

As filed with the U.S. Securities and Exchange Commission on September 22, 2023.

Registration No. 333-274251

**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION**

Washington, D.C. 20549

**AMENDMENT NO. 2
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
(State or other jurisdiction of
incorporation or organization)

2834
(Primary Standard Industrial
Classification Code Number)

81-1065054
(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)

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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. **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 contained in this preliminary prospectus is not complete and may be changed. These securities may not be sold 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 SEPTEMBER 22, 2023

11,479,408 Shares of Common Stock Up to 11,479,408 Pre-Funded Warrants to Purchase Common Stock

T R A N S C O D E
T H E R A P E U T I C S™

TransCode Therapeutics, Inc.

We are offering 11,479,408 shares of our common stock on a firm commitment basis.

Our common stock is listed on the Nasdaq Capital Market under the symbol “RNAZ.” The last reported sale price of our common stock on the Nasdaq Capital Market on September 21, 2023 was \$0.6969 per share. The final public offering price will be determined through negotiation between us and the underwriter; the recent market price used throughout this prospectus may not be indicative of the actual offering price.

We are also offering to each purchaser whose purchase of shares of our common stock in this offering would otherwise result in the purchaser, together with its affiliates and certain related parties, beneficially owning more than 4.99% (or, at the election of the holder, 9.99%) of our outstanding shares of common stock immediately following the consummation of this offering, the opportunity to purchase, if the purchaser so chooses, pre-funded warrants to purchase shares of common stock, or the pre-funded warrants, in lieu of shares of common stock. Each pre-funded warrant will be exercisable for one share of our common stock. The purchase price of each pre-funded warrant will equal the price per share of common stock being sold to the public in this offering, minus \$0.01, and the exercise price of each pre-funded warrant will be \$0.01 per share. For each pre-funded warrant that we sell, the number of shares of our common stock that we are offering will be decreased on a one-for-one basis. The pre-funded warrants will not be listed on the Nasdaq Capital Market and are not expected to trade in any market, however we anticipate that the shares of our common stock to be issued upon exercise of the pre-funded warrants will trade on the Nasdaq Capital Market.

We are an “emerging growth company,” as that term is used in the Jumpstart Our Business Startups Act of 2012, or JOBS Act, and, as such, we have elected to comply with certain reduced public company reporting requirements. See the section titled “*Prospectus Summary — Implications of Being an Emerging Growth Company and a Smaller Reporting Company.*”

Investing in our common stock involves a high degree of risks. See “Risk Factors” beginning on page 21. Neither the U.S. 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	Per Pre-Funded Warrant	Total
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 public offering price payable to the underwriter, the reimbursement of certain expenses of the underwriter we have agreed to pay and certain other compensation. We refer you to “*Underwriting*” beginning on page 52 for additional information regarding underwriter’s compensation.

We have granted a 45-day option to the underwriter to purchase up to an additional 1,721,911 shares of our common stock (and/or pre-funded warrants in lieu thereof), representing 15% of the shares of common stock and pre-funded warrants sold in the offering solely to cover over-allotments, if any.

The underwriter expects to deliver the shares on or about _____, 2023.

ThinkEquity

The date of this prospectus is _____, 2023

Table of Contents

TRADEMARKS, SERVICE MARKS AND TRADE NAMES	i
WHERE YOU CAN OBTAIN MORE INFORMATION	ii
INCORPORATION BY REFERENCE	iii
PROSPECTUS SUMMARY	1
THE OFFERING	16
SUMMARY FINANCIAL DATA	19
RISK FACTORS	21
CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS	31
INDUSTRY AND OTHER DATA	33
USE OF PROCEEDS	34
DIVIDEND POLICY	35
CAPITALIZATION	36
DILUTION	38
DESCRIPTION OF CAPITAL STOCK AND SECURITIES WE ARE OFFERING	40
MATERIAL U.S. FEDERAL INCOME TAX CONSIDERATIONS	46
UNDERWRITING	52
LEGAL MATTERS	58
EXPERTS	58

Neither we nor the underwriter have authorized anyone to provide you with information other than that contained in or incorporated by reference into this prospectus or any free writing prospectus prepared by or on our behalf or to which we have referred you. We and the underwriter 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 underwriter are offering to sell, and seeking offers to buy, securities only in jurisdictions where offers and sales are permitted. The information contained in or incorporated by reference into 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 securities. 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 securities 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.

We and the underwriter are offering to sell, and seeking offers to buy, our shares of common stock and pre-funded warrants only in jurisdictions where offers and sales are permitted. Neither we nor any of the underwriter have done anything that would permit this offering or possession or distribution of this prospectus in any jurisdiction where action for that purpose is required, other than in the United States. Persons outside of the United States who come into possession of this prospectus must inform themselves about, and observe any restrictions relating to, the offering of our shares of common stock and pre-funded warrants and the distribution of this prospectus outside of the United States.

Trademarks, Service Marks and Trade Names

We own, have applied for or have rights to use one or more registered and common law trademarks, service marks and/or trade names in connection with our business in the United States and/or in certain foreign jurisdictions.

This prospectus and our other public filings 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 and our other public filings is not intended to, and does not imply a relationship with, or endorsement or sponsorship by us. Solely for convenience, the trademarks, service marks, logos and trade names referred to in this prospectus and our other public filings may appear without the ®, ™ 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 rights of the applicable owner of or licensor to these trademarks, service marks and trade names.

This prospectus contains additional trademarks, service marks and trade names of others, which are the property of their respective owners. All trademarks, service marks and trade names appearing in this prospectus are, to our knowledge, the property of their respective owners. We do not intend our use or display of other companies' trademarks, service marks, copyrights or trade names to imply a relationship with, or endorsement or sponsorship of us by, any other company.

On May 30, 2023, we received a Notice Of Allowance from the United States Patent and Trademark Office, or USPTO, allowing TRANSCODE THERAPEUTICS as a trademark under International Class 005, pharmaceutical preparations for the treatment of cancer, diagnostic preparations for medical purposes, having Serial Number 97/083236. For the purpose of this prospectus, TransCode Therapeutics® is referred to as TransCode. Additionally, “we”, “our”, “us” and the “company” refer to TransCode.

Where You Can Obtain More Information

We have filed with the Securities and Exchange Commission, or SEC, a registration statement on Form S-1 under the Securities Act of 1933, as amended, or the Securities Act, with respect to the securities 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 securities, we refer you to the registration statement, including the exhibits filed as a part of the registration statement of which this prospectus forms a part. 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 a website 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.

We are subject to the information reporting requirements of the Securities Exchange Act of 1934, as amended, or the Exchange Act, and we file reports, proxy statements and other information with the SEC. The SEC maintains a website that contains reports, proxy and information statements and other information regarding registrants that file electronically with the SEC. The address is www.sec.gov. We also maintain a website at www.transcodetherapeutics.com. You may access our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K, and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act with the SEC free of charge as soon as reasonably practicable after they are electronically filed with, or furnished to, the SEC.

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.

Our code of conduct, corporate governance guidelines and the charters of our Audit Committee, Compensation Committee and Nomination and Corporate Governance Committee are available through the “Governance” portion of our website.

Incorporation by Reference

The SEC allows us to incorporate by reference the information and reports we file with it, which means that we can disclose important information to you by referring you to these documents. The information incorporated by reference is an important part of this prospectus and information that we file after the date hereof with the SEC will automatically update and supersede the information already incorporated by reference. We are incorporating by reference the documents listed below, which we have already filed with the SEC, and any future filings we make with the SEC under Sections 13(a), 13(c), 14 or 15(d) of the Exchange Act, except as to any portion of any future report or document that is not deemed filed under such provisions, after the date of this prospectus and prior to the termination of this offering:

- > [our Annual Report on Form 10-K for the fiscal year ended December 31, 2022, filed with the SEC on March 31, 2023;](#)
- > the information included in [our Definitive Proxy Statement on Schedule 14A, filed with the SEC on April 10, 2023](#), to the extent incorporated by reference into Part III of the [Annual Report on Form 10-K for the fiscal year ended December 31, 2022](#);
- > our Quarterly Reports on Form 10-Q for the quarter ended March 31, 2023, filed with the SEC on [May 15, 2023](#) and for the quarter ended June 30, 2023, filed with the SEC on [August 14, 2023](#);
- > our Current Reports on Form 8-K filed with the SEC on [February 17, 2023](#), [March 31, 2023](#), [April 14, 2023](#), [May 10, 2023](#), [May 18, 2023](#), [May 19, 2023](#), [May 22, 2023](#), [June 8, 2023](#), [July 28, 2023](#), [August 4, 2023](#) and [August 24, 2023](#); and
- > the description of our common stock contained in our registration statement on [Form 8-A filed with the SEC on April 26, 2021](#), as supplemented by the description of our common stock contained in [Exhibit 4.1](#) to our Annual Report on Form 10-K for the year ended December 31, 2022, filed with the SEC on March 31, 2023, and any amendment or report filed with the SEC for the purpose of updating such description.

Pursuant to Rule 412 under the Securities Act, any statement contained in a document incorporated or deemed to be incorporated by reference into this prospectus will be deemed to be modified or superseded for purposes of this prospectus to the extent that a statement contained in this prospectus or any other subsequently filed document that is deemed to be incorporated by reference into this prospectus modifies or supersedes the statement. Any statement so modified or superseded will not be deemed, except as so modified or superseded, to constitute a part of this prospectus.

Upon request, we will provide, without charge, to each person, including any beneficial owner, to whom a copy of this prospectus supplement is delivered, a copy of the documents incorporated by reference into this prospectus but not delivered with the prospectus. You may request a copy of these filings, and any exhibits we have specifically incorporated by reference as an exhibit in this prospectus, at no cost, by writing to us at the following address: Investor Relations Department, TransCode Therapeutics, Inc., 6 Liberty Square, #2382, Boston, Massachusetts 02109. These filings may also be obtained through our website located at <https://www.transcodetherapeutics.com>. The reference to our website is intended to be an inactive textual reference and, except for the documents incorporated by reference as noted above, the information on, or accessible through, our website is not intended to be part of this prospectus.

You should rely only on the information incorporated by reference or provided in this prospectus. We have not authorized anyone else to provide you with different information. You should not assume that the information in this prospectus or in the documents incorporated by reference is accurate as of any date other than the date on the front of this prospectus or those documents.

Reverse Stock Split

On May 23, 2023, we effected a reverse split of our common stock, shares either issued and outstanding or held by the Company as treasury stock, or the 2023 Reverse Split. The 2023 Reverse Split was previously

approved by the Board and shareholders of the Company. The 2023 Reverse Split was at a ratio of one share for every 20 shares previously held with no change in the par value per share. The 2023 Reverse Split did not change the number of authorized shares of common stock. All common stock share and per share data, and exercise price data for applicable common stock equivalents, included in this prospectus, have been retroactively adjusted to reflect the 2023 Reverse Split.

Prospectus Summary

This summary highlights selected information about us and this offering and does not contain all of the information that you should consider before investing in our securities. You should carefully read the entire prospectus and the documents incorporated by reference, especially the “Risk Factors,” as well as “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and our financial statements, including the accompanying notes to those statements, incorporated herein by reference to our Form 10-K, our [Quarterly Report on Form 10-Q filed with the SEC on August 14, 2023](#) and our other filings with the SEC before making an investment decision. If any of the risks materialize or other events or conditions arise that we cannot predict, our business, financial condition, operating results and prospects could be materially and adversely affected. As a result, the price of our common stock could decline, and you could lose part or all of your investment. Some of the statements in this prospectus and the documents incorporated by reference constitute forward-looking statements that involve risks and uncertainties. See “Cautionary Note Regarding Forward-Looking Statements.” Our actual results could differ materially from those anticipated in such forward-looking statements as a result of certain factors, including those discussed in “Risk Factors” and other sections of this prospectus and the documents incorporated by reference.

Overview

TransCode is a platform delivery company focused on oncology, created on the belief that cancer can be defeated through the intelligent design and effective delivery of targeted therapeutics. Our lead therapeutic candidate, TTX-MC138, targets microRNA-10b, or miRNA-10b, a master regulator of metastatic cell viability in a range of cancers, including breast, pancreatic, ovarian, colon cancer, glioblastomas, and several others. Metastatic disease is responsible for approximately 90% of cancer deaths and is the primary determinant in the life-limiting aspect of cancer. One validated driver of metastasis is miRNA-10b, a non-coding RNA associated with metastatic progression in numerous preclinical and more than 100 clinical studies. TransCode has developed a novel therapeutic agent (termed MN-anti-miR10b and commercially developed as TTX-MC138) that relies on specific eradication of metastatic tumor cells. TTX-MC138 consists of antagomirs against miRNA-10b conjugated to a unique delivery platform, called TTX, which is optimized for the targeting of primary and metastatic tumor cells. TransCode’s proprietary and patented technology allows for the selective targeting of microRNA-10b in metastatic cells independent of their type or primary tumor origin. Numerous preclinical studies conducted by TransCode have shown that TTX-MC138 mediates significant miR-10b inhibition *in vivo* eliciting a marked and durable regression of lymph node and distant metastases in mouse models of breast cancer with no evidence of systemic toxicity. Specifically, as few as four to six weekly treatments with TTX-MC138 in combination with low dose chemotherapy led to complete regressions of detectable metastases. Of critical importance, following elimination of metastases and following discontinuation of therapy, no evidence was found to suggest recurrence over the remaining natural life span of the animals. In addition, similar studies in mouse models of pancreatic cancer were conducted with complete responses, defined as complete regression with no disease recurrence. Due to this large unmet medical need, the global metastatic cancer treatment market is expected to reach \$136.9 billion by 2032 (July 6, 2023 /PRNewswire/ — Allied Market Research published a report, titled, “Metastatic Cancer Drugs Market”).

In December 2022, TransCode received authorization from the U.S. Food and Drug Administration, or FDA, to conduct a Phase 0 clinical trial intended to demonstrate quantitative delivery of TTX-MC138 to metastatic lesions in subjects with advanced solid tumors. On April 25, 2023, we received Institutional Review Board, or IRB, approval from the Dana Farber Cancer Center to commence the trial at its affiliate, Massachusetts General Hospital, or MGH. In parallel, we completed IND-enabling toxicity studies with TTX-MC138 in support of our planned investigational new drug, or IND, application for a Phase I/II clinical trial with TTX-MC138. On August 23, 2023, we announced the dosing of the first subject in our First-in-Human Phase 0 clinical trial.

Our other preclinical program is a solid tumor program, TTX-siPDL1, an siRNA-based modulator of programmed death-ligand 1, or PD-L1. TransCode also has three cancer-agnostic programs in various stages of development, TTX-RIGA, an RNA-based agonist of the retinoic acid-inducible gene I, or RIG-I, targeting activation of innate immunity in the tumor microenvironment; TTX-CRISPR, a CRISPR/Cas9-based therapy

platform for the repair or elimination of cancer-causing genes inside tumor cells; and TTX-mRNA, an mRNA-based platform for the development of cancer vaccines that activate cytotoxic immune responses against tumor cells.

