020 or December 31, 2019.

(h) Concentrations of Credit Risk

Financial instruments that potentially expose the Company to concentrations of credit risk consist primarily of cash. The Company generally maintains balances in various accounts at one or more U.S. banks in amounts that may exceed federally insured limits. The Company has not experienced any losses related to its cash and does not believe that it is subject to unusual credit risk beyond the normal credit risk associated with commercial banking balances.

(i) Derivative Liabilities

The Company does not use derivative instruments to hedge exposures to interest rate, market, or foreign currency risks. The Company evaluates all of its financial instruments, including convertible promissory notes, to determine if such instruments contain features that meet the definition of embedded derivatives.

Embedded derivatives must be separately measured from the host contract if all the requirements for bifurcation are met. The assessment of the conditions surrounding the bifurcation of embedded derivatives depends on the nature of the host contract. Bifurcated embedded derivatives are recognized at fair value, with changes in fair value recognized in the statement of operations each period. Bifurcated embedded derivatives are classified with the related host contract in the Company’s balance sheet.

In connection with the Company’s convertible promissory notes, the Company has identified certain embedded and freestanding derivatives which are recorded as liabilities on the balance sheets and are

(2) Summary of Significant Accounting Policies (Continued)

remeasured to fair value at each reporting date until the derivative is settled. Changes in the fair value of the derivative liabilities are recognized in the statements of operations.

(j) Deferred Offering Costs

The Company capitalizes certain legal, professional accounting and other third-party fees that are directly associated with in-process capital stock financings as deferred offering costs until such financings are consummated. After consummation of the financing, these costs are recorded in stockholders' equity (deficit) as a reduction of additional paid-in capital generated as a result of the offering. Should a planned equity financing be abandoned, the deferred offering costs will be expensed immediately as a charge to operating expenses in the statements of operations. The Company had no deferred offering costs as of December 31, 2019. As of December 31, 2020, the Company had recorded deferred offering costs of $224,153 reported as long-term assets on the accompanying balance sheets.

(k) Emerging Growth Company Status

The Company is an "emerging growth company" ("EGC") as defined in the Jumpstart Our Business Startups Act ("JOBS Act") and may take advantage of certain exemptions from various reporting requirements that are applicable to public companies that are not EGCs. The Company may take advantage of these exemptions until it is no longer an EGC under Section 107 of the JOBS Act and has elected to use the extended transition period for complying with new or revised accounting standards. As a result of this election, the Company's financial statements may not be comparable to companies that comply with public company Financial Accounting Standards Board ("FASB") standards' effective dates. The Company may take advantage of these exemptions up until the last day of the fiscal year following the fifth anniversary of a public offering or such earlier time that it is no longer an EGC.

(l) Recent Accounting Pronouncements

In August 2020, the FASB issued ASU No. 2020-06, Debt — Debt with Conversion and Other Options (Subtopic 470-20) and Derivatives and Hedging — Contracts in Entity's Own Equity (Subtopic 815-40). ASU 2020-06 simplifies accounting for convertible instruments by removing major separation models required under current GAAP. The ASU also simplifies the diluted earnings per share (EPS) calculation in certain areas. The ASU is effective for public business entities that meet the definition of a Securities and Exchange Commission (SEC) filer, excluding entities eligible to be smaller reporting companies as defined by the SEC, for fiscal years beginning after December 15, 2021, including interim periods within those fiscal years. For all other entities, the standard will be effective for fiscal years beginning after December 15, 2023, including interim periods within those fiscal years. Early adoption is permitted. The Company is currently evaluating ASU 2020-06. The Company is currently assessing the impact of the adoption of ASU 2020-06 on its financial statements.

In February 2016, the FASB issued ASU No. 2016-02, Leases (Topic 842), which supersedes the existing guidance for lease accounting ("Topic 842"). The FASB has issued several updates to the standard which: (i) clarify how to apply certain aspects of the new standard; (ii) provide an additional transition method for adoption of the new standard; (iii) provide a practical expedient for certain lessor accounting; and (iv) amend certain narrow aspects of the guidance. Topic 842 requires the identification of arrangements that should be accounted for as leases by lessees. In general, for lease arrangements exceeding a twelve-month term, these arrangements must be recognized as assets and liabilities on the balance sheet of the lessee. Under Topic 842, a right-of-use asset and lease obligation will be recorded for all leases, whether operating or financing, while the income statement will reflect lease expense for operating leases and amortization/interest expense for financing leases. The balance sheet amount recorded for existing leases at the date of

(2) Summary of Significant Accounting Policies (Continued)

adoption of Topic 842 is calculated using the applicable incremental borrowing rate at the date of adoption. While Topic 842 is effective for the Company, the Company has no long-term leases requiring consideration under Topic 842.

(m) On March 22, 2021, the board of directors and shareholders of the Company approved a reverse stock split of the Company's common stock at a ratio of one share for every 1.6486484 shares previously held. All common stock share and per share data and conversion or exercise price data for applicable common stock equivalents included in these financial statements have been retroactively adjusted to reflect the reverse stock split.

(3) Fair Value Measurements

ASC 820, Fair Value Measurements, provides guidance on the development and disclosure of fair value measurements. The Company follows this authoritative guidance for fair value measurements, which defines fair value, establishes a framework for measuring fair value under U.S. GAAP, and expands disclosures about fair value measurements. The guidance requires fair value measurements be classified and disclosed in one of the following three categories:

- Level 1: Quoted prices (unadjusted) in active markets that are accessible at the measurement date for identical assets or liabilities.
- Level 2: Observable prices that are based on inputs not quoted on active markets but corroborated by market data.
- Level 3: Unobservable inputs which are supported by little or no market activity and values determined using pricing models, discounted cash flow methodologies, or similar techniques, as well as instruments for which the determination of fair value requires significant judgment or estimation.