All our therapeutic candidates are designed to utilize our proprietary delivery system with the goal of delivering therapeutic payloads safely and accurately to tumors and metastases with the goal of significantly improving outcomes for cancer patients.

Recent Developments

Pre-Clinical Glioblastoma Multiforme Study

Glioblastoma Multiforme, or GBM, is the most common and aggressive form of brain cancer. Its prognosis is poor despite advances in standard-of-care therapy. The 5-year survival rate has remained essentially unchanged over the past 30 years. We believe there is an urgent need to develop more effective therapies for GBM. In a pre-clinical study, mice implanted with tumors derived from human GBM patients were treated with TTX-MC138 and imaged by magnetic resonance imaging, or MRI, to determine delivery of the therapeutic candidate to the tumors. In addition, the pharmacodynamic activity of TTX-MC138 was determined by measuring inhibition of the therapeutic target, miRNA-10b, using qRT-PCR. TTX-MC138 was injected intravenously and accumulated efficiently in the tumors. Importantly, the therapeutic candidate showed lasting activity and significantly inhibited miRNA-10b, known to be a driver of tumor progression in glioblastoma.

First Subject Dosed

On August 23, 2023, we announced the dosing of the first subject in our First-in-Human Phase 0 clinical trial. The Phase 0 trial is an open-label, single-center, microdose study intended to demonstrate delivery of the radio-labeled version of our lead therapeutic candidate, TTX-MC138, to radiographically-confirmed metastases in subjects with advanced solid tumors. The subject received a single subtherapeutic dose of radiolabeled TTX-MC138 and appeared to tolerate the dosing well. Analysis and monitoring of data from this subject is ongoing including results of positron emission tomography-magnetic resonance imaging (PET-MRI), to determine uptake of TTX-MC138 to the subject's metastatic lesions. Enrollment of additional subjects is also currently underway.

A Phase 0 clinical trial is an exploratory study conducted under an Investigational New Drug application. Up to 12 subjects may be enrolled in this clinical trial, each of which is intended to receive a single microdose of radiolabeled TTX-MC138 followed by PET-MRI. The trial is intended to quantify the amount of TTX-MC138 delivered to metastatic lesions and the pharmacokinetics of the therapeutic candidate in cancer subjects, but not to have a therapeutic effect. The trial could yield critical data regarding therapeutic dosing, timing, and potential safety that could inform later clinical trials, including a Phase 1 trial planned to commence in 2024.

NIH SBIR Award

On April 3, 2023, we received a Notice of Award from the National Institutes of Health confirming the availability of the third tranche of funding under the award we received in April 2021. On April 11, 2023, we drew down the third tranche of the Award in the amount of \$870,684. We received approximately \$309 thousand in the first tranche and approximately \$1.1 million in the second tranche. The staff at the National Cancer Institute proposed that TransCode submit an application for an SBIR Phase IIB award to extend the studies in the original SBIR. On August 21, 2023, we submitted a proposal for the Phase IIB award totaling \$4.5 million over two years, scheduled to commence in April 2024, if awarded.

TTX-MC138 IND-enabling studies

We completed IND-enabling toxicity studies for TTX-MC138 in two species of animals with very favorable results. No mortality or unacceptable toxicity were seen even at the highest feasible dose tested, reflecting the safety profile of the therapeutic. Upon completion of our FDA briefing book which will include relevant

information that we previously filed in the nearly 3,800 page eIND application late in 2022 which the FDA approved less than a month after submission, we plan to file an IND with FDA in Q4 2023 to conduct a Phase 1/II clinical trial with TTX-MC138. The scale up and manufacturing of GMP drug product for the IND enabling studies was completed along with production of final drug product in late August 2023 for the Ph I/II to treat patients.

Feline Case Study with Spontaneous Breast Cancer

To test the applicability of our therapeutic strategy in a larger animal, our scientific co-founders conducted a case study with a feline that had developed spontaneous mammary carcinoma, or FMC, the third most common cancer in cats, which is also highly metastatic. FMC has high resemblance to human breast cancer compared to mammary carcinomas of other companion animals in terms of relative age at onset, incidence, risk factors, prognostic aspects, histopathology, biological behavior, metastatic pattern and response to therapy. In the case study, a feline patient that had previously failed multiple rounds of standard-of-care treatment for advanced metastatic FMC and was at the end of her life expectancy was dosed with TTX-MC138. Delivery of TTX-MC138 to the metastatic lesions was demonstrated using noninvasive magnetic resonance imaging. Dosing with TTX-MC138 resulted in durable inhibition of the miR-10b target and induction of the downstream metastasis suppressor, HOXD10, lasting as long as three months after injection. The patient tolerated the injection well with no adverse effects and vital signs remained within the normal range. Additionally, seven weeks after the first dose, the feline patient was dosed a second time and tolerated the injection well. The patient survived for approximately five months compared to its life expectancy prior to dosing. Subsequently, additional animals have been enrolled in the trial. This trial has demonstrated delivery to the metastatic lesions and target inhibition in the brain tumors. Also, it has demonstrated safety of a dosing regimen comprising six doses (two doses biweekly for the first month followed by four monthly doses). Importantly, the trial demonstrated stable disease despite initiating treatment when disease was at a very advanced stage with widely present lung metastases. Notwithstanding the need for additional therapeutic and toxicology studies, we believe that in combination with our other preclinical findings, this case study suggests the robustness and potential tolerability of therapy with TTX-MC138.

Positive Preclinical Results with TTX-MC138 in Pancreatic Adenocarcinoma

We recently evaluated the efficacy of TTX-MC138 as monotherapy in a murine model of pancreatic adenocarcinoma and achieved positive preclinical results. In this study, we treated mice bearing human pancreatic tumors with TTX-MC138 once weekly for eight weeks. The candidate demonstrated a pharmacodynamic response by successfully inhibiting miR-10b. Serum miR-10b was down-regulated by TTX-MC138 and was shown to be a potential surrogate biomarker of therapeutic efficacy, opening up the possibility of noninvasive monitoring of therapeutic response in human patients. Forty percent (40%) of animals treated with TTX-MC138 had complete responses, defined as complete regression of disease and long-term survival without recurrence.

These new findings expand the potential therapeutic relevance of TTX-MC138 beyond breast cancer, in which activity had previously been shown in preclinical studies, to include pancreatic adenocarcinoma. However, there is no assurance that these preclinical results will be duplicated in further preclinical studies or in cancer patients suffering from pancreatic cancer.

Positive Preclinical Results in Glioblastoma

Recent studies have shown that miR-10b is highly expressed in high-grade glioblastoma multiforme, and its inhibition leads to dysregulation of multiple pathways in tumorigenesis, resulting in repression of tumor growth and increased apoptosis. Thus, we hypothesized that suppressing miR-10b could enhance the cytotoxicity of conventional GBM chemotherapy with temozolomide, or TMZ. A recent study conducted with our scientific co-founder, Dr. Anna Moore, at Michigan State University was published in *Frontiers in Molecular Biosciences* (see Recent Publications).

Inhibition of miR-10b in glioblastoma cells was achieved using MN-anti-miR10b (a TTX-MC138 analogue). Treatment of U251 and LN229 human glioblastoma cells led to inhibition of miR-10b accompanied by

repression of growth and an increase in apoptosis. We next explored whether MN-anti- miR10b could enhance the cytotoxic effect of TMZ. During these studies, we unexpectedly found that TMZ monotherapy increased miR-10b expression and changed the expression of corresponding miR-10b targets. This discovery led to our design of a sequence-dependent combination treatment, in which an initial administration of MN-anti-miR10b resulting in miR-10b inhibition and induction of apoptosis was, in turn, followed by administration of a sub-therapeutic dose of TMZ causing cell cycle arrest and ultimately cell death.

Orphan Drug Designation

TTX-siPDL1

In June 2022, we received Orphan Drug Designation from the FDA for our TTX-conjugated small interfering RNA against PD-L1, a candidate for treatment of pancreatic cancer. The designation was granted based on positive results achieved in *in vivo* studies treating human pancreatic tumors implanted in animals.

TTX-MC138

In addition, we conducted preclinical *in vivo* studies with TTX-MC138 in a pancreatic cancer model and submitted data to the FDA requesting Orphan Drug Designation which we received on February 27, 2023. We intend to conduct additional *in vivo* studies to support filings of other TTX-based therapeutic candidates in other orphan disease indications including osteosarcoma, glioblastoma, and small cell lung cancer. There is no assurance that we will receive any additional designations.

New Patent Applications

TTX-RIGA

TransCode converted U.S. Provisional Patent Application No. 63/356,449 on June 28, 2023 into an international application (PCTG/US/2023/026460) and a U.S. utility application (18/215,550). This filing discloses the use of nucleic acid-based agonists of RIG-I singly or in combination with a radiolabeled nanoparticle for activation of the innate immune system that we anticipate will lead to tumor cell death.

TTX-beta

TransCode filed U.S. Provisional Patent Application No. 63/456,602 entitled *Nanoparticles Comprising Payloads and their In Vivo Delivery* on April 3, 2023, disclosing novel iron oxide nanoparticles able to deliver therapeutic payloads for the treatment of disease.

Target Binding Scaffolds

TransCode filed U.S. Provisional Patent Application No. 63/464,469 entitled *Nanoparticles comprising target binding scaffold proteins and their in vivo delivery* on May 5, 2023, disclosing novel nanoparticles complexed with polypeptide-based payloads designed to target proteins of interest for the diagnosis and treatment of disease.

There is no assurance that we will successfully convert any provisional patent application or that, if converted, any patents will issue therefrom.

Licensing Option

On May 9, 2022, we executed an option agreement with MGH giving TransCode the right to negotiate an exclusive, worldwide, royalty-bearing license related to a radiotheranostic technology disclosed in patent application PCT/US2021/057912 entitled THERAPEUTIC, RADIOLABELED NANOPARTICLES AND METHODS OF USE THEREOF. We expect to finalize negotiations of a license to this technology in the near term, but there is no assurance that any license will be effected.

Targeted Therapeutic Delivery Background

For decades, ribonucleic acid, or 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, potentially applicable to a broad array of previously undruggable targets in the human genome. We believe that one of the major challenges to widespread use of RNA therapeutics in oncology and other indications has been the inability to deliver these molecules inside cells other than in the liver.

Additionally, delivery remains a significant challenge with CRISPR-based genome editing tools as well as mRNAs in the context of cancer. We believe that our proprietary TTX delivery platform has the potential to resolve these key challenges. We believe overcoming the challenges of delivery would represent an important step in unlocking therapeutic access to a variety of documented targets involved in a range of cancers and other diseases.

TransCode has created a design engine to customize the development of targeted therapeutics that is modular, both at the levels of the core nanoparticle and therapeutic loading. The size, charge, and surface chemistry of the core iron oxide nanoparticle is designed so that it can be tuned to optimize the particles for the intended target and therapeutic load. The therapeutic load is designed to consist of synthetic oligonucleotides and other molecular moieties that can be adapted to the specific approach being developed. The approach can range from RNA interference, or RNAi, including small interfering RNAs, antisense oligonucleotides, and non-coding RNA mimics to mRNA-based cancer vaccines, CRISPR-based gene repair and replacement platforms, and Pattern Recognition Receptors such as RIG-I. We believe the platform can further be used for developing targeted radiolabeled therapeutics and diagnostics and other custom products targeting known and novel biomarkers and other genetic elements as they are discovered and validated.

The TTX platform is designed to overcome extracellular and intracellular delivery issues of stability, efficiency, and immunogenicity faced by existing lipid and liposomal nanoparticle platforms while optimizing targeting of and accumulation in tumors and metastases. We believe the ability to deliver targeted therapeutics inside tumors and metastases will potentially allow us to target genes and other important biomarkers for cancer treatment that have until now remained undruggable using other delivery systems.

Potential Near-term Milestones

Before the end of 2023, we anticipate reporting top-line results for patients enrolled in our Phase 0 clinical trial. Recently, we completed IND enabling toxicity studies with our lead candidate TTX-MC138, and our outsourced manufacturing partner completed the manufacture GMP drug product for our planned Phase I clinical trial. We anticipate filing our IND for our planned Phase I/II clinical trial by the end of 2023 and to file for European Orphan Drug Designation status for TTX-MC138 in pancreatic cancer.

We have ongoing discussions with strategic partners involving a variety of our therapeutic candidates and hope to complete a partnering agreement with respect to one or more therapeutic candidates sometime in 2024. At this time, we have no firm commitments from any strategic partners.

In 2024, we anticipate receiving FDA approval to proceed with our planned Phase I/II clinical trial which will be a multicenter trial with designated sites throughout the US. Once we have FDA approval, sites that have shown interest in participating in the trial will commence steps to seek IRB approval within their respective institutions. Once IRBs approve the clinical protocol, patients can be enrolled in the Phase Ia portion of the trial. At the date of this registration statement, we anticipate enrolling patients in the second quarter of 2024, with the potential of reporting top line results within three months after dosing has commenced in the first patients treated.

Also in 2024, assuming capital is available, we may advance one or two additional drug candidates into IND enabling studies. Additionally, we anticipate that a diagnostic test to measure miR-10b in blood samples from patients in our Phase I clinical trial will be available for use. By 2025, with positive clinical trial results, the potential exists for our lead candidate to receive breakthrough therapy status which could allow for expansion

into Phase II more rapidly, possible expansion to Phase III, or even go directly to commercialization due to the large unmet need in metastatic disease. This rapid regulatory path has occurred with some therapeutic candidates in the past, especially in cancer treatment, but there is no assurance that we can achieve any of these rapid regulatory approvals from the FDA.

Delivery System

The therapeutic potential of RNA in oncology has remained an unrealized promise due in large part, we believe, to the difficulty in safely and effectively delivering oligonucleotides, i.e., synthetic RNA molecules, to tumors anywhere in the body. TransCode believes it is now closer to solving this challenge by means of our TTX platform. Our TTX platform leverages an iron-oxide nanoparticle, or IONP, approved for clinical use as a cancer imaging agent and in treating iron deficiency anemia, as the physical carrier.

Our TTX technology has gone through over 18 years of research and development, or R&D, and optimization, including 12 years at Harvard Medical School and the Massachusetts General Hospital, by our scientific co-founders prior to company formation. As an expansion of the original platform design, we recently submitted U.S. provisional patent applications US 63/464,469 and US 63/456,602 as part of our next generation IONP delivery platform. We believe that this expanded-use platform has the potential to broaden TTX's targeted therapeutic delivery to include mRNA vaccines as well as CRISPR candidates to tumors and metastases; immunotherapy candidates targeting RIG-I and PDL-1; nanobodies and other proteins; as well as radiolabeled therapeutics. Expanded delivery could allow us to participate in additional rapidly growing global marketplaces. According to a recent analysis by Emergen Research and other publications, the global CRISPR Technology Market in cancer is expected to reach \$3.2 billion by 2027; and the global mRNA cancer vaccine market was estimated to reach \$4.9 billion in 2023 with a compound annual growth rate of 17.7%, reaching \$158.20 billion by 2030. Immunotherapy candidates for oncology along with radiolabeled therapeutics and nanobodies have market potentials of \$119.4 billion, \$6.5 billion and \$7.4 billion, respectively, according to the following recent publications: Growth Market Reports January 2023; Emergen Research 2021; KD Markets Insight 2023; Allied Market Research 2023; Research Reports World 2023; Coherent Market Insights 2023 and Research and Markets 2023. The sizes of the markets for RNAi therapeutics and for Diagnostics products reported in these publications are \$6.2 billion and \$135.2 billion, respectively.

Our TTX nanocarrier is designed to be tunable to pre-designed specifications to deliver therapeutic oligonucleotides to RNA targets in tumors and metastases without compromising the integrity of the oligonucleotide. We believe TTX nanocarriers differentiate us from competitive delivery approaches, many of which rely on lipid particles or chemical structures, such as GalNac. These competitive delivery approaches effectively target sites in the liver but not sites in tumors and metastases elsewhere. Our nanocarrier is derived from, and is chemically similar to, nanoparticles extensively used in imaging (Feridex, from Advanced Magnetics) or for treating iron deficiency anemia (Feraheme, also from Advanced Magnetics).

Our TTX delivery platform is highly efficient at delivering nucleic acid payloads into tumor cells. This efficient target engagement is partly due to the high degree of endosomal escape achieved by the TTX platform. In order to function, nucleic acid therapeutics need to enter a target cell as well as be released into the proper intracellular compartment (i.e., the cytosol). Typically, uptake by the cell localizes the therapeutic payload inside vesicles called endosomes, which comprise a lipid bilayer. Alternative delivery systems such as lipid nanoparticles or GalNac are trapped inside endosomes and can release only 1-3% of their payload into the cytosol (source: Dowdy, Steven F., Setten, RL, Cui, XS, Jadhav, SG; Nucleic Acid Therapeutics Vol 00, Number 00, 2022, Delivery of RNA Therapeutics: The Great Endosomal Escape!). By contrast, TTX nanoparticles are endocytosed into cancer cells and due to the proton sponge effect, resulting from the presence of positively charged amines on the surface of the particles, are released from endosomes with high efficiency, resulting in more than 90% RNA target inhibition in vivo. This efficient release is part of the reason why TTX performs so much better in rapidly dividing tumor cells than competing delivery systems, which have limited success in tumors and metastases due to entrapment by endosomes.

Our TTX delivery platform is specifically designed to minimize early kidney and liver clearance, translating into a long circulation half-life that allows for efficient accumulation in tumors and metastases. Nanoparticles similar in formulation to ours have an excellent clinical safety record of low toxicity and immunogenicity, and

their built-in imaging capabilities due to their iron core which is magnetic and visible with magnetic resonance imaging, or MRI, have the additional benefit of enabling quantification of the particles' delivery to target organs. The nanoparticles are functionalized with amino groups to provide stable links to the therapeutic oligonucleotides of interest through disulfide bonds. The nanoparticles are coated with dextran, a glucose polymer, to protect the oligonucleotides from degradation and to provide overall stability to the particle.

The small hydrodynamic size and the charge of the resulting nanoparticles are designed to maximize distribution throughout the tumor microvasculature, extravasation into the interstitium of tumors and metastases, and uptake by tumors. The physicochemical properties of the nanoparticles are expected to further facilitate their rapid uptake by tumors by exploiting the high metabolic activity of cancer cells, a process analogous to the mechanism behind the systemic loading of metastatic cancer cells with fluorodeoxyglucose for diagnostic Positron Emission Tomography. We believe the combined result of a hydrodynamically-favored distribution and a metabolically-triggered uptake will result in the enhanced ability of TransCode's nanoparticles to access genetic targets inside tumors.

Exemplified by our June 2022 filing of U.S. provisional application 63/356,449, TransCode initiated research and development efforts designed to introduce radiotherapy into the delivery of RNA therapeutic payloads using TTX. Two of TransCode's programs, TTX-MC138 and TTX-RIGA, are being assessed for radionuclide integration in either a systemically or locally delivered manner for both the treatment and diagnosis of solid tumors.

Advancing new RNA therapies through a modular approach

The TransCode TTX platform is modular by design, both at the level of the core nanoparticle and at the therapeutic loading. The size, charge, and surface chemistry of the core nanoparticles are designed to be tuned to optimize them for the intended target and therapeutic load. Also, the therapeutic load is designed to be adapted to the specific approach being developed, ranging from RNAi which includes small interfering RNAs, or siRNAs, antisense oligonucleotides, non-coding RNA mimics to mRNA-based cancer vaccines, and Clustered Regularly Interspaced Palindromic Repeats, or CRISPR, -based gene repair and replacement platforms as well as Pattern Recognition Receptors such as RIG-I.

Additionally, we are interested in pursuing diagnostic approaches for RNA targets that might be relevant and important to informing treatment of patients using RNA therapeutics. Our 2018 license with MGH includes a patented microRNA screening assay with the potential to detect expression of microRNAs in patient blood. We intend to optimize this diagnostic test to detect miR-10b in cancer patients as our first commercial testing product. If approved, this test could be used as a screening assay to detect metastasis in a variety of tumor types. Also, we believe we may be able to use this test to evaluate miR-10b expression before, during and after treatment to best determine timing of therapeutic intervention.

In September 2021, research conducted by MGH was published in *Cancer Nanotechnology*, entitled "Radiolabeling and PET-MRI microdosing of the experimental cancer therapeutic, MN-anti-miR10b, demonstrates delivery to metastatic lesions in a murine model of metastatic breast cancer." This paper reported on an MGH study using a radiolabeled derivative of TTX-MC138 (referred to in the paper as MN-anti-miR10b). In this study, TTX-MC138 was tagged with copper-64, or Cu-64. As a result, highly sensitive and specific quantitative determination of pharmacokinetics and biodistribution, as well as observation of delivery of the Cu-64 labeled TTX-MC138 to metastases, was made in laboratory tests using noninvasive positron emission tomography-magnetic resonance imaging, or PET-MRI. The key results of the study suggest that TTX-MC138, when injected intravenously, accumulates in metastatic lesions. These results suggest that our TTX platform delivers its therapeutic candidate as intended and supports clinical evaluation of TTX-MC138. In addition, the MGH investigation describes a microdosing PET-MRI approach to measure TTX-MC138 biodistribution in cancer patients and its delivery to clinical metastases. (Microdoses are minute, subpharmacologic doses of a test compound, not greater than 0.1 micrograms.) The capacity to carry out microdosing PET-MRI studies in patients under an exploratory IND, or eIND, application could be important because it has the potential to facilitate FDA authorization of additional human studies. This research, published by Dr. Zdravka Medarova, our Chief Technology Officer and scientific co-founder, and others describes what we believe is an effective approach to assessing delivery of TTX-MC138 in metastatic

cancer patients. Since the PET-MRI technique is sensitive enough to determine the concentration of radiolabeled drug in the sub-picomolar range, microgram quantities of the radiolabeled drug are believed to be sufficient to perform such a study in humans. We believe this capability has significant advantages in the initial phases of drug development. Because the low mass of the radiolabeled drug does not induce reactions in humans, we believe the regulatory process will be less complex.

Dr. Medarova's paper suggests that the radiolabeling does not impact tumor cell uptake or the ability of TTX-MC138 to engage its target. The paper also shows that the biodistribution of Cu-64 labeled TTX-MC138, when injected at a microdose, reflects its biodistribution at the level of a therapeutic dose.

These key findings are expected to enable a microdosing study with TTX-MC138 in patients which we believe:

- (i) allows precise quantitation of the amount of TTX-MC138 delivered to the metastatic lesions because of the higher sensitivity and quantitative accuracy of positron emission tomography;
- (ii) permits measurement of the pharmacokinetics and biodistribution of TTX-MC138 not only in the metastatic lesions but in other tissues throughout the body. This knowledge can inform Phase I/II clinical trial designs by allowing us to determine drug uptake and clearance from vital organs;
- (iii) enables measurement of pharmacokinetic endpoints potentially informing dosing for Phase II/III clinical trials. Specifically, because of the high sensitivity and quantitative nature of PET-MRI, it may be possible to derive a more precise calculation of drug concentration in the metastatic lesions over time and then correlate that information to the effective dose defined in our preclinical studies; and
- (iv) further informs patient enrollment during Phase II/III trials by allowing patient inclusion in the trials based on which patients' metastases demonstrated accumulation of TTX-MC138 in prior trials.

Because of the benefits we believe we can derive from a microdosing Phase 0 trial, and reflecting the studies described in Cancer Nanotechnology, we are conducting a Phase 0 trial as our First-in-Human clinical trial to demonstrate delivery to tumors and metastases with high efficiency.

Success in the microdosing study could also validate delivery generally for our TTX pipeline which potentially opens-up additional relevant RNA targets that have been previously undruggable. Concurrent with the Phase 0 study, we expect to complete studies to support an IND for a Phase I clinical trial with TTX-MC138.

The Phase 0 study is an open-label, single-center, microdose study to demonstrate delivery of TTX-MC138-NODAGA-Cu64 (a radio-labeled version of our lead candidate therapeutic) to radiographically confirmed metastases in subjects with advanced solid tumors. In the study, we may enroll up to 12 patients with late-stage advanced solid tumors, and use PET-MRI to measure TTX-MC138 delivery to metastatic lesions and other tissues in the body. We are conducting the clinical portion of the study at a major cancer center in Boston, MA. As of the date of this prospectus, we have dosed and imaged one patient and expect additional patients to consent to participate in the trial before year end. Depending on the results with the first four patients, which are intended to be more extensively evaluated, we may end the trial after completing the protocol with those four patients.

Our Lead Therapeutic Candidate

Our scientific co-founders developed TransCode's lead therapeutic candidate at The General Hospital Corporation, d/b/a Massachusetts General Hospital 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. We believe 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 700 peer-reviewed scientific publications.

TTX-MC138 comprises proprietary iron-oxide nanoparticles conjugated to sequence-specific LNA/DNA oligonucleotides that target microRNA-10b. The nanoparticles serve as a vehicle to deliver oligonucleotides to tumors and metastases. The magnetic properties of these nanoparticles allow for monitoring their delivery using non-invasive imaging, which we believe adds value for clinical implementation of this therapeutic approach.

Preclinical Study Results Breast Cancer

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 involving over 125 mice, TTX-MC138 was injected into mice implanted with human metastatic breast tumors. These mouse models included the rodent 4T1-luc2 orthotopic allograft, which is a very aggressive model of stage IV metastatic breast cancer, the human MDA-MB-231-luc-D3H2LN xenograft, which is a stage II/III cancer model, and the human MDA-MB-231-BrM2-831 xenograft, which is a model of breast cancer metastatic to the brain. Tumors in mice implanted with MDA-MB-231 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 miR-10b inside the tumor cells.

After four weeks of therapy, metastases in mice treated with TTX-MC138 regressed. 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, there was no recurrence and 100% survival in 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 rate of tumor cell replication in this model resulting in dilution of the therapeutic. We do not expect this to be the case in humans with metastatic disease, in whom tumor cell replication is dramatically slower than in mice.

Pancreatic Cancer

We recently evaluated the efficacy of TTX-MC138 as monotherapy in a murine model of pancreatic adenocarcinoma and achieved positive preclinical results. In this study, we treated mice bearing human pancreatic tumors with TTX-MC138 once weekly for eight weeks. The candidate demonstrated a pharmacodynamic response by successfully inhibiting miR-10b. Serum miR-10b was down-regulated by TTX-MC138 and was shown to be a potential surrogate biomarker of therapeutic efficacy, opening up the possibility of noninvasive monitoring of therapeutic response in human patients. Forty percent (40%) of animals treated with TTX-MC138 had complete responses, defined as complete regression of disease and long-term survival without recurrence.

These new findings expand the potential therapeutic relevance of TTX-MC138 beyond breast cancer, in which activity had previously been shown in preclinical studies, to include pancreatic adenocarcinoma. However, there is no assurance that these preclinical results will be duplicated in further preclinical studies or in cancer patients suffering from pancreatic cancer.

Glioblastoma

Recent studies have shown that miR-10b is highly expressed in high-grade glioblastoma multiforme, or GBM, and its inhibition leads to dysregulation of multiple pathways in tumorigenesis, resulting in repression of tumor growth and increased apoptosis. Thus, we hypothesized that suppressing miR-10b could enhance the cytotoxicity of conventional GBM chemotherapy with temozolomide, or TMZ. Inhibition of miR-10b in glioblastoma cells was achieved using MN-anti-miR10b (a TTX-MC138 analogue). Treatment of U251 and LN229 human glioblastoma cells with our drug candidate led to inhibition of miR-10b accompanied by repression of growth and increase in apoptosis. We next explored whether MN-anti-miR10b could enhance the cytotoxic effect of TMZ. During these studies, we unexpectedly found that TMZ monotherapy increased miR-10b expression and changed the expression of corresponding miR-10b targets. This discovery led to the design of a sequence-dependent combination treatment, in which miR-10b inhibition and induction of apoptosis by MN-anti-miR10b was followed by a sub-therapeutic dose of TMZ, which caused cell cycle arrest and ultimately tumor cell death. Additionally, studies in human patient-derived models of GBM confirmed delivery to the brain tumors and exhibited a highly significant level of target inhibition, indicating robust pharmacodynamic activity.

Ongoing and Planned Clinical Trials

We submitted an eIND application to the FDA on November 30, 2022, to conduct a First-in-Human, or FIH, clinical trial with TTX-MC138-NODAGA-Cu64 and received written authorization from the agency on December 23, 2022, allowing us to proceed with the clinical trial. On April 25, 2023, we received authorization from the IRB to proceed with the trial in up to 12 cancer patients with advanced solid tumors. This clinical trial involves injecting a single microdose of radiolabeled TTX-MC138, termed TTX-MC138-NODAGA-Cu64, into cancer patients with advanced solid tumors. Injections are to be followed by imaging using integrated positron emission tomography-magnetic resonance imaging, or PET-MRI. The Phase 0 trial is intended to quantify the amount of radiolabeled TTX-MC138 delivered to metastatic lesions and the pharmacokinetics (PK) and biodistribution of the therapeutic candidate in cancer patients. The single dose involved in this trial is not expected to demonstrate target engagement. The Phase 0 trial could yield critical data regarding therapeutic dose, timing, and potential safety that could inform later clinical trials. We believe that demonstrating our ability to overcome the challenge of RNA delivery to genetic targets outside the liver, and specifically to tumors and metastases, would represent a major step forward in unlocking therapeutic access to genetic targets involved in a range of cancers. We commenced enrollment of the Phase 0 trial during the third quarter of 2023 and anticipate announcing preliminary, topline data from initial patients in this trial in the fourth quarter of 2023. Concurrent with the Phase 0 trial, we have completed IND-enabling toxicity studies to support the filing of our IND for a Phase I/II clinical trial with TTX-MC138. On April 24, 2023, we submitted a pre-IND briefing package to the FDA regarding our planned Phase I/II clinical trial and development plans and received a written response from FDA on May 24, 2023.