Fair value measurements discussed herein are based upon certain market assumptions and pertinent information available to management as of and during the years ended December 31, 2020 and 2019. The carrying amount of cash and accounts payable approximated fair value as they are short term in nature. The guidance in ASC 815, Derivatives and Hedging, requires that we mark the value of our common stock warrant liability to market and recognize the change in valuation in our statements of operations each reporting period. Determining the warrant liability to be recorded requires us to develop estimates to be used in calculating the fair value of the warrant. The fair value of common stock warrants issued were estimated based on a Black-Scholes model during the years ended December 31, 2020 and 2019. The estimated fair value of the warrant liability and the derivative liability ("embedded put features") included in the convertible promissory notes, represent Level 3 measurements. The following table details the fair value measurement within the fair value hierarchy of the Company's financial instruments, which includes the Level 3 liabilities:

	Fair value measurements as of December 31, 2019, using:			
	Level 1	Level 2	Level 3	Total
Liabilities				
Derivative liabilities	$—	$—	$239,000	$239,000
Warrant liability	—	—	14,524	14,524
	$—	$—	$253,524	$253,524

(3) Fair Value Measurements (Continued)

	Fair value measurements as of December 31, 2020, using:			
	Level 1	Level 2	Level 3	Total
Liabilities				
Derivative liabilities	$—	$—	1,751,000	1,751,000
Warrant liability	—	—	29,376	29,376
	$—	$—	$1,780,376	1,780,376

Between the years ended December 31, 2020 and 2019, there were no transfers between level 1, level 2 and level 3.

For further discussion of the derivative liabilities, see Note 6. For further discussion of the warrant liability, see Note 8.

(4) Accounts Payable and Accrued Expenses

Accounts payable and accrued expenses consisted of the following:

	December 31,	
	2020	2019
Professional fees	$193,281	$ 1,650
Consulting fees	80,013	—
Research and development billings	51,806	—
State filing and other fees	1,778	607
Accrued license payments	42,300	25,000
	$369,178	$27,257

See Note 5 for further information regarding the accrued license payments.

(5) Commitments and Contingencies

(a) Leases

The Company leased no office or laboratory facilities in the year ended December 31, 2019. In March 2020, the Company entered into an agreement with the Pagliuca Harvard Life Lab whereby the Company rents one laboratory bench and the right to use certain common facilities at the Life Lab. The monthly rental for the bench is $2,600 and the Company pays $200 per month for each Company person who regularly uses the Life Lab. The agreement is for one year and is cancelable anytime upon 30 days' notice.

(b) License Agreement

In November 2018, the Company licensed the exclusive rights to certain intellectual property to support development of its therapeutic candidates ("License"). The intellectual property licensed by the Company is owned by The General Hospital Corporation, d/b/a Massachusetts General Hospital, ("Licensor"). Payments by the Company under the license agreement included a one-time non-refundable fee of $50,000 paid after execution of the License; reimbursement of Licensor's patent costs which, at execution of the License, were approximately $145,000; a minimum annual license fee of $25,000 payable within 60 days of each anniversary of the effective date of the License prior to the first commercial sale of a

(5) Commitments and Contingencies (Continued)

product or process covered by the License; milestone payments upon attainment of certain milestone events; royalties based on net sales of products covered by the patent-related rights; and a portion of any sublicense income received by the Company. The Company is responsible for the development and commercialization of the licensed assets and for meeting certain milestones set forth in the License.

At December 31, 2020 and 2019, the Company had accrued $42,300 and $25,000, respectively, in license payments under the terms of the License, included in accrued expenses. The amount due at December 31, 2019, has been paid.

The milestone payments the Company shall pay to Licensor shall not exceed $1,550,000 based upon and subject to the attainment of each milestone event indicated below. These payments are generally due within 60 days of achievement of the milestone.

Milestone Event	Amount
Enrollment of first patient in a phase II clinical trial of a therapeutic product or process	$ 100,000
Enrollment of first patient in a phase III clinical trial of a therapeutic product or process	$ 200,000
First commercial sale of a therapeutic product or process	$1,000,000
Filing of an application for regulatory approval of a clinical diagnostic product or process	$ 100,000
First regulatory approval of a clinical diagnostic product or process	$ 150,000

As of December 31, 2020 and 2019, no milestone events had been achieved.

In addition to milestone payments, royalties shall be paid to Licensor assessed on net sales of licensed products on a country-by-country basis in an amount equal to 3.0% for therapeutic products or processes and 6.0% for clinical diagnostic products and processes. The Company shall pay Licensor 30% of any and all sublicense income.

The Company has the right to terminate the License at any time by giving 90 days advance notice subject to the payment of any amounts due under the License at that time. The License may also be terminated for cause by either party upon the breach of the material obligations of the other party or the bankruptcy or liquidation of the other party. If the Company does not terminate the License, the term of the License shall continue until the latest of (i) the date on which all issued patents and filed patent applications subject to the License have expired or been abandoned; (ii) expiration of the last to expire regulatory exclusivity covering a covered product or process; or (iii) 10 years after the first commercial sale. The License requires the Company to make royalty payments beyond the term of the License at 1.5%.