Modular Design Toolbox

We employ a design engine to enable development of RNA therapeutic candidates that we believe can be efficiently delivered to genetic targets inside tumor cells. This approach is based on four complementary elements that together address the challenges of RNA drug development in oncology:

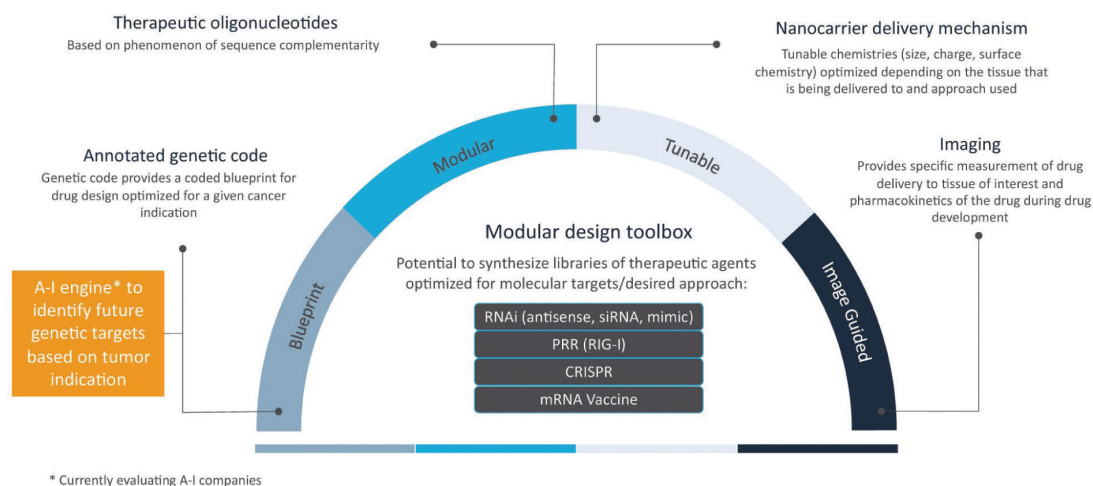
Nanocarrier Delivery Mechanism — Our strategy seeks to leverage a nanoparticle that has been extensively used in humans for imaging by repurposing it to deliver targeted therapeutics to oncology targets and for other therapeutic applications. The nanocarrier is tunable to pre-designed specifications to deliver therapeutic oligonucleotides to an RNA target in tumors and metastases without compromising its integrity. These nanocarriers differentiate us from competitive delivery approaches, many of which rely on lipid nanoparticles or chemical structures, such as GalNAc. Competitive delivery approaches effectively target sites in the liver but not sites in tumors and metastases elsewhere. Our nanocarrier is derived from, and is chemically similar to, nanoparticles extensively used in imaging (Feridex, from Advanced Magnetix) or for treating iron deficiency anemia (Feraheme, also from Advanced Magnetix).

We expect that our competitive advantages will include effectively reaching tumors and metastases, achieving robust target engagement in tumor cells, and an anticipated wide therapeutic window based on prior experience in preclinical models and clinical experience of others with similar iron oxide nanoparticles.

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 therapeutic or diagnostic agents. Specifically, once we determine the code of the cancer target, we can develop therapeutic candidates using specific nucleic acids that are harmonized to that target and potentially rewrite the story on cancer. This is what TransCode means — to change the code. After determining the genetic target of interest, we may be able to choose from a variety of RNA approaches best suited for that target. Those approaches will likely range from RNAi, which include siRNAs, antisense oligonucleotides, and non-coding RNA mimics; messenger RNA-based cancer vaccines; CRISPR-based gene repair and replacement platforms; or Pattern Recognition Receptors like RIG-I.

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 therapeutic candidates incorporate synthetic oligonucleotides, or 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 to enable delivery of CRISPR genome editing tools and mRNAs. Combined, the modularity and tunability of these oligonucleotides and nanocarrier components may enable the potential to synthesize libraries of 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.

Image Guided — Because our therapeutic 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 in assessing and controlling the amount of oligonucleotide that reaches targeted tissues. MRI use during the design phase of the therapeutic 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.



Current Pipeline

Drug Candidate	Target	Type	Disease Indication	R&D	Preclinical	IND Enabling	Phase 0	Phase 1	Phase 2	Phase 3
TTX-MC138	miR-10b	RNAi	Metastatic Cancer	External partner development						
			*Glioblastoma (GBM); **Pancreatic Cancer	External partner development						
			*SCLC, & Osteosarcoma	External partner development						
				External partner development						
TTX-siPDL1	PD-L1	RNAi	**Pancreatic Cancer	External partner development						
TTX-RIGA	Multiple	PRR-RIGI	Cancer Agnostic	External partner development						
TTX-CRISPR	Multiple	CRISPR (Cas9)	Cancer Agnostic	External partner development						
TTX-CRISPR	Multiple	CRISPR (BEC)	Cancer Agnostic	External partner development						
TTX-mRNA	Vaccine	mRNA	Cancer Agnostic	External partner development						

* Seeking Orphan designation status
**Received Orphan designation status from FDA

External partner development

Recent Publications

In collaboration with scientists from MGH, Harvard Medical School and Michigan State University, we have published the five manuscripts listed below. The publication by Smith et al. reviews recent progress towards translating short non-coding RNAs into the clinic. The manuscript by Le Fur et al. describes a method for radiolabeling our lead candidate, TTX-MC138, and employing PET-MRI to assess the tissue distribution of microdoses of the therapeutic candidate. This manuscript serves as the basis for our FIH clinical trial. The publication by Chen et al. reviews key microRNA targets, including miR-10b, in glioblastoma. The fourth study, by Moore et al., presents a case study of a feline patient with metastatic breast cancer treated with TTX-MC138.

Clinical Applications of Short Non-Coding RNA-Based Therapies in the Era of Precision Medicine. Smith ES, Whitty E, Yoo B, Moore A, Sempere LF, Medarova Z. *Cancers (Basel)*. 2022 Mar 21;14(6):1588.

Radiolabeling and PET-MRI microdosing of the experimental cancer therapeutic, MN-anti-miR10b, demonstrates delivery to metastatic lesions in a murine model of metastatic breast cancer. Le Fur M, Ross A, Pantazopoulos P, Rotile N, Zhou I, Caravan P, Medarova Z, Yoo B. *Cancer Nanotechnol*. 2021;12(1):16.

Role of microRNAs in glioblastoma.

Chen M, Medarova Z, Moore A. *Oncotarget*. 2021 Aug 17;12(17):1707-1723.

Case Report: microRNA-10b as a Therapeutic Target in Feline Metastatic Mammary Carcinoma and its Implications for Human Clinical Trials. Moore A, Savan NA, Saavedra PV, Halim A, Yuzbasiyan-Gurkan V, Wang P, Yoo B, Kiupel M, Sempere L, Medarova Z. *Front. Oncol. Sec. Cancer Molecular Targets and Therapeutics* doi: 10.3389/fonc.2022.959630.

Co-administration of Temozolomide (TMZ) and the Experimental Therapeutic Targeting miR-10b, Profoundly Affects the Tumorigenic Phenotype of Human Glioblastoma Cells. Ming Chen, Bryan Kim, Neil Robertson, Sujan K. Mondal, Zdravka Medarova, Anna Moore *Frontiers in Molecular Biosciences* 2023.

In addition to the five publications described above, we submitted a manuscript describing the feasibility of our RIG-I targeting approach using our TTX-RIGA candidate which was recently published in BioRxiv.

Summary of Risks

Our business is subject to numerous material and other risks and uncertainties that you should be aware of in evaluating our business. These risks are described more fully elsewhere in this prospectus or incorporated by reference herein, including in the section entitled "Risk Factors", and include, but are not limited to, the following:

- > our immediate low cash position and our estimates and expectations regarding our capital requirements, cash and expense levels, liquidity sources and our ability to obtain, on satisfactory

terms or at all, the financing required to support operations, research, development, clinical trials, and commercialization of products;

- our business is highly dependent on the success of TTX-MC138, our lead therapeutic candidate which is at the early stages of development. Our therapeutic and diagnostic candidates require significant additional preclinical and clinical development before we may be able to seek regulatory approval for and launch a product commercially;
- a potential delisting of our common stock from trading on the Nasdaq Capital Market, including if our stockholders' equity does not meet and maintain the \$2.5 million minimum Nasdaq threshold or if Nasdaq concludes this offering does not constitute a Public Offering as defined by Nasdaq;
- the results and timing of our preclinical and clinical trial activities;
- if we encounter difficulties enrolling patients in our clinical trials, our clinical development activities could be delayed or otherwise adversely affected.
- our ability to expand our therapeutic candidate portfolio through internal research and development or the acquisition or in-licensing of intellectual property assets;
- the therapeutic benefits, effectiveness and safety of our therapeutic candidates;
- our ability to receive regulatory approval for our therapeutic candidates in the United States, Europe and other geographies;
- the expected regulatory approval pathway for our therapeutic candidates;
- potential changes in regulatory requirements, and delays or negative outcomes from the regulatory approval process;
- our reliance on third parties for the planning, conduct and monitoring of clinical trials, for the manufacture of clinical drug supplies and drug product and for other requirements;
- our estimates of the size and characteristics of the markets that may be addressed by our therapeutic candidates;
- market acceptance of our therapeutic candidates that are approved for marketing in the United States or other countries;
- our ability to successfully commercialize our therapeutic candidates;
- the impact of natural disasters, global pandemics (including further outbreaks of existing strains of COVID-19 or new strains of the virus), labor disputes, lack of raw materials or other supplies, issues with facilities and equipment or other forms of disruption to business operations at our manufacturing or laboratory facilities or those of our vendors, or at clinical trial sites;
- our ability to utilize our proprietary technological approach to develop and commercialize our therapeutic candidates;
- our heavy dependence on licensed intellectual property, including our ability to source and maintain licenses from third-party owners;
- our ability to attract, retain and motivate key personnel;
- our ability to generate revenue and become profitable;
- our reliance on third-party manufacturers to manufacture our drug substance and drug product that meets with our design specifications;
- our dependence on contract research organizations and other institutions to manage our clinical trials;
- 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 therapeutic 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 therapeutic candidates;
- quality problems could delay or prevent delivery of our materials for clinical trials or to the market;
- changes in methods of therapeutic candidate manufacturing or formulation may result in additional costs or delays;
- our therapeutic 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;
- if we are unable to advance our therapeutic candidates to clinical development, obtain regulatory approval and ultimately commercialize our therapeutic candidates or if we experience significant delays in doing so, our business will be materially harmed;
- even if we receive regulatory approval of TTX-MC138 or any of our other therapeutic 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 therapeutic candidates;
- we expect to rely on third-parties to manufacture and supply materials we require for research and development, preclinical studies and clinical trials which could result in supplies that are limited or interrupted or which may not be of satisfactory quantity or quality or other delays or disruptions;
- ongoing healthcare legislative and regulatory reform measures may have a material adverse effect on our business and results of operations;
- 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.
- obtaining and maintaining regulatory approval for our therapeutic candidates in one jurisdiction does not mean that we will be successful in obtaining regulatory approval for that or of any of our other therapeutic candidates in other jurisdictions;
- we face substantial competition, which may result in others discovering, developing or commercializing products before or more successfully than we do;
- the price of our common stock may be volatile and fluctuate substantially, which could result in substantial losses for purchasers of our common stock;
- we have broad discretion in the use of the net proceeds from this offering and may not use them effectively;
- investors may incur dilution in the net tangible book value of the shares purchased in the offering, assuming no sale of any pre-funded warrants in lieu of common 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 and the trading price of our common stock; and
- other risks and uncertainties, including those listed under the caption “Risk Factors” in our Annual Report on Form 10-K and in our other regulatory filings, including our Quarterly Report on Form 10-Q filed with the SEC on August 14, 2023.

Corporate Information

We were incorporated in the State of Delaware in January 2016. Our corporate address 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. Our design logo and our other registered and common law trade names, trademarks and service marks are the property of TransCode.