In November 2020, the Company and Licensor amended the November 2018 license. Under the amendment, the intellectual property licensed in 2018 was categorized as “Patent Family 1” and a provision patent filing related to the Company’s nanoparticle technology was added to Patent Family 1. A second patent family (“Patent Family 2”) was created which includes Licensor intellectual property targeting PD-L1.

The minimum annual license fee prior to the first commercial sale of a product or process covered by the License was increased from $25,000 per year to $30,000 per year for Patent Family 1 and a minimum annual license fee of $10,000 per year was added related to Patent Family 2. All other terms of the License including milestone payments, royalties and payment terms related to sublicense income received by the Company remain the same as in the original License.

(5) Commitments and Contingencies (Continued)

(c) Litigation

The Company may from time to time be subject to claims by others under various legal disputes. The defense of such claims, or any adverse outcome relating to any such claims, could have a material adverse effect on the Company's liquidity, financial condition and cash flows. At December 31, 2020 and 2019, the Company did not have any pending legal actions.

(d) Indemnification Agreements

In the ordinary course of business, the Company may provide indemnification of varying scope and terms to vendors, lessors, business partners, and other parties with respect to certain matters including, but not limited to, losses arising out of breach of such agreements or from intellectual property infringement claims made by third parties. In addition, the Company has entered into indemnification agreements with members of its board of directors and executive officers that require the Company, among other things, to indemnify the parties against certain liabilities that may arise by reason of their status or service as directors or officers. The maximum potential amount of future payments the Company could be required to make under these indemnification agreements is, in many cases, unlimited. To date, the Company has not incurred any costs as a result of such indemnifications. The Company is not aware of any indemnification arrangements that could have a material adverse effect on its financial position, results of operations or cash flows, and it has not accrued any liabilities related to such obligations in its financial statements as of December 31, 2020 or 2019.

(e) Risks and Uncertainties

In December 2019, a novel strain of a virus named SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), or coronavirus, which causes COVID-19, surfaced in Wuhan, China and has since spread worldwide, including to Eastern Massachusetts where our primary office and laboratory space is located. The coronavirus pandemic is evolving, and to date has led to the implementation of various responses, including government-imposed quarantines, travel restrictions and other public health safety measures. The extent to which the coronavirus impacts our operations directly or through parties on whom we depend will also depend on future developments, which are highly uncertain and cannot be predicted with confidence. The outcome of these events could delay our plans, increase our operating expenses and have a material adverse effect on our financial results.

(6) Convertible Promissory Notes

From May 2018 through May 2020, the Company issued 14 convertible promissory notes ("Notes") having an aggregate principal amount of $2,240,000. The Notes bear interest at a rate of 6% per annum and were initially set to mature on February 14, 2021. In 2020, the Notes were extended and unless previously converted, principal and accrued but unpaid interest on the Notes is payable on demand any time after December 31, 2022, ("Maturity Date"). As of December 31, 2020 and 2019, total accrued interest on the Notes was $191,687 and $69,978, respectively. Principal and accrued but unpaid interest on the Notes automatically convert, at a discount, into the same equity securities as are sold by the Company in a Qualified Financing (generally an equity financing with gross proceeds of $5 million or more) or upon a change in control of the Company. Subject to a pre-money valuation limit of $15 million, the conversion discount ranges from 20% to 30%. In the event of a liquidation, dissolution or winding up of the Company, the conversion rights shall terminate.

Convertible promissory notes at December 31, 2020 and 2019, comprised the following:

(6) Convertible Promissory Notes (Continued)

Note Identifier	Issue Date	Principal Amount	Accrued Interest at December 31, 2020	Accrued Interest at December 31, 2019
Note One	May 2, 2018	$ 500,000	$80,137	$50,055
Note Two	June 26, 2018	$ 50,000	$ 7,562	$ 4,553
Note Three	March 2, 2019	$ 100,000	$10,767	$ 4,751
Note Four	March 5, 2019	$ 50,000	$ 5,466	$ 2,458
Note Five	March 8, 2019	$ 50,000	$ 5,384	$ 2,375
Note Six	March 15, 2019	$ 50,000	$ 5,326	$ 2,318
Note Seven	March 20, 2019	$ 50,000	$ 5,293	$ 2,285
Note Eight	November 7, 2019	$ 100,000	$ 6,723	$ 723
Note Nine	November 7, 2019	$ 100,000	$ 6,460	$ 460
Note Ten	February 17, 2020	$1,000,000	$50,984	—
Note Eleven	April 3, 2020	$ 40,000	$ 1,790	—
Note Twelve	May 8, 2020	$ 50,000	$ 1,951	—
Note Thirteen	May 8, 2020	$ 50,000	$ 1,951	—
Note Fourteen	May 15, 2020	$ 50,000	$ 1,893	—

The unamortized amounts of debt issuance costs and debt discounts at December 31, 2020 and 2019, are:

	2020	2019
Principal amount of convertible promissory notes	$2,240,000	$1,050,000
Less unamortized debt issuance costs	(8,002)	(18,540)
Less unamortized debt discounts	(145,323)	(103,650)
Convertible promissory notes, net	$2,086,675	$ 927,810

Upon closing of the Qualified Financing, the Notes settle by providing the holder with a variable number of shares in the Qualified Financing with an aggregate fair value determined by reference to the debt principal and accrued but unpaid interest. In this scenario, the value that the holder receives at settlement does not vary with the value of the Company's common stock, so the settlement provision was not a typical conversion option. Rather, the share settlement feature was considered a contingent redemption provision (i.e., a contingent embedded put). The Company evaluated the embedded put features in accordance with ASC 815-15-25. The embedded puts are not clearly and closely related to the debt host instrument and therefore have been separately measured at fair value, with subsequent changes in fair value recognized in the statement of operations.