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 \$1.235 billion or more; (ii) the last day of our fiscal year following the fifth anniversary of the completion of our initial public offering (i.e., December 31, 2026); (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 Securities Exchange Act of 1934, as amended, or 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 (i) until the fiscal year following the determination that the market value of 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 (ii) if our annual revenues are less than \$100 million during the most recently completed fiscal year, until the fiscal year following the determination that the market value of 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	11,479,408 shares of our common stock (13,201,319 shares if the underwriter exercises its over-allotment option in full).
Pre-funded warrants offered by us	<p>We are also offering to those purchasers, if any, whose purchase of the common stock in this offering would result in the purchaser, together with its affiliates and certain related parties, beneficially owning more than 4.99% (or at the election of the purchaser, 9.99%) of our outstanding common stock immediately following the consummation of this offering, the opportunity to purchase, if they so choose, pre-funded warrants in lieu of the common stock that would otherwise result in ownership in excess of 4.99% (or 9.99%, as applicable) of our outstanding common stock.</p> <p>The purchase price of each pre-funded warrant will equal the price per share of common stock being sold to the public in this offering, minus \$0.01, and the exercise price of each pre-funded warrant will be \$0.01 per share.</p> <p>For each pre-funded warrant we sell, the number of shares of common stock we are offering will be decreased on a one-for-one basis.</p> <p>Each pre-funded warrant will be immediately exercisable and may be exercised at any time until exercised in full. There is no expiration date for the pre-funded warrants. To better understand the terms of the pre-funded warrants, you should carefully read the “Description of Capital Stock” section of this prospectus. You should also read the form of pre-funded warrant, which is filed as an exhibit to the registration statement that includes this prospectus.</p>
Common Stock to be outstanding after this offering(1)	13,430,082 shares of common stock (15,151,993 shares if the underwriter exercises its over-allotment option in full), assuming no sale of any pre-funded warrants. To the extent pre-funded warrants are sold, it will reduce the number of shares of common stock sold in this offering on a one-for-one basis until such warrants are exercised, if ever.
Over-Allotment Option	<p>The underwriter has an option for a period of 45 days to purchase up to 1,721,911 additional shares of our common stock and/or pre-funded warrants to cover over-allotments, if any.</p> <p>The purchase price to be paid by the underwriters per additional share of common stock or pre-funded warrant shall be equal to the public offering price of one share of common stock or pre-funded warrant, as applicable, less the underwriting discount.</p>
Use of Proceeds	We intend to use the net proceeds of this offering (i) to fund one or more clinical trials of TTX-MC138, our lead therapeutic candidate, including related IND-enabling studies; and (ii) for working capital and general corporate purposes. See “Use of Proceeds” for more information.
Nasdaq Capital Market Symbol for Common Stock	RNAZ

Lock-up Agreements	<p>We do not intend to apply for the listing of the pre-funded warrants on any national securities exchange or other trading system. Without an active trading market, the liquidity of the pre-funded warrants will be limited.</p>
Underwriter’s Warrants	<p>The company and our directors, officers and certain of our stockholders have agreed with the underwriter, 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 90 days (or 60 days if gross proceeds from this offering are less than \$10 million). See “<i>Underwriting</i>” for more information.</p>
Underwriter’s Warrants	<p>The registration statement of which this prospectus is a part also registers for sale warrants to purchase 573,970 shares of our common stock (660,066 shares if the underwriter exercises its over-allotment option in full) which we will issue to the underwriter as a portion of the underwriting compensation payable to the underwriter 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 public offering price of the common stock. See “<i>Underwriting — Underwriter’s Warrants</i>” for a description of these warrants.</p>
Risk Factors	<p>Investing in our securities involves a high degree of risk. See “<i>Risk Factors</i>” for important information.</p>
<p>¹⁾ The number of shares of common stock to be outstanding after the offering is based on 1,950,674 shares of common stock outstanding as of June 30, 2023, and excludes, as of that date, the following:</p> <ul style="list-style-type: none"> ➤ 267,277 shares of common stock issuable upon exercise of outstanding stock options at a weighted average exercise price of \$10.84 per share; ➤ 15,625 shares of common stock issuable upon the exercise of outstanding IPO Underwriter Warrants at an exercise price of \$100.00 per share; ➤ 9,962 shares of common stock issuable upon exercise of outstanding February 2023 Placement Agent Warrants at an exercise price of \$13.18 per share; ➤ 6,250 shares of common stock issuable upon exercise of outstanding Consultant Warrants at an exercise price of \$10.00 per share; ➤ 950,000 shares of common stock issuable upon the exercise of outstanding June 2023 Pre-funded Warrants at an exercise price of \$0.01 per share; ➤ 140,000 shares of common stock issuable upon the exercise of outstanding June 2023 Placement Agent Warrants at an exercise price of \$4.38 per share; ➤ 2,000,000 shares of common stock issuable upon the exercise of outstanding Series A-1 Warrants at an exercise price of \$3.25 per share; ➤ 2,000,000 shares of common stock issuable upon the exercise of outstanding Series A-2 Warrants at an exercise price of \$3.25 per share; ➤ 4,479 shares of common stock reserved for future issuance under our 2021 Stock Option and Equity Incentive Plan, or the 2021 Plan; and ➤ 16,500 shares of common stock reserved for future issuance under our 2021 Employee Stock Purchase Plan, or our 2021 ESPP. 	

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

- no exercise by the underwriter of the over-allotment option to purchase additional shares (or pre-funded warrants in lieu thereof);
- no exercise of outstanding options or warrants;
- no exercise of the underwriter'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
- no sale of any pre-funded warrants in this offering.

Summary Financial Data

You should read the following summary financial data together with the section entitled “*Management’s Discussion and Analysis of Financial Condition and Results of Operations*” and our financial statements and related notes for the year ended December 31, 2022, and for the six months ended June 30, 2023, appearing in our Annual Report on Form 10-K for the Fiscal Year Ended December 31, 2022, and [Quarterly Report on Form 10-Q for the Three and Six Months Ended June 30, 2023](#), incorporated herein by reference. The following summary statement of operations data for the years ended December 31, 2022 and 2021, are derived from our audited financial statements appearing in our [Annual Report on Form 10-K for the Fiscal Year Ended December 31, 2022](#), incorporated herein by reference. We have derived the summary statements of operations data for the six months ended June 30, 2023 and 2022, and balance sheet data as of June 30, 2023, from our unaudited interim financial statements appearing in our [Quarterly Report on Form 10-Q for the Three and Six Months Ended June 30, 2023](#), incorporated herein by reference. We have prepared the unaudited interim financial statements on the same basis as the audited financial statements and have included all adjustments, consisting only of normal recurring adjustments that, in management’s opinion, are necessary to state fairly the information set forth in those financial statements. Our historical results are not necessarily indicative of the results that may be expected in the future and our results for the six months ended June 30, 2023, are not necessarily indicative of the results that may be expected for the full year ending December 31, 2023, or any other period. The summary financial data in this section are not intended to replace our financial statements and related notes and are qualified in their entirety by the financial statements and related notes incorporated herein by reference.

	<u>Six Months Ended June 30,</u>		<u>Years Ended December 31,</u>	
	<u>2023</u>	<u>2022</u>	<u>2022</u>	<u>2021</u>
Unaudited				
Statement of Operations Data				
Operating expenses				
Research and development	\$ 5,557,260	\$ 4,501,604	\$ 10,232,366	\$ 2,753,966
General and administrative	4,474,688	3,683,191	8,433,448	3,397,169
Total operating expenses	10,031,948	8,184,795	18,665,814	6,151,135
Operating loss	(10,031,948)	(8,184,795)	(18,665,814)	(6,151,135)
Other income (expense)				
Change in fair value of derivative liabilities	—	—	—	(867,000)
Change in fair value of warranty liability	—	—	—	(6,109)
Grant income	868,345	41,720	1,080,436	278,333
Loss on sale of equipment	—	—	—	(3,082)
Interest expense	—	—	—	(95,070)
Interest income	5,017	1,773	20,410	664
Total other income (expense)	873,362	43,493	1,100,846	(692,264)
Loss before income taxes	(9,158,586)	(8,141,302)	(17,564,968)	(6,843,399)
Income tax expense (benefit)	—	—	—	—
Net loss	\$ (9,158,586)	\$ (8,141,302)	\$ (17,564,968)	\$ (6,843,399)
Basic and diluted loss per common share(1)	\$ (8.97)	\$ (12.55)	\$ (27.07)	\$ (16.24)
Weighted average number of common shares outstanding, basic and diluted(1)	1,020,644	648,862	648,861	421,294
Balance Sheet Data				
Cash	\$3,572,475	\$4,968,418	\$20,825,860	
Current assets	4,892,937	7,379,405	22,732,175	
Total assets	5,881,545	7,587,986	22,938,443	
Current liabilities	3,523,430	4,347,290	2,534,097	
Total liabilities	3,789,082	4,347,290	2,534,097	
Total stockholders' equity	2,092,463	3,240,696	20,404,346	
¹⁾ See note 13 to our audited financial statements and our unaudited interim financial statements for further details on the calculation of basic and diluted net loss per common share.				

Risk Factors

Investing in our common stock involves a high degree of risk. Before making an investment decision, you should carefully consider the risks described below, and the risk factors included in our [Annual Report on Form 10-K filed with the SEC on March 31, 2023](#), and the most recent [Form 10-Q filed with the SEC on August 14, 2023](#), incorporated by reference into this prospectus, as well as the other information in this prospectus and the documents incorporated by reference into this prospectus. Our business, prospects, financial condition, or operating results could be harmed by any of these risks, as well as other risks not currently known to us or that we currently consider immaterial. If any such risks or uncertainties actually occur, our business, prospects, financial condition or operating results could differ materially from the plans, projections and other forward-looking statements included in the section titled “Management’s Discussion and Analysis of Financial Condition and Results of Operations” incorporated by reference into this prospectus. The trading price of our common stock could decline significantly due to any of these risks or other factors, and as a result, you may lose all or part of your investment.

Risks related to our financial position and need for additional capital

We have identified conditions and events that raise substantial doubt about our ability to continue operations in the near-term. We may need to seek an in-court or out-of-court restructuring of our liabilities.

We may be forced to amend, delay, limit, reduce or terminate the scope of our development programs and/or limit or cease our operations if we are unable to obtain additional funding. As of June 30, 2023, we had cash and cash equivalents totaling \$3.6 million. We do not believe that our cash as of June 30, 2023, will enable us to fund our operating expenses and capital requirements beyond September 2023. We will need to raise additional capital to continue as a going concern. The failure to obtain sufficient additional funds on commercially acceptable terms to fund our operations and satisfy our obligations to creditors may have a material adverse effect on our business, results of operations and financial condition and jeopardize our ability to continue operations in the near-term. We will likely need to consider additional cost reduction strategies, which may include, among others, amending, delaying, limiting, reducing, or terminating our development programs, and we may need to seek an in-court or out-of-court restructuring of our liabilities. In the event of such future restructuring activities, holders of our common stock and other securities will likely suffer a total loss of their investment.

We could lose our listing on the Nasdaq Capital Market if we do not increase our stockholders’ equity. The loss of our Nasdaq listing would in all likelihood make our common stock significantly less liquid and adversely affect its value.

As initially disclosed on our Current Report on Form 8-K filed with the SEC on May 18, 2023, we received a letter from the Listing Qualifications Department (the “Staff”) of The Nasdaq Stock Market LLC (“Nasdaq”) on May 16, 2023, that we are not in compliance with the stockholders’ equity requirement for continued listing on the Nasdaq Capital Market. Nasdaq Listing Rule 5550(b)(1) requires that companies listed on the Nasdaq Capital Market maintain stockholders’ equity of at least \$2,500,000 (the “Stockholders’ Equity Requirement”) or that they meet one of the alternative listing standards, market value of listed securities of at least \$35 million or net income of \$500,000 from continuing operations in the most recently completed fiscal year, or in two of the three most recently completed fiscal years. We were given 45 calendar days, or until June 30, 2023, to submit a plan to Nasdaq describing how we intend to seek to regain compliance with the Stockholders’ Equity Requirement (the “Compliance Plan”).

If the Compliance Plan was determined to be acceptable to the Staff, the Staff would have the discretion to grant the Company an extension of 180 calendar days from the date of the Staff notification to regain compliance with the Stockholders’ Equity Requirement. The Company submitted the Compliance Plan to Nasdaq on June 30, 2023, and supplemented it with additional materials on July 24, 2023.

On July 26, 2023, the Company received a Delisting Determination Letter from the Staff advising the Company that the Staff had determined not to accept the Company’s Compliance Plan, that the Company’s request for an extension had been denied, and that the Company’s common stock was subject to delisting

Risk Factors

from the Nasdaq Capital Market (the “Delisting Determination”). In accordance with Nasdaq Listing Rule 5815(a)(2), the Company was provided with seven calendar days, or until August 2, 2023, to request a hearing before the Nasdaq Hearings Panel (the “Panel”) to appeal the Delisting Determination. The Company submitted a request for a hearing to Nasdaq, and on August 2, 2023, was notified by Nasdaq that an oral hearing (the “Hearing”) by the Panel to discuss the Delisting Determination has been scheduled for October 2023. Accordingly, any delisting action by the Staff will be stayed at least until the Hearing has been held and a final written decision by the Panel has been issued, and until any extension granted by the Panel following the Hearing expires.

At the Hearing, the Company intends to present its plan to regain compliance with the Stockholders’ Equity Requirement. Following the Hearing, the Panel will issue a final written decision to the Company concerning the Delisting Determination. There can be no assurance that the Company’s plan will be accepted by the Panel or that, if it is, the Company will be able to regain compliance with the Stockholders’ Equity Requirement. Also, the timing of the Panel’s final written decision is unknown and cannot be predicted with any certainty.

Upon a delisting from the Nasdaq Capital Market, our stock would likely be traded in the over-the-counter inter-dealer quotation system, more commonly known as the OTC. OTC transactions involve risks in addition to those associated with transactions in securities traded on the securities exchanges, such as the Nasdaq Capital Market, or, together, Exchange-listed stocks. Many OTC stocks trade less frequently and in smaller volumes than Exchange-listed stocks. Accordingly, our stock would be less liquid than it would be otherwise. Also, the prices of OTC stocks are often more volatile than Exchange-listed stocks. Additionally, institutional investors are usually prohibited from investing in OTC stocks, and it might be more challenging to raise capital when needed.

The Nasdaq Capital Market may seek to delist our Common Stock if it concludes this offering does not qualify as a Public Offering as defined under Nasdaq’s shareholder approval rule.

The continued listing of our common stock on the Nasdaq Capital Market depends on our compliance with the requirements for continued listing under the Nasdaq Marketplace Rules, including but not limited to Market Place Rule 5635, or the shareholder approval rule. The shareholder approval rule prohibits the issuance of shares of common stock (or derivatives) in excess of 20% of our outstanding shares of common stock without shareholder approval, unless those shares are sold at a price that equals or exceeds the Minimum Price, as defined in the shareholder approval rule, or in what Nasdaq deems a Public Offering, as defined in the shareholder approval rule. The securities sold in this offering may be sold at a significant discount to the Minimum Price as defined in the shareholder approval rule, and we do not intend to obtain the approval of our stockholders for the issuance of the securities in this offering. Accordingly, we have sought to conduct, and plan to continue to conduct, this offering as a Public Offering as defined in the shareholder approval rule, which is a qualitative analysis based on several factors as determined by Nasdaq, including by broadly marketing and offering these securities in a firm commitment underwritten offering registered under the Securities Act. Demand for the securities sold by us in this offering, and the final offering price for these securities, will be determined following a broad public marketing effort over several trading days, and final distribution of these securities will ultimately be determined by the underwriter. Nasdaq has also published guidance that an offering of securities that are “deeply discounted” to the Minimum Price (for example a discount of 50% or more) will typically preclude a determination that the offering qualifies as Public Offering for purposes of the shareholder approval rule. We cannot assure you that Nasdaq will determine that this offering will be deemed a Public Offering under the shareholder approval rule. If Nasdaq determines that this offering was not conducted in compliance with the shareholder approval rule, Nasdaq may cite a deficiency and move to delist our securities from the Nasdaq Capital Market. Upon a delisting from the Nasdaq Capital Market, our stock would likely be traded in the over-the-counter inter-dealer quotation system, more commonly known as the OTC. OTC transactions involve risks in addition to those associated with transactions in securities traded on the securities exchanges, such as the Nasdaq Capital Market, or, together, Exchange-listed stocks. Many OTC stocks trade less frequently and in smaller volumes than Exchange-listed stocks. Accordingly, our stock would be less liquid than it would be otherwise. Also, the prices of OTC stocks are often more volatile than Exchange-listed stocks. Additionally, institutional investors are usually prohibited from investing in OTC stocks, and it might be more challenging to raise capital when needed.

Risk Factors

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 therapeutic candidate development programs or commercialization efforts.