Management used a scenario-based analysis to estimate the fair value of the embedded put features upon issuance of the Notes. The original values of the embedded put features were recorded as a debt discount to the Notes which discount is amortized as non-cash interest expense during the reporting periods. At December 31, 2020 and 2019, the fair value of the derivative liability was $1,751,000 and $239,000, respectively. The Company recorded an expense of $1,208,000 resulting from the increase in fair value of the derivative liability for the year ended December 31, 2020, and a gain of $4,000 resulting from the decrease in fair value of the derivative liability for the year ended December 31, 2019.

During the years ended December 31, 2020 and 2019, the Company amortized debt issuance costs of $10,537 and $12,717, respectively, to interest expense.

(6) Convertible Promissory Notes (Continued)

Concurrent with the derivative liabilities, the Company recorded debt discounts in the amount of $304,000 and $117,000 during the years ended December 31, 2020 and 2019, respectively. The debt discount is being amortized to interest expense over the life of the Notes. Amounts amortized to interest expense were $262,327 and $95,878 for the years ended December 31, 2020 and 2019, respectively.

(7) Stockholders' Equity

a) Overview

The Company's Certificate of Incorporation, originally filed on January 11, 2016, was amended on April 15, 2020, to increase the number of shares of Common Stock authorized and to authorize the issuance of Preferred Stock. The total number of shares which the Company is authorized to issue is 25,000,000, each with a par value of $0.0001 per share. Of these shares, 20,000,000 shall be Common Stock and 5,000,000 shall be Preferred Stock. At December 31, 2020 and 2019, the Company had issued 4,636,216 shares of restricted common stock subject to forfeiture until vested. At those dates, 4,489,738 shares and 4,049,528 shares, respectively, of restricted common stock had vested. Of the shares sold in 2018, an aggregate of 292,250 shares were issued to two purchasers in exchange for subscriptions receivable. These notes bear interest at 4% per annum and are secured by the underlying restricted shares. As of December 31, 2020 and 2019, the principal balance of subscriptions receivable was $11,690 at both dates, and accrued interest was $1,073 and $582, respectively. The Preferred Stock is undesignated; no shares of Preferred Stock have been issued.

As of December 31, 2020 and 2019, the Company had reserved 1,050,694 shares and 483,341 shares, respectively, of common stock for the conversion of outstanding Convertible Promissory Notes (see Note 6) and the exercise of outstanding warrants to purchase shares of common stock (see Note 8).

The following table lists information about unvested restricted common stock.

Unvested restricted common stock at December 31, 2018	1,395,815
Shares issued	—
Shares vested	(809,122)
Unvested restricted common stock at December 31, 2019	586,693
Shares issued	—
Shares vested	(440,209)
Unvested restricted common stock at December 31, 2020	146,483

b) Common Stock

i. Dividends

Subject to the rights of holders of any Preferred Stock, holders of the Common Stock are entitled to receive dividends as may be declared from time to time by the Board. No cash dividends were declared or paid during the years ended December 31, 2020 or 2019.

ii. Liquidation

Subject to the rights of holders of any Preferred Stock as to liquidation, upon the liquidation, dissolution or winding up of the Company, the remaining assets of the Company will be distributed to holders of Common Stock.

(7) Stockholders' Equity (Continued)

iii. Voting

Holders of Common Stock are entitled to one vote for each share of Common Stock held but shall not be entitled to vote on any amendment to the Certificate of Incorporation that relates solely to the terms of any series of Preferred Stock. There is no cumulative voting.

(8) Warrants

In connection with the May 2, 2018, issuance of the Convertible Promissory Note designated as "Note One" (see Note 6), the Company agreed to pay a cash fee to the finder involved in the sale and to issue to the finder warrants to purchase shares of the Company's common stock. The number of shares of common stock subject to the warrants is equal to five percent of the number of shares of Common Stock into which Note One converts. The exercise price is the conversion price applicable on conversion of the Note. The number of shares of Common Stock to be issued to the holder of the Note on conversion of the Note is equal to the principal amount of the Note plus accrued but unpaid interest to the date of conversion divided by the applicable conversion price. The applicable conversion price is equal to the price paid for the Company's equity securities in a Qualified Financing (as defined) less a discount. The discount ranges from 20% to 30% depending on the length of time after the investment to complete the Qualified Financing. Regardless of the applicable conversion price resulting from application of the foregoing process, the applicable conversion price cannot exceed that price per share that equates to a $15 million pre-money valuation. Exercise of the purchase rights represented by the warrant may be made, in whole or in part, at any time or from time to time until May 2, 2028, except that the warrants terminate upon an initial public offering of the Company's Common Stock or a change in control of the Company.

Pursuant to ASC 718, the obligation to issue the Warrants will be a liability until issuance as they are an award that embodies an unconditional obligation to issue an undeterminable number of shares for a fixed monetary amount known at inception. Upon issuance, the liability would be reclassified to equity.

The obligation to issue Warrants has been recorded at fair value on inception date and remeasured at each reporting period until issuance. The compensation cost recognized for a liability-classified award equals the amount for which the award is settled. Therefore, the Company measured the obligation to issue warrants at fair value on May 2, 2018, and remeasures fair value at each reporting period until issuance of the Warrants.