The development of pharmaceutical drugs is capital intensive. We are currently advancing TTX-MC138 into clinical development. Our current cash resources are insufficient to fund our planned operations or development plans beyond September 2023. We may not be able to complete our planned FIH trial, we may only be able to complete the trial in a small subset of patients and in only one tumor type. Even if completed, we will 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 therapeutic candidates or even to continue operations, either of which occurrence would have a material adverse effect on us.

We expect our expenses to continue 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 therapeutic candidates. In addition, if we obtain marketing approval for any of our current or future therapeutic candidates, we expect to incur significant commercialization expenses related to sales, marketing, 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 therapeutic candidates or otherwise expand more rapidly than we presently anticipate. Furthermore, we expect to continue to incur significant 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 therapeutic candidates, delay our pursuit of potential licenses or acquisitions, or significantly reduce our operations.

We expect that the net proceeds from this offering, together with our existing cash, will be sufficient to fund our operations to the end of 2023, assuming the net proceeds to us from this offering are at least \$6.8 million. If we receive less net proceeds from this offering, the period of time for which we will be able to fund our operating expenses and capital expenditure requirements will be correspondingly reduced. 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 therapeutic 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 therapeutic 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 license other current or future therapeutic 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 therapeutic candidates.

Risk Factors

Identifying potential current or future therapeutic 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 therapeutic 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 therapeutic candidates. Disruptions in the financial markets in general, and those due to the COVID-19 pandemic in particular, 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 could result in 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 therapeutic 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 therapeutic 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.

Risks related to our securities and this offering

The price of our common stock may be volatile or may decline regardless of our operating performance, and shareholders may not be able to resell their shares at or above the price at which they purchase those shares.

Trading volume in shares of our common stock on the Nasdaq Capital Market has been limited. 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. An active or liquid market in our common stock may not develop or, if it does develop, it may not sustain. As a result of these and other factors, shareholders may not be able to resell their shares of our common stock at or above the price at which they purchase those shares in this offering.

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 has been volatile since our initial public offering. The stock market in general, and the market for the stocks of biopharmaceutical companies in particular, have experienced extreme price and volume fluctuations often unrelated or disproportionate to the operating performance of particular companies, for numerous reasons including as a result of the COVID-19 pandemic, economic events and expectations, and the war in the Ukraine. Broad market and industry factors may negatively affect the market price of our common stock, regardless of our actual operating performance. As a result of the foregoing, shareholders

Risk Factors

may not be able to sell their common stock at or above the price at which they purchase those shares in this offering or otherwise. 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 therapeutic 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 therapeutic candidates or clinical development programs;
- the results of our efforts to discover, develop, acquire or license additional current or future therapeutic 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 and in the documents incorporated by reference herein.

If the market price of our common stock after this offering does not exceed the public offering price in this offering, you may not realize any return on your investment in us and you may lose some or all of your investment. Additionally, 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 securities in this offering, you will incur immediate and substantial dilution in the book value of your shares of common stock.

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 public offering price of \$0.6969 per share, the last reported price of our common stock on the Nasdaq Capital Market on September 21, 2023, purchasers of securities in this offering will experience immediate dilution of \$0.04 per share in net tangible book value of the common stock. See the section of this prospectus titled “*Dilution*” for a more detailed description of these factors.

There is no public market for any pre-funded warrants sold in this offering.

There is no established public trading market for the pre-funded warrants being sold in this offering. We will not list the pre-funded warrants on any securities exchange or nationally recognized trading system, including

Risk Factors

the Nasdaq Capital Market. Therefore, we do not expect a market to ever develop for the pre-funded warrants. Without an active market, the liquidity of the pre-funded warrants will be limited.

The pre-funded warrants are speculative in nature.

The pre-funded warrants do not confer any rights of common stock ownership on their holders, such as voting rights or the right to receive dividends, but merely represent the right to acquire shares of common stock at a fixed price. Commencing on the date of issuance, holders of pre-funded warrants may exercise their right to acquire the underlying common stock and pay the stated warrant exercise price per share.

Until holders of pre-funded warrants acquire shares of our common stock upon exercise thereof, holders of such pre-funded warrants will have no rights with respect to shares of our common stock. Upon exercise of the pre-funded warrants, such holders will be entitled to exercise the rights of a common stockholder only as to matters for which the record date occurs after the exercise date.

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 therapeutic 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 into or exchangeable for common stock, the ownership interest of our shareholders will be diluted, and the terms of these new securities may include liquidation or other preferences that materially adversely affect the rights of our shareholders. 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 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 therapeutic candidates or grant licenses on terms that may not be favorable to us. If we are unable to raise additional funds when needed, we may be required to delay, scale back or discontinue the development and commercialization of one or more of our therapeutic candidates, delay our pursuit of potential licenses or acquisitions, or grant rights to develop and market current or future therapeutic 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 the ability of our other shareholders to influence corporate matters and could delay or prevent a change in corporate control.

The holdings of our executive officers, directors, principal stockholders and their affiliates represent beneficial ownership, in the aggregate, of 250,876 shares of our outstanding common stock as of September 21, 2023, representing approximately 8.6% of our total shares of common stock outstanding as of such date, or approximately 1.7% of our outstanding common stock after giving effect to the assumed sale of 11,479,408 shares of common stock in this offering. The foregoing calculation assumes no exercise of the underwriter's overallotment option, no sales of pre-funded warrants in this offering and no exercise of options and warrants outstanding as of the date of this prospectus. If the specified individuals exercised all options they hold, and no other options were exercised by any other holder, the holdings of the specified individuals would represent beneficial ownership, in the aggregate, of approximately 13.6% of our outstanding common stock prior to this offering, or approximately 2.9% of our outstanding common stock after giving effect to the assumed sale of 11,479,408 shares of common stock in this offering, assuming no exercise of the underwriter's overallotment option, no sales of pre-funded warrants in this offering and no exercise of options and warrants outstanding as of the date of this prospectus. As a result of their combined ownership, these stockholders, if they act together, may 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

Risk Factors

or substantially all of our assets. These stockholders acquired certain of their shares of common stock for substantially less than the price of the shares of common stock sold in our initial public offering and being sold in this offering, and these stockholders may have interests, with respect to their common stock, that are different from those of investors who invest 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.

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

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

- a 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

Risk Factors

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 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 completed our initial public offering, although circumstances could cause us to lose that status earlier. We will remain an EGC until the earlier of the last day of the fiscal year (a) following the fifth anniversary of the completion of our initial public offering (i.e., December 31, 2026), (b) in which we have total annual gross revenue of at least \$1.235 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 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.

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 may be influenced, in part, on the research and reports that industry or financial analysts publish about us or our business. If begun, we may lose research coverage by industry or financial analysts. If no or few analysts maintain coverage of us, the trading price of our stock would likely decrease. If one or more of the analysts covering our business downgrade their evaluations of our stock, the price of our stock would likely 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 do not intend to pay cash dividends on our common stock, so any returns will be limited to the value of our stock.

We currently anticipate that we will retain any future earnings for the development, operation and expansion of our business and do not anticipate declaring or paying 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, if any, and which could decrease in value resulting in losses to our stockholders.

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 are 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. In connection with the preparation of our financial

Risk Factors

statements as of and for the years ended December 31, 2022 and 2021, 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, 2022 and 2021, 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, implementation of these and other 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

Risk Factors

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 following the year in which we completed our initial public offering, although circumstances could cause us to lose that status earlier. 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 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, 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 States 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.

Cautionary Note Regarding Forward-Looking Statements

This prospectus contains forward-looking statements within the meaning of the federal securities laws, Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Exchange Act. We intend these forward-looking statements to be covered by the safe harbor provisions for forward-looking statements contained in the Private Securities Litigation Reform Act of 1995 and are included in this prospectus for purposes of complying with those safe harbor provisions. All statements other than statements of historical facts contained in this prospectus and our other public filings are forward-looking statements. In some cases, you can identify forward-looking statements by terminology such as “may,” “will,” “should,” “could,” “expects,” “plans,” “intends,” “anticipates,” “believes,” “estimates,” “predicts,” “potential,” “continue,” or the negative of these terms or other comparable terminology. These forward-looking statements include, but are not limited to, statements about our clinical development and trials, regulatory review and approvals, our results of operations and financial condition, liquidity, prospects, growth, strategies and the industry in which we operate. These forward-looking statements are subject to known and unknown risks and uncertainties, assumptions and other factors that could cause our actual results to differ materially from those expressed in, or implied by, these forward-looking statements. Factors that could cause these differences include, but are not limited to:

- > our immediate low cash position, our estimates and expectations regarding our capital requirements, cash and expense levels, liquidity sources and our ability to obtain, on satisfactory terms or at all, the financing required to support operations, research, development, clinical trials, and commercialization of products;
- > a potential delisting of our common stock from trading on the Nasdaq Capital Market;
- > the results and timing of our preclinical and clinical trial activities;
- > our ability to expand our therapeutic candidate portfolio through internal research and development or the acquisition or in-licensing of intellectual property assets;
- > the impact of the global outbreak of the COVID-19 coronavirus, including the spread of new strains of the virus, on our activities as above-described and otherwise, including but not limited to our ability to enroll a sufficient number of patients to advance the above-described clinical trials;
- > the results and timing of our preclinical and clinical trial activities;
- > the therapeutic benefits, effectiveness and safety of our therapeutic candidates;
- > our ability to receive regulatory approval for our therapeutic candidates in the United States, Europe and other geographies;
- > the expected regulatory approval pathway for our therapeutic candidates;
- > potential changes in regulatory requirements, and delays or negative outcomes from the regulatory approval process;
- > our reliance on third parties for the planning, conduct and monitoring of clinical trials, for the manufacture of clinical drug supplies and drug product and for other requirements;
- > our ability to expand our therapeutic candidate portfolio through internal research and development or the acquisition or in-licensing of intellectual property assets;
- > our estimates of the size and characteristics of the markets that may be addressed by our therapeutic candidates;
- > market acceptance of our therapeutic candidates that are approved for marketing in the United States or other countries;
- > our ability to successfully commercialize our therapeutic candidates;
- > the safety and efficacy of therapeutics marketed by our competitors that are targeted to indications which our therapeutic candidates have been developed to treat;

Cautionary Note Regarding Forward-Looking Statements

- the impact of natural disasters, global pandemics (including further outbreaks of existing strains of COVID-19 or new strains of the virus), labor disputes, lack of raw materials or other supplies, issues with facilities and equipment or other forms of disruption to business operations at our manufacturing or laboratory facilities or those of our vendors, or at clinical trial sites;
- our ability to utilize our proprietary technological approach to develop and commercialize our therapeutic candidates;
- our heavy dependence on licensed intellectual property, including our ability to source and maintain licenses from third-party owners;
- our ability to protect our intellectual property and operate our business without infringing the intellectual property rights of others;
- our ability to attract, retain and motivate key personnel;
- our ability to generate revenue and become profitable;
- our reliance on third-party manufacturers to manufacture our drug substance and drug product that meets with our design specifications;
- our dependence on contract research organizations and other institutions to manage our clinical trials;
- other risks and uncertainties, including those listed under the caption “Risk Factors” in our Annual Report on Form 10-K and in our other regulatory filings, including our Quarterly Report on Form 10-Q filed with the SEC on August 14, 2023.

The risks set forth above are not exhaustive. Other sections of this prospectus may include additional factors that could adversely affect our business and financial performance. Moreover, we operate in a very competitive and rapidly changing environment. New risk factors emerge from time to time and it is not possible for management to predict all risk factors, nor can we assess the impact of all risk factors on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements. Forward-looking statements contained in this prospectus reflect our current views with respect to future events and with respect to our business and future financial performance, and involve known and unknown risks, uncertainties and other factors that may cause our actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by these forward-looking statements. Given these uncertainties, you should not place undue reliance on these forward-looking statements. Except as required by law, we assume no obligation to update or revise these forward-looking statements for any reason even if new information becomes available in the future.

Industry and Other Data

This prospectus may include industry, market, competitive position and other data. We obtain such information from industry publications and research, surveys and studies conducted by third-parties. Industry publications and third-party research, surveys and studies generally indicate that their information has been obtained from sources believed to be reliable, although they do not guarantee the accuracy or completeness of such information. This prospectus also may include data based on our own internal estimates and research. Our internal estimates have not been verified by any independent source. While we believe any data obtained from industry publications and third-party research, surveys and studies and our own estimates are reliable, we have not independently verified such data. The industry in which we operate, as well as such third-party data and our internal estimates and research, are subject to a high degree of uncertainty and risks due to a variety of factors, including those described in “*Risk Factors*” elsewhere in this prospectus and our other public filings. These and other factors could cause our results to differ materially from those expressed in this prospectus and our other public filings.

Use of Proceeds

We estimate that the net proceeds we will receive from the sale of our common stock in this offering, after deducting underwriter discounts and commissions and other offering expenses payable by us and assuming no sale of any pre-funded warrants, will be approximately \$6.8 million (or \$7.9 million if the underwriter exercises its option to purchase additional shares in full), based on an assumed public offering price of \$0.6969 per share and pre-funded warrants, which was the last reported sale price of our common stock on the Nasdaq Capital Market on September 21, 2023.

We currently expect to use the net proceeds from this offering, together with our existing funds, for product development activities, including one or more clinical trials with TTX-MC138, our lead therapeutic candidate, including related IND enabling studies, and for working capital and other general corporate purposes.

From time to time in the ordinary course of our business, we may evaluate the acquisition of, investment in or in-licensing of additional therapeutic candidates that we believe are commercially viable or to develop ourselves. We could use a portion of the net proceeds from this offering for such purposes. We may also use a portion of the net proceeds of this offering for the acquisition or licensing of additional technologies, other assets or businesses, or for other strategic investments or opportunities, although we currently have no understandings, agreements or commitments with respect to any of the foregoing.

Although we currently anticipate that we will use the net proceeds from this offering as described above, there may be circumstances where we determine that a different use of our funds is in the best interest of the company. The amounts and timing of our actual expenditures will depend upon numerous factors, including results and progress of our clinical trial activities, results of and progress of our preclinical development activities, the progress of any partnering efforts we conduct, our operating costs, technological advances, the competitive environment for our therapeutic candidates and other factors described in the section titled “*Risk Factors*” in this prospectus. Our management will have flexibility in applying the net proceeds from this offering and you will be relying on their judgment with regard to the use of these net proceeds. An investor purchasing shares of our common stock will not have the opportunity, as part of the investment decision, to evaluate the economic, financial or other information on which we base our decisions about how to use the proceeds or to make their own assessment of 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.

A \$0.25 increase (decrease) in the assumed public offering price per share set forth above would increase (decrease) the net proceeds to us from this offering by approximately \$2.6 million, assuming the number of shares and pre-funded warrants offered by us, as set forth on the cover of this prospectus, remains the same and after deducting underwriting discounts and commissions and estimated expenses payable by us. An increase (decrease) of one million shares (or pre-funded warrants) sold by us in this offering would increase (decrease) the net proceeds to us from this offering by approximately \$0.6 million (\$0.5 million), assuming the public offering price per share remains the same and after deducting underwriting discounts and commissions and estimated expenses payable by us. The information in this paragraph is illustrative only and will change based on the actual public offering price and other terms of this offering determined at the pricing of this offering.

We believe that the net proceeds from this offering, together with our existing cash, will enable us to fund our operating expenses and capital expenditure requirements to the end of 2023, assuming the net proceeds to us from this offering are at least \$6.8 million. If we receive less net proceeds from this offering, the period of time for which we will be able to fund our operating expenses and capital expenditure requirements will be correspondingly reduced. They are not expected to be sufficient to fund advancement of any of our therapeutic candidates through regulatory approval. 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 will need to raise substantial additional funds to complete development and commercialization of our therapeutic candidates which development or commercialization may not be successful.

Pending our use of the net proceeds from this offering as described above, we intend to invest the net 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 deems 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 our capitalization at June 30, 2023:

- > on an actual basis; and
- > on an as adjusted basis to give effect to the sale and issuance by us of 11,479,408 shares of our common stock in this offering, at an assumed offering price of \$0.6969 per share, the last reported sale price of our common stock on the Nasdaq Capital Market on September 21, 2023, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

You should read the following table together with the sections of this prospectus titled “*Summary Financial Data*,” as well as our financial statements and the related notes, and “*Management’s Discussion and Analysis of Financial Condition and Results of Operations*” incorporated herein by reference to our Form 10-K filed with the SEC on March 31, 2023, and our Form 10-Q for the quarter ended June 30, 2023, filed with the SEC on August 14, 2023.

	June 30, 2023	
	(unaudited)	
	Actual	As Adjusted
Cash	\$ 3,572,475	\$ 10,397,474
Stockholders’ equity		
Preferred stock – \$0.0001 par value; 10,000,000 shares authorized actual and as adjusted; no shares issued or outstanding actual or as adjusted	—	—
Common stock – \$0.0001 par value; 290,000,000 shares authorized; 1,950,674 shares issued and outstanding actual; 13,430,082 shares issued and outstanding as adjusted	\$ 195	\$ 1,343
Additional paid-in capital	39,121,104	45,944,955
Accumulated deficit	(37,028,836)	(37,028,836)
Total stockholders’ equity	\$ 2,092,463	\$ 8,917,462
Total capitalization	\$ 2,092,463	\$ 8,917,462

The number of shares of common stock to be outstanding after the offering is based on 1,950,674 shares of common stock outstanding as of June 30, 2023, and excludes, as of that date, the following:

- > 267,277 shares of common stock issuable upon exercise of outstanding stock options at a weighted average exercise price of \$10.84 per share;
- > 15,625 shares of common stock issuable upon the exercise of outstanding IPO Underwriter Warrants at an exercise price of \$100.00 per share;
- > 9,962 shares of common stock issuable upon exercise of outstanding February 2023 Placement Agent Warrants at an exercise price of \$13.18 per share;
- > 6,250 shares of common stock issuable upon exercise of outstanding Consultant Warrants at an exercise price of \$10.00 per share;
- > 950,000 shares of common stock issuable upon the exercise of outstanding pre-funded warrants at an exercise price of \$0.01 per share;
- > 140,000 shares of common stock issuable upon the exercise of outstanding placement agent warrants at an exercise price of \$4.38 per share;
- > 2,000,000 shares of common stock issuable upon the exercise of outstanding Series A-1 warrants at an exercise price of \$3.25 per share;

Capitalization

- > 2,000,000 shares of common stock issuable upon the exercise of outstanding Series A-2 warrants at an exercise price of \$3.25 per share;
- > 4,479 shares of common stock reserved for future issuance under our 2021 Stock Option and Equity Incentive Plan, or the 2021 Plan; and
- > 16,500 shares of common stock reserved for future issuance under our 2021 Employee Stock Purchase Plan, or our 2021 ESPP.

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

- > no exercise by the underwriter of the over-allotment option to purchase additional shares (or pre-funded warrants in lieu thereof);
- > no exercise of outstanding options or warrants;
- > no exercise of the underwriter'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
- > no sale of any pre-funded warrants.

Dilution

If you invest in our common stock in this offering, your ownership interest may be diluted immediately depending on the difference between the public offering price per share of our common stock (assuming no pre-funded warrants are sold in this offering) and the as adjusted net tangible book value per share of our common stock immediately after this offering (assuming no pre-funded warrants are sold in this offering).

At June 30, 2023, we had a net tangible book value of \$2,092,463 or \$1.07 per share. Net tangible book value per share represents our total tangible assets (total assets less intangible assets) less total liabilities at that date, divided by the total number of our outstanding shares of common stock as of June 30, 2023.

After giving effect to the sale and issuance of 11,479,408 shares of common stock in this offering, assuming no exercise of the over-allotment option, at an assumed public offering price of \$0.6969 per share, the last reported sale price of our common stock on the Nasdaq Capital Market on September 21, 2023, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us, our as adjusted net tangible book value as of June 30, 2023, would have been approximately \$8.9 million, or \$0.66 per share of our common stock (assuming no pre-funded warrants are sold in this offering). This represents an immediate decrease in net tangible book value of approximately \$0.41 per share to our existing stockholders and immediate dilution of \$0.04 per share to new investors.

The dilutive or antidilutive effect per share to investors participating in this offering is determined by subtracting the as adjusted net tangible book value per share after this offering from the public offering price per share paid by investors participating in this offering. The following table illustrates this result (without giving effect to any exercise by the underwriter of its option to purchase additional shares) on a per share basis:

Assumed public offering price per share	\$0.6969
Net tangible book value per share at June 30, 2023	\$1.07
Decrease in book value per share attributable to new investors	\$0.41
As adjusted net tangible book value per share after this offering	\$ 0.66
Dilution per share to new investors	\$ 0.04

An increase of \$0.25 in the assumed public offering price of \$0.6969 per share, which is the last reported trading price of our common stock on the Nasdaq Capital Market on September 21, 2023, would decrease our as adjusted net tangible book value per share after this offering by \$0.21 and result in dilution to new investors purchasing shares in this offering of \$0.09 per share, while a decrease of \$0.25 would decrease our as adjusted net tangible book value per share after this offering by \$0.66 per share and result in dilution to new investors purchasing shares in this offering of \$0.03 per share, all 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 expenses payable by us.

An increase (decrease) of one million shares in the number of shares offered by us in this offering would result in our as adjusted net tangible book value per share being \$0.66 (\$0.68) with immediate dilution to investors participating in this offering of \$0.04 (\$0.02) per share. The foregoing calculations assume that the public offering price remains the same, and are after deducting estimated underwriting discounts and commissions and estimated expenses payable by us.

If the underwriter's over-allotment option is exercised in full, our as adjusted net tangible book value per share after this offering would be approximately \$0.66 and dilution to new investors purchasing common stock in this offering would be \$0.04 per share. These calculations assume a public offering price of \$0.6969 per share, the last reported sale price of our common stock on the Nasdaq Capital Market on September 21, 2023, and are after deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us.

Dilution

The table and discussion above are based on 1,950,674 shares of common stock outstanding at June 30, 2023, assume no sale of any pre-funded warrants, and exclude, as of that date, the following:

- > 267,277 shares of common stock issuable upon exercise of outstanding stock options at a weighted average exercise price of \$10.84 per share;
- > 15,625 shares of common stock issuable upon the exercise of outstanding IPO Underwriter Warrants at an exercise price of \$100.00 per share;
- > 9,962 shares of common stock issuable upon exercise of outstanding February 2023 Placement Agent Warrants at an exercise price of \$13.18 per share;
- > 6,250 shares of common stock issuable upon exercise of outstanding Consultant Warrants at an exercise price of \$10.00 per share;
- > 950,000 shares of common stock issuable upon the exercise of outstanding pre-funded warrants at an exercise price of \$0.01 per share;
- > 140,000 shares of common stock issuable upon the exercise of outstanding placement agent warrants at an exercise price of \$4.38 per share;
- > 2,000,000 shares of common stock issuable upon the exercise of outstanding Series A-1 warrants at an exercise price of \$3.25 per share;
- > 2,000,000 shares of common stock issuable upon the exercise of outstanding Series A-2 warrants at an exercise price of \$3.25 per share;
- > 4,479 shares of common stock reserved for future issuance under our 2021 Stock Option and Equity Incentive Plan, or the 2021 Plan; and
- > 16,500 shares of common stock reserved for future issuance under our 2021 Employee Stock Purchase Plan, or our 2021 ESPP.

To the extent that outstanding options or warrants are exercised, or shares are issued under our equity incentive plans, you may experience 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, in the future, additional capital is raised through the sale of equity, convertible debt securities, or securities with equity components, those issuances may result in dilution to our stockholders.

Description of Capital Stock and Securities we are Offering

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, certain provisions of Delaware General Corporation Law, and the pre-funded warrants. 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, as amended, our Amended and Restated Bylaws, and applicable provisions of the Delaware General Corporation Law.

Capital Stock

Our authorized capital stock consists 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 are undesignated. As of September 21, 2023, 2,900,674 shares of our common stock were outstanding, reflecting the exercise of 950,000 pre-funded warrants subsequent to June 30, 2023, held by approximately 18 stockholders of record. As of September 21, 2023, there were no shares of preferred stock outstanding.

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 convertible 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.

Preferred Stock

Our board of directors has 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. As of August 24, 2023, there were no shares of preferred stock outstanding.

Stock Options

In April 2020, the company adopted the 2020 Stock Option and Incentive Plan, or the 2020 Plan, which provided for awards to purchase up to 151,639 shares of our common stock. In March 2021, the company adopted its 2021 Stock Option and Incentive Plan, or the 2021 Plan, which provided for awards to purchase up to 125,000 shares of our common stock plus annual increases in such number of shares, and, with the 2020 Plan, the Plans. The purpose of the Plans is to encourage and enable our officers, employees, directors, consultants and other key persons (including prospective employees, but conditioned on their employment)

Description of Capital Stock and Securities we are Offering

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. Upon completion of our initial public offering, or our IPO, our Board of Directors determined that no further awards under the 2020 Plan would be made. At that time, there were 89,632 shares subject to options outstanding under the 2020 Plan.

As of June 30, 2023, options to purchase an aggregate of 267,277 shares of our common stock were outstanding under the Plans, of which 85,198 were exercisable.

Warrants

The following table summarizes the Company's outstanding or issuable warrants at June 30, 2023:

Description	Number of Shares	Exercise Price Per Share
IPO Underwriter Warrants	15,625	\$100.00
February 2023 Placement Agent Warrants	9,962	13.18
Consultant Warrants	6,250	10.00
Series A-1 Warrants	2,000,000	3.25
Series A-2 Warrants	2,000,000	3.25
June 2023 Placement Agent Warrants	140,000	4.38
June 2023 Pre-funded Warrants	950,000	0.01

Upon the closing of our IPO, we issued as compensation to the underwriter warrants, or the IPO Underwriter Warrants, to purchase up to 15,625 shares of common stock exercisable at \$100.00 per share. The IPO Underwriter Warrants are exercisable at any time and from time to time, in whole or in part, until July 8, 2026.

Upon the closing of our registered direct offering on February 17, 2023, we issued as compensation to the placement agent warrants, or the February 2023 Placement Agent Warrants, to purchase up to 9,962 shares of common stock exercisable at \$13.18 per share. The February 2023 Placement Agent Warrants are exercisable beginning six months after the closing of the offering and expire five years after issuance.

In connection with an agreement we entered into with a consultant, we agreed to issue warrants, or the Consultant Warrants, to purchase up to 12,500 shares of common stock at \$10.00 per share. The Consultant Warrants are exercisable any time after six months from the effective date of the agreement (February 23, 2023) through the fifth anniversary thereof, subject to our right in our sole discretion exercisable not later than August 22, 2023, to reduce the number of warrants to 6,250. On May 31, 2023, we exercised this right.

Upon the closing of our registered direct offering on June 9, 2023 we issued pre-funded warrants, or the June 2023 Pre-funded Warrants, to purchase up to 1,901,000 shares of our common stock at an exercise price of \$0.01 per share. The June 2023 Pre-funded Warrants are exercisable immediately after the closing and have no expiration date. We also issued warrants, or the Series A-1 Warrants, to purchase up to 2,000,000 shares of our common stock at an exercise price of \$3.25 per share, and additional warrants, or the Series A-2 Warrants, to purchase up to 2,000,000 shares of our common stock at an exercise price of \$3.25 per share. The Series A-1 Warrants and the Series A-2 Warrants are exercisable at any time following closing and expire three years following the date of sale and have an exercise price of \$3.25 per share. In addition, we also issued as compensation to the placement agent warrants, or the June 2023 Placement Agent Warrants, to purchase up to 140,000 shares of common stock at an exercise price of \$4.375 per share. The June 2023 Placement Agent Warrants are exercisable at any time following the date of issuance, and expire three years following the closing date.

In addition, in this offering, we have agreed to issue as compensation to the underwriter warrants to purchase up to 573,970 (660,066 if the underwriter exercises its over-allotment option in full) shares of common stock (5% of the aggregate number of shares of common stock sold in this offering). The underwriter's warrants will

Description of Capital Stock and Securities we are Offering

be exercisable at a per share exercise price equal to 125% of the public offering price per share in this offering. The underwriter'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.

Pre-Funded Warrants

The following is a summary of certain terms and provisions of the pre-funded warrants offered hereby in lieu of shares of common stock. This summary is not complete and is subject to, and qualified in its entirety by, the provisions of the pre-funded warrant, the form of which is filed as an exhibit to the registration statement of which this prospectus forms a part. Prospective investors should carefully review the terms and provisions of the form of pre-funded warrant for a complete description of the terms and conditions of the pre-funded warrants.

Duration and Exercise Price. Each pre-funded warrant offered hereby will have an initial exercise price per share equal to \$0.01. The pre-funded warrants will be immediately exercisable and may be exercised at any time. There is no expiration date for the pre-funded warrants. The exercise price and number of shares of common stock issuable upon exercise is subject to appropriate adjustment in the event of stock dividends, stock splits, reorganizations or similar events affecting our common stock and the exercise price.

Exercisability. The pre-funded warrants will be exercisable, at the option of each holder, in whole or in part, by delivering to us a duly executed exercise notice accompanied by payment in full for the number of shares of our common stock purchased upon such exercise (except in the case of a cashless exercise as discussed below). A holder (together with its affiliates) may not exercise any portion of the pre-funded warrant to the extent that the holder would own more than 4.99% (or at the election of the holder prior to the issuance of any pre-funded warrants, 9.99%) of the outstanding shares of common stock immediately after exercise. Any holder may increase such percentage to any percentage not in excess of 9.99% upon at least 61 days' prior notice to us. No fractional shares of common stock will be issued in connection with the exercise of a pre-funded warrant. In lieu of fractional shares of common stock, we will pay the holder an amount in cash equal to the fractional amount multiplied by the exercise price of such pre-funded warrant or round up to the next whole share.