A summary regarding the fair value of the warrant liability is as follows:

	Warrant Liability
Fair value at December 31, 2018	$17,108
Change in fair value	(2,584)
Fair value at December 31, 2019	14,524
Change in fair value	14,852
Fair value at December 31, 2020	$29,376

The fair value of the Company's warrant liability was calculated using the Black-Scholes model and the following assumptions:

	As of December 31,	
	2020	2019
Fair value per share of Company's common stock	$ 3.91	$ 0.08

(8) Warrants (Continued)

	As of December 31,	
	2020	2019
Dividend yield	0.0%	0.0%
Expected volatility	84.0%	79.0%
Risk Free interest rate	0.3%	1.7%
Expected life (years)	4.67	4.73
Fair value of warrants	$29,376	$14,524

(9) Share-Based Compensation

Since inception, the Company has sold shares of restricted stock to co-founders, directors, managers, and advisors generally at prices believed to be fair market value at the time of the sale. Shares of restricted stock were reserved at the time of issue. To the extent that the sale price was less than the estimated fair market value at the grant date, a charge is recorded for the periods in which such shares vest. The vesting period for restricted stock is generally two to three years.

In April 2020, the Board approved the TransCode Therapeutics, Inc. 2020 Stock Option and Incentive Plan (the “Plan”) providing for the issuance of options or other awards to purchase up to 3,032,787 shares of the Company’s Common Stock. The Plan provides for grants of equity in the form of stock awards, stock options and other instruments to employees, members of the Board, officers and consultants of and advisors to the Company. The Plan is administered by the Board or, at the discretion of the Board, by a committee of the Board. The amount and terms of grants are determined by the Board. The terms of options granted under the Plan generally are for ten (10) years after date of grant and are exercisable in cash or as otherwise determined by the Board. The vesting period for equity-based awards is determined at the discretion of the Board and is generally two to four years. If grants of stock options under the Plan terminate, expire, or are surrendered or cancelled, the shares subject to such grants will again be available under the Plan. In 2020, the Board awarded options to purchase 1,756,279 shares of Common Stock under the Plan, all of which were outstanding at December 31, 2020.

The exercise price for incentive stock options is determined at the discretion of the Board but for grants to any person possessing less than 10% of the total combined voting power of all classes of stock may not have an exercise price less than 100% of the fair market value of the Common Stock on the grant date (110% for grants to any person possessing more than 10% of the total combined voting power of all classes of stock). The option term for incentive stock option awards may not be greater than ten years from the date of the grant (five years for grants to any person possessing more than 10% of the total combined voting power of all classes of stock).

At December 31, 2020, options to purchase 1,276,508 shares were available for future grants and there were 353,824 options that were vested and exercisable. At December 31, 2020, options to purchase Common Stock of the Company under the Plan were outstanding as follows:

	Number of shares	Weighted average exercise price per share	Weighted average remaining contractual term (years)
Outstanding at December 31, 2019	—	—	—
Granted	1,756,279	$0.25	6.4
Exercised	—	—	—

TRANSCODE THERAPEUTICS, INC.

NOTES TO FINANCIAL STATEMENTS (Continued)
December 31, 2020 and 2019

(9) Share-Based Compensation (Continued)

	Number of shares	Weighted average exercise price per share	Weighted average remaining contractual term (years)
Forfeited	—	—	—
Outstanding at December 31, 2020	1,756,279	$0.25	6.4

The intrinsic value of the outstanding options as of December 31, 2020, was $6,430,910.

Option valuation

The assumptions that the Company used to determine the grant-date fair value of options granted in 2020 were as follows:

	Year ended December 31, 2020
Risk-free interest rate	0.25% - 0.55%
Expected term (in years)	3.5 - 6.25
Expected volatility	95.83% - 97.20%
Expected dividend yield	0%
Fair value of underlying stock	$0.08 - $3.91

The weighted average grant date fair value of the options granted in 2020 was $0.18 per share.

The Company recorded stock-based compensation expense for these awards of $42,651 during the year ended December 31, 2020. The remaining compensation costs to be recognized on the stock options is approximately $271,000 over approximately 2.8 years.

(10) Net Loss Per Share

The Company has reported a net loss for the years ended December 31, 2020 and 2019, and the basic and diluted net loss per share attributable to common stockholders are the same for both years because shares issuable on conversion of all convertible promissory Notes and upon exercise of all Warrants have been excluded from the computation of diluted weighted-average shares outstanding because such securities would have an antidilutive impact.

The following table sets forth the computation of basic and diluted net loss per share:

	Years Ended December 31,	
	2020	2019
Numerator		
Net loss	$(2,343,893)	$ (607,212)
Denominator		
Weighted-average common shares outstanding, basic and diluted	4,636,216	4,636,216
Net loss per share attributable to common stockholders, basic and diluted	$ (0.51)	$ (0.13)

Based on the amounts of Notes outstanding at December 31, 2020 and 2019, including accrued interest, and an assumed applicable conversion price per share of $2.34, potential common shares issuable

(10) Net Loss Per Share (Continued)

upon conversion of Notes, exercise of Warrants and options excluded from the computation of diluted weighted-average shares outstanding are assumed as follows:

	December 31,	
	2020	2019
Shares issuable on conversion of Promissory Notes	1,038,309	471,757
Shares issuable on exercise of Warrants	12,385	11,584
Shares issuable on exercise of vested Options	353,824	—

(11) Income Taxes

For the years ended December 31, 2020 and 2019, the Company recognized no provision for or benefit from income taxes.

A reconciliation of income tax benefit computed at the statutory federal and state income tax rates to income taxes as reflected in the financial statements is as follows:

	December 31,	
	2020	2019
Federal income tax benefit at statutory rate	21.0%	21.0%
State and local tax, net of federal benefit	1.9%	4.9%
Permanent differences	(14.8)%	(4.8)%
Change in valuation allowance	(7.5)%	(21.1)%
Effective Income Tax rate	0.0%	0.0%

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

	December 31,	
	2020	2019
Net operating loss carryforwards	$ 421,000	$ 243,000
Capitalized research and development costs, start-up costs and amortization	14,000	17,000
Total deferred tax assets	435,000	260,000
Less valuation allowance	(435,000)	(260,000)
Net deferred taxes	$ —	$ —

As of December 31, 2020, the Company had U.S. federal net operating loss carryforwards of approximately $1,545,000, which may be available to offset future income tax liabilities. Federal net operating loss carryforwards generated in 2017 and prior of approximately $38,000 will expire beginning 2036. The remaining approximately $1,507,000 of federal net operating loss carryforwards generated in 2018, 2019 and 2020, do not expire. As of December 31, 2020, the Company also had Massachusetts state net operating loss carryforwards of approximately $1,543,000 which may be available to offset future income tax liabilities and will expire beginning in 2036.

The Company has recorded a full valuation allowance against its net deferred tax assets as of December 31, 2020 and 2019, because the Company has determined that is it more likely than not that these

(11) Income Taxes (Continued)

assets will not be fully realized due to the significant uncertainty about the realization of the deferred tax asset until the Company can operate profitably. The Company experienced a net change in valuation allowance of $175,000 in the year ended December 31, 2020.

Under the provisions of the Internal Revenue Code, the net operating loss carryforwards are subject to review and possible adjustment by the Internal Revenue Service and state tax authorities. Net operating loss carryforwards may become subject to an annual limitation in the event of certain cumulative changes in the ownership interest of significant stockholders over a three-year period in excess of 50%, as defined under Sections 382 and 383 of the Internal Revenue Code as well as similar state provisions. This could limit the amount of tax attributes that can be utilized annually to offset future taxable income or tax liabilities. The amount of the annual limitation is determined based on the value of the Company immediately prior to the ownership change. Subsequent ownership changes may further affect the limitation in future years. The Company has completed financings since its inception which may have resulted in a change in control as defined by Sections 382 and 383 of the Internal Revenue Code or could result in a change in control in the future. The Company has not analyzed the historical or potential impact of its financings on beneficial ownership, and therefore, no determination has been made whether the net operating loss carryforward is subject to any Internal Revenue Code Section 382 limitation. To the extent there is a limitation, there could be a reduction in the deferred tax asset with an offsetting reduction in the valuation allowance.

The Company files tax returns as prescribed by the tax laws of applicable jurisdictions. In the normal course of business, the Company is subject to examination by federal and state jurisdictions, where applicable. The Company’s tax years from 2016 to the present remain open for review. All open years may be examined to the extent that net operating loss carryforwards are used in future periods. The Company will recognize interest and penalties related to uncertain tax positions in income tax expense. As of December 31, 2020 and 2019, the Company had no accrued interest or penalties related to uncertain tax positions, and no amounts have been recognized in the Company’s statements of operations.

On March 27, 2020, the Coronavirus Aid, Relief, and Economic Security (CARES) Act was signed into law. The Act contains several new or changed income tax provisions, including but not limited to the following: increased limitation threshold for determining deductible interest expense, class life changes to qualified improvements (in general, from 39 years to 15 years), and the ability to carry back net operating losses incurred from tax years 2018 through 2020 up to the five preceding tax years. The Company has evaluated the new tax provisions of the CARES Act and determined the impact to be either immaterial or not applicable.

(12) Related-Party Transactions

The Company had no related party transactions for the years ended December 31, 2020 and 2019. Between inception and mid-2018, major shareholders and co-founders funded certain expenses of the Company. The aggregate amount of these expenses remaining unreimbursed at December 31, 2020 and 2019, is $35,685. The Company intends to reimburse these amounts shortly after completion of its next equity funding.

(13) Subsequent Events

For its financial statements as of December 31, 2020, the Company evaluated subsequent events through February 26, 2021, the date on which those financial statements were issued, except for the effects of the reverse stock split described in Note 2(m), as to which the date is March 24, 2021.

Stock Split

The Company's Board of Directors and Stockholders approved a 1-for-1.6486484 reverse stock split of the Company's common stock that became effective March 22, 2021. All share and per share amounts in

(13) Subsequent Events (Continued)

the financial statements and notes thereto have been retroactively adjusted for all periods presented to give effect to this reverse split.

Option Agreement

The Company signed an Exclusive Option And Internal Evaluation License Agreement (the "Option") with The General Hospital Corporation, d/b/a Massachusetts General Hospital, ("Licensor"). The Option was effective February 15, 2021. Under the Option, the Company has (1) the exclusive right to negotiate a license of a technology patented by the Licensor and (2) a non-exclusive internal evaluation license to allow the Company to evaluate the technology. The Option has a six month term at a cost of $5,000 with a right to extend, upon the mutual agreement of the parties, for an additional six months for a second $5,000 payment. The Company shall also be responsible for patent costs incurred by Licensor during the Option period. Patent costs incurred by Licensor prior to the Effective Date will not be reimbursed under the Option.

2,777,778 Shares of Common Stock

Transcode Therapeutics, Inc.

PRELIMINARY PROSPECTUS

ThinkEquity

a division of Fordham Financial Management, Inc.

, 2021

Through and including , 2021 (the 25th day after the date of this offering), all dealers effecting transactions in these securities, whether or not participating in this offering, may be required to deliver a prospectus. This is in addition to a dealer's obligation to deliver a prospectus when acting as an underwriter and with respect to an unsold allotment or subscription.

Part II

Information Not Required in Prospectus

Item 13. Other Expenses of Issuance and Distribution.

The following table sets forth the fees and expenses, other than underwriting discounts and commissions, payable in connection with the registration of the common stock hereunder. All amounts are estimates except the SEC registration fee, the FINRA filing fee and the listing fee.

	Amount Paid or to Be Paid
SEC registration fee	$ 3,675
FINRA filing fee	$ 4,800
Printing and mailing	$125,000
Legal fees and expenses	$475,000
Accounting fees and expenses	$175,000
Transfer agent and registrar fees and expenses	$ 4,000
Miscellaneous	$187,525
Total	$975,000

Item 14. Indemnification of Directors and Officers. Section 145 of the DGCL authorizes a corporation to indemnify its directors and officers against liabilities arising out of actions, suits and proceedings to which they are made or threatened to be made a party by reason of the fact that they have served or are currently serving as a director or officer to a corporation. The indemnity may cover expenses (including attorneys' fees) judgments, fines and amounts paid in settlement actually and reasonably incurred by the director or officer in connection with any such action, suit or proceeding. Section 145 permits corporations to pay expenses (including attorneys' fees) incurred by directors and officers in advance of the final disposition of such action, suit or proceeding. In addition, Section 145 provides that a corporation has the power to purchase and maintain insurance on behalf of its directors and officers against any liability asserted against them and incurred by them in their capacity as a director or officer, or arising out of their status as such, whether or not the corporation would have the power to indemnify the director or officer against such liability under Section 145.

We have adopted provisions in our amended and restated certificate of incorporation and amended and restated bylaws to be in effect immediately prior to the completion of this offering that limit or eliminate the personal liability of our directors to the fullest extent permitted by the DGCL, as it now exists or may in the future be amended. 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 unlawful payments related to dividends or unlawful stock purchases, redemptions or other distributions; or any transaction from which the director derived an improper personal benefit.

These limitations of liability do not alter director liability under the federal securities laws and do not affect the availability of equitable remedies such as an injunction or rescission.

In addition, our bylaws provide that:

- we will indemnify our directors, officers and, in the discretion of our board of directors, certain employees to the fullest extent permitted by the DGCL, as it now exists or may in the future be amended; and
- we will advance reasonable expenses, including attorneys' fees, to our directors and, in the discretion of our board of directors, to our officers and certain employees, in connection with legal proceedings relating to their service for or on behalf of us, subject to limited exceptions.

We intend to enter into indemnification agreements with each of our directors, executive officers, and other officers as determined from time to time by our board of directors or our remuneration committee. These agreements will provide that we will indemnify each of our directors, officers with whom we have entered into indemnification agreements, and, at times, their affiliates to the fullest extent permitted by Delaware law. We will advance expenses, including attorneys' fees (but excluding judgments, fines and settlement amounts), to each indemnified director, executive officer or affiliate in connection with any proceeding in which indemnification is available and we will indemnify our directors and officers for certain actions or proceedings arising out of that person's services as a director or officer brought on behalf of us or in furtherance of our rights. Additionally, certain of our directors or officers may have certain rights to indemnification, advancement of expenses or insurance provided by their affiliates or other third parties, which indemnification relates to and might apply to the same proceedings arising out of such director's or officer's services as a director referenced herein. Nonetheless, we will agree in the indemnification agreements that our obligations to those same directors or officers are primary and any obligation of such affiliates or other third parties to advance expenses or to provide indemnification for the expenses or liabilities incurred by those directors are secondary.

We will maintain general liability insurance which covers certain liabilities of our directors and officers arising out of claims based on acts or omissions in their capacities as directors or officers, including liabilities under the Securities Act of 1933, as amended, or the Securities Act.

The underwriting agreement filed as Exhibit 1.1 to this registration statement provides for indemnification of us and our directors and officers by the underwriters against certain liabilities under the Securities Act and the Securities Exchange Act of 1934.

Item 15. Recent Sales of Unregistered Securities.

In the three years preceding the filing of this registration statement, we have issued the following securities that were not registered under the Securities Act. No underwriters were involved in the sales and the certificates representing the securities sold and issued contain legends restricting transfer of the securities without registration under the Securities Act or an applicable exemption from registration.

(a) From January 2016 through October 2018, we issued and sold to our directors, officers, employees, consultants and other service providers an aggregate of 4,636,216 shares of Common Stock at prices per share ranging from $0.0001 to $0.07 for an aggregate purchase price of $15,706.90.

(b) Between May 2018 and May 2020, we sold $2,240,000 of interest-bearing, unsecured convertible notes, or Notes, to nine investors. The interest rate on the Notes is 6% per annum. Upon the consummation of a Qualified Financing (as defined in the Notes documents), all of the outstanding principal together with accrued but unpaid interest on the Notes shall be automatically converted into shares of the class or series of our capital stock sold in the Qualified Financing. We expect this offering to comprise a Qualified Financing and that the Notes will therefore automatically convert into 1,058,475 shares of our common stock simultaneous with the closing of this offering.

(c) In June 2020, we granted to our directors, officers, employees, consultants and other service providers stock options to purchase an aggregate of 1,683,500 shares of common stock upon the exercise of options under our 2020 Plan at exercise prices per share of $0.08 and $0.09.

(d) In December 2020, we granted to our independent directors stock options to purchase an aggregate of 72,786 shares of common stock upon the exercise of options under our 2020 Plan at an exercise price per share of $3.91.

(e) In January 2021, we granted Dr. Marquet, upon her appointment to our board of directors, stock options to purchase an aggregate of 36,393 shares of common stock upon the exercise of options under our 2020 Plan at an exercise price per share of $3.91.

The issuances of certain 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.

Item 16. Exhibits and financial statement schedules.

(a) Exhibits

Exhibit number	Description
1.1**	Form of Underwriting Agreement.
3.1**	Certificate of Incorporation of the Registrant as currently in effect.
3.2**	Certificate of Amendment of Certificate of Incorporation of the Registrant.
3.3**	Form of Amended and Restated Certificate of Incorporation of Registrant, to be in effect prior to the completion of this offering.
3.4**	Bylaws of the Registrant, as currently in effect.
3.5**	Form of Amended and Restated Bylaws of the Registrant, to be in effect prior to the completion of this offering.
4.1**	Specimen Common Stock Certificate.
4.2**	Form of Representative Warrant.
5.1**	Opinion of Goodwin Procter LLP.
10.1**#	2020 Stock Option and Incentive Plan and form of award agreements thereunder.
10.2**#	2021 Stock Option and Incentive Plan, and form of award agreements thereunder.
10.3**#	Senior Executive Cash Incentive Bonus Plan.
10.4**#	Form of Indemnification Agreement between the Registrant and each of its executive officers.
10.5**#	Form of Indemnification Agreement between the Registrant and each of its directors.
10.6**†	Exclusive Patent License Agreement by and between TransCode Therapeutics, Inc. and The General Hospital Corporation, d/b/a Massachusetts General Hospital, dated as of October 26, 2018.
10.7**†	First Amendment to Exclusive Patent License Agreement by and between TransCode Therapeutics, Inc. and The General Hospital Corporation, d/b/a Massachusetts General Hospital, dated as of October 30, 2020.
10.8**#	2021 Employee Stock Purchase Plan.
10.9**#	Employment Agreement, dated as of March 24, 2021, by and Between TransCode Therapeutics, Inc. and Robert Michael Dudley.
10.10**#	Letter Agreement, dated as of March 24, 2021, by and Between TransCode Therapeutics, Inc. and Robert Michael Dudley.
10.11**#	Employment Agreement, dated as of March 24, 2021, by and Between TransCode Therapeutics, Inc. and Thomas A. Fitzgerald.
10.12**#	Letter Agreement, dated as of March 24, 2021, by and Between TransCode Therapeutics, Inc. and Thomas A. Fitzgerald.
23.1	Consent of Withum Smith+Brown, PC.
23.2**	Consent of Goodwin Procter LLP (included in Exhibit 5.1).
24.1**	Power of Attorney (included on signature page to this registration statement).

** Previously filed.

# Indicates a management contract or any compensatory plan, contract or arrangement.

† Portions of this exhibit (indicated by asterisks) have been omitted in accordance with the rules of the SEC.

(b) Financial Statements Schedules:

None.

Item 17. Undertakings.

Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers and controlling persons of the registrant pursuant to the foregoing provisions, or otherwise, the registrant has been advised that in the opinion of the Securities and Exchange Commission such indemnification is against public policy as expressed in the Securities Act and is, therefore, unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the registrant of expenses incurred or paid by a director, officer or controlling person of the registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Securities Act and will be governed by the final adjudication of such issue.

The undersigned hereby undertakes that:

(1) The undersigned Registrant will provide to the underwriters at the closing specified in the underwriting agreement, certificates in such denominations and registered in such names as required by the underwriters to permit prompt delivery to each purchaser.

(2) For purposes of determining any liability under the Securities Act, the information omitted from the form of prospectus filed as part of this registration statement in reliance upon Rule 430A and contained in a form of prospectus filed by the registrant pursuant to Rule 424(b)(1) or (4) or 497(h) under the Securities Act shall be deemed to be part of this registration statement as of the time it was declared effective.

(3) For the purpose of determining any liability under the Securities Act, each post-effective amendment that contains a form of prospectus shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, the registrant has duly caused this Registration Statement on Form S-1 to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of Boston, Commonwealth of Massachusetts, on the 16th day of April, 2021.

TRANSCODE THERAPEUTICS, INC.

By: /s/ Robert Michael Dudley
Robert Michael Dudley
Chief Executive Officer

SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, as amended, this Registration Statement and Power of Attorney has been signed by the following person in the capacities and on the date indicated.

NAME	TITLE	DATE
/s/ Robert Michael Dudley Robert Michael Dudley	*Director and Chief Executive Officer (Principal Executive Officer)*	April 16, 2021
/s/ Thomas A. Fitzgerald Thomas A. Fitzgerald, MBA	*Director and Chief Financial Officer (Principal Financial and Accounting Officer)*	April 16, 2021
* Philippe P. Calais, PhD	*Director*	April 16, 2021
* Erik Manting, PhD	*Director*	April 16, 2021
* Magda Marquet, PhD	*Director*	April 16, 2021

*Pursuant to Power of Attorney

By: /s/ Thomas A. Fitzgerald
Attorney-in-Fact

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Prospectus constituting a part of this Registration Statement of our report dated February 26, 2021, except for the effects of the reverse stock split described in Note 2(m), as to which the date is March 24, 2021, which includes an explanatory paragraph relating to the Company's ability to continue as a going concern, relating to the financial statements of Transcode Therapeutics, Inc. as of and for the years ended December 31, 2020 and 2019. We also consent to the reference to us under the caption "Experts" in the Prospectus.

/s/ WithumSmith+Brown, PC

East Brunswick, New Jersey
April 15, 2021