Cashless Exercise. In lieu of making the cash payment of the aggregate exercise price otherwise contemplated to be made to us upon such exercise, the holder may elect instead to receive upon such exercise (either in whole or in part) the net number of shares of common stock determined according to a formula set forth in the pre-funded warrants.

Fundamental Transaction. In the event of a fundamental transaction, as described in the pre-funded warrants and generally including any reorganization, recapitalization or reclassification of our common stock, the sale, transfer or other disposition of all or substantially all of our properties or assets, our consolidation or merger with or into another person, the acquisition of more than 50% of our outstanding shares of common stock, or any person or group becoming the beneficial owner of 50% of the voting power represented by our outstanding shares of common stock, the holders of the pre-funded warrants will be entitled to receive upon exercise of the pre-funded warrants the kind and amount of securities, cash or other property that the holders would have received had they exercised the pre-funded warrants immediately prior to such fundamental transaction.

Transferability. Subject to applicable laws, a pre-funded warrant may be transferred at the option of the holder upon surrender of the pre-funded warrant to us together with the appropriate instruments of transfer.

No Exchange Listing. We do not intend to list the pre-funded warrants on any securities exchange or nationally recognized trading system.

No Rights as a Stockholder. Except as otherwise provided in the pre-funded warrants or by virtue of such holder's ownership of shares of our common stock, the holders of the pre-funded warrants do not have the rights or privileges of holders of our common stock, including any voting rights.

Description of Capital Stock and Securities we are Offering

Anti-Takeover Effects of our Certificate of Incorporation and Bylaws and Delaware Law

Our certificate of incorporation and bylaws 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 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 have 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 provides 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 the 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 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 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 the 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,

Description of Capital Stock and Securities we are Offering

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 provides 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 us 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, 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 States 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 business address 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

We are subject to the provisions of Section 203 of the Delaware General Corporation Law. In general, Section 203 prohibits a publicly held Delaware corporation from engaging in a "business combination" with an "interested stockholder" for a three-year period following the time that this stockholder becomes an interested stockholder, unless the business combination is approved in a prescribed manner. 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;

Description of Capital Stock and Securities we are Offering

- > 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

Our common stock is traded on the Nasdaq Capital Market under the trading symbol "RNAZ." See "Risk Factors" on page 19 under the caption "*We could lose our listing on the Nasdaq Capital Market if we do not increase our stockholders' equity. The loss of our Nasdaq listing would in all likelihood make our common stock significantly less liquid and adversely affect its value.*"

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is VStock Transfer, LLC.

Material U.S. Federal Income Tax Considerations

The following discussion is a summary of certain material U.S. federal income tax consequences of (i) the purchase, ownership and disposition of shares of our common stock issued pursuant to this offering, or the Shares and (ii) the purchase, ownership and disposition of the pre-funded warrants. The Shares and pre-funded warrants are referred to collectively herein as our securities. This summary does not purport to be a complete analysis of all potential tax consequences relating to the purchase, ownership, exercise, lapse and disposition of our securities. The effects of other U.S. federal tax laws, such as estate and gift tax laws, and any applicable U.S. state or local or non-U.S. tax laws are not discussed, nor is the potential application of the alternative minimum tax, the Medicare contribution tax on net investment income, or the special tax accounting rules under Section 451(b) of the U.S. Internal Revenue Code of 1986, as amended, or the Code. This discussion is based on the Code, Treasury Regulations promulgated thereunder, judicial decisions, and published rulings and administrative pronouncements of the U.S. Internal Revenue Service, or the IRS, in each case in effect as of the date hereof. These authorities may change or be subject to differing interpretations. Any such change or differing interpretation may be applied retroactively in a manner that could adversely affect a holder. We have not sought and will not seek any rulings from the IRS regarding the matters discussed below. There can be no assurance the IRS or a court will not take a contrary position to that discussed below regarding the tax consequences of the purchase, ownership, exercise, lapse and disposition (as applicable) of our securities.

This discussion is limited to holders that hold our securities as “capital assets” within the meaning of Section 1221 of the Code (generally, property held for investment). This discussion does not address all U.S. federal income tax consequences relevant to a holder’s particular circumstances. In addition, it does not address consequences relevant to holders subject to special rules, including, without limitation:

- > holders that own or are deemed to own more than 5% of our capital stock;
- > certain former citizens or long-term residents of the United States;
- > persons for whom shares of our common stock or pre-funded warrants constitute “qualified small business stock” within the meaning of Section 1202 of the Code;
- > persons holding our securities as part of a hedge, straddle or other risk reduction strategy or as part of a conversion transaction or other integrated investment;
- > persons deemed to sell our securities under the constructive sale provisions of the Code;
- > banks, insurance companies, and other financial institutions;
- > brokers, dealers or traders in securities or currencies;
- > “controlled foreign corporations,” “passive foreign investment companies,” and corporations that accumulate earnings to avoid U.S. federal income tax;
- > S corporations, partnerships or other entities or arrangements treated as partnerships for U.S. federal income tax purposes (and investors therein);
- > tax-exempt organizations or governmental organizations;
- > tax-qualified retirement plans;
- > holders who hold or receive our securities pursuant to the exercise of employee stock options or otherwise as compensation; and
- > “qualified foreign pension funds” as defined in Section 897(1)(2) of the Code and entities all of the interests of which are held by one or more qualified foreign pension funds.

If an entity or arrangement treated as a partnership for U.S. federal income tax purposes holds our securities, the tax treatment of a partner in such partnership will depend on the status of the partner, the activities of the partnership and certain determinations made at the partner level. Accordingly, partnerships holding securities and the partners in such partnerships should consult their tax advisors regarding the U.S. federal income tax consequences to them.

Material U.S. Federal Income Tax Considerations

THIS DISCUSSION IS NOT TAX ADVICE. INVESTORS SHOULD CONSULT THEIR TAX ADVISORS WITH RESPECT TO THE APPLICATION OF THE U.S. FEDERAL INCOME TAX LAWS TO THEIR PARTICULAR SITUATIONS AS WELL AS ANY TAX CONSEQUENCES OF THE PURCHASE, OWNERSHIP, EXERCISE, LAPSE AND DISPOSITION OF OUR SECURITIES ARISING UNDER THE U.S. FEDERAL ESTATE OR GIFT TAX LAWS OR UNDER THE LAWS OF ANY U.S. STATE OR LOCAL OR NON-U.S. TAXING JURISDICTION OR UNDER ANY APPLICABLE INCOME TAX TREATY.

Treatment of Pre-Funded Warrants

Although it is not entirely free from doubt, a pre-funded warrant should be treated as a share of our common stock for U.S. federal income tax purposes and a holder of pre-funded warrants should generally be taxed in the same manner as a holder of such shares, as described below. Accordingly, no gain or loss should be recognized upon the exercise of a pre-funded warrant and, upon exercise, the holding period of a pre-funded warrant should carry over to the share received. Similarly, the tax basis of the pre-funded warrant should carry over to the share received upon exercise, increased by the exercise price of \$0.0001 per share. If a pre-funded warrant expires without being exercised, the holder should recognize a capital loss in an amount equal to such holder's tax basis in the pre-funded warrant. This loss will be long-term capital loss if, at the time of the expiration, the holder's holding period in the pre-funded warrant is more than one year. The deductibility of capital losses is subject to limitations.

Our characterization is not binding on the IRS, and the IRS may treat our pre-funded warrants as warrants to acquire shares of our common stock. In that case, the amount and character of your gain with respect to an investment in our pre-funded warrants could be materially different than the discussion set forth below. Accordingly, each holder should consult his, her or its tax advisor regarding the risks associated with the acquisition of pre-funded warrants pursuant to this offering (including potential alternative characterizations). The balance of this discussion generally assumes that a pre-funded warrant is treated as a share of our common stock for U.S. federal income tax purposes.

Tax Considerations Applicable to U.S. Holders

Definition of U.S. Holder

In general, a "U.S. holder" means a beneficial owner of our securities (other than a partnership or an entity or arrangement treated as a partnership for U.S. federal income tax purposes) that is, for U.S. federal income tax purposes:

- > an individual who is a citizen or resident of the United States;
- > a corporation, or an entity treated as a corporation for U.S. federal income tax purposes, created or organized in the United States or under the laws of the United States or of any state thereof or the District of Columbia;
- > an estate, the income of which is subject to U.S. federal income tax regardless of its source; or
- > a trust if (a) a U.S. court can exercise primary supervision over the trust's administration and one or more U.S. persons have the authority to control all of the trust's substantial decisions or (b) the trust has a valid election in effect under applicable U.S. Treasury Regulations to be treated as a U.S. person.

Distributions on the Shares

As described in the section titled "Dividend Policy," we do not anticipate declaring any cash dividends to holders of common stock in the foreseeable future. However, if we do make distributions (including constructive distributions as described below) on our Shares, such distributions will constitute dividends to the extent paid from our current or accumulated earnings and profits, as determined under U.S. federal income tax principles, and will be includible in your income as ordinary income when received. However, with respect to dividends received by individuals, such dividends generally are taxed under current law at applicable

Material U.S. Federal Income Tax Considerations

long-term capital gains rates, provided certain holding period requirements are satisfied. If a distribution exceeds our current and accumulated earnings and profits, the excess will be treated as a tax-free return of the U.S. holder's investment, up to such U.S. holder's adjusted tax basis in the Shares. Any remaining excess will be treated as capital gain from the sale or exchange of such Shares, as applicable, subject to the tax treatment described below in "— Sale or Other Taxable Disposition of Our Securities."

Constructive Dividends on Pre-Funded Warrants

Under Section 305 of the Code, an adjustment to (or failure to adjust) the number of shares that will be issued on the exercise of the pre-funded warrants, or an adjustment to (or failure to adjust) the exercise price of the pre-funded warrants, may be treated as a constructive distribution to a U.S. holder of the pre-funded warrants if, and to the extent that, such adjustment (or failure to adjust) has the effect of increasing such U.S. holder's proportionate interest in our assets or earnings and profits as determined under U.S. federal income tax principles, depending on the circumstances of such adjustment (for example, if such adjustment is to compensate for a distribution of cash or other property to our shareholders). U.S. holders should consult their tax advisors as to (i) whether a constructive dividend deemed paid to a non-corporate U.S. holder would be eligible for the preferential rates of U.S. federal income tax applicable in respect of certain dividends received, (ii) whether corporate holders would be entitled to claim the dividends received deduction with respect to any such constructive dividends, and (iii) the general treatment of constructive distributions under their particular circumstances. Because a constructive dividend deemed received by a U.S. holder would not give rise to any cash from which any applicable withholding could be satisfied, if backup withholding is paid on behalf of a U.S. holder (because such U.S. holder failed to establish an exemption from backup withholding), such backup withholding may be set off against payments on the pre-funded warrants or Shares, or offset against other assets of such U.S. holder. Generally, a U.S. holder's adjusted tax basis in pre-funded warrant should be increased to the extent any such constructive distribution is treated as a dividend. U.S. holders should consult their tax advisors on the impact a constructive distribution may have on their holding period in the securities.

Sale or Other Taxable Disposition of Our Securities

Upon the sale, exchange or other taxable disposition of the Shares or pre-funded warrants, a U.S. holder will generally recognize capital gain or loss equal to the difference between the amount of cash and the fair market value of any property received upon the sale, exchange or other taxable disposition and such

U.S. holder's adjusted tax basis in such securities. This capital gain or loss will be long-term capital gain or loss if the U.S. holder's holding period in such securities is more than one year at the time of the sale, exchange or other taxable disposition. Long-term capital gains recognized by certain non-corporate U.S. holders, including individuals, generally will be subject to reduced rates of U.S. federal income tax. The deductibility of capital losses is subject to limitations.

Backup Withholding and Information Reporting

A U.S. holder may be subject to information reporting and backup withholding when such holder receives payments on our securities (including constructive dividends) or receives proceeds from the sale or other taxable disposition of our securities. Certain U.S. holders are exempt from backup withholding, including C corporations and certain tax-exempt organizations. A U.S. holder will be subject to backup withholding if such holder is not otherwise exempt and such holder:

- > fails to furnish the holder's taxpayer identification number, which for an individual is ordinarily his or her social security number;
- > furnishes an incorrect taxpayer identification number;
- > is notified by the IRS that the holder previously failed to properly report payments of interest or dividends; or
- > fails to certify under penalties of perjury that the holder has furnished a correct taxpayer identification number and that the IRS has not notified the holder that the holder is subject to backup withholding.

Material U.S. Federal Income Tax Considerations

Backup withholding is not an additional tax. Any amounts withheld under the backup withholding rules may be allowed as a refund or a credit against a U.S. holder's U.S. federal income tax liability, provided the required information is timely furnished to the IRS. U.S. holders should consult their tax advisors regarding their qualification for an exemption from backup withholding and the procedures for obtaining such an exemption.

Tax Considerations Applicable to Non-U.S. Holders

Definition of Non-U.S. Holder

For purposes of this discussion, a "non-U.S. holder" is a beneficial owner of our securities that is neither a U.S. holder (nor a partnership or an entity or arrangement treated as a partnership) for U.S. federal income tax purposes.

Distributions and Constructive Distributions

As described in the section titled "Dividend Policy," we do not anticipate declaring any cash dividends to holders of Common Stock in the foreseeable future. However, if we do make distributions of cash or property on the Shares, or if any deemed dividends result from certain adjustments, or failure to make adjustments, to the conversion rate or exercise price of the pre-funded warrants, as described above under "Tax Considerations Applicable to U.S. Holders — Constructive Dividends on Pre-Funded Warrants," such actual or deemed distributions 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. Amounts not treated as dividends for U.S. federal income tax purposes will constitute a return of capital and first be applied against and reduce a non-U.S. holder's adjusted tax basis in its Shares or pre-funded warrants, but not below zero. Any excess will be treated as capital gain and will be treated as described below under "— Sale or Other Taxable Disposition of Our Securities."

Subject to the discussion below on effectively connected income, backup withholding and FATCA, dividends paid or deemed paid to a non-U.S. holder will be subject to U.S. federal withholding tax at a rate of 30% of the gross amount of the actual or deemed dividends (or such lower rate specified by an applicable income tax treaty, provided the non-U.S. holder furnishes a valid IRS Form W-8BEN or W-8BEN-E (or other applicable documentation) certifying qualification for the lower treaty rate). Because a constructive dividend deemed received by a non-U.S. holder would not give rise to any cash from which any applicable withholding tax could be satisfied, if withholding taxes are paid on behalf of a non-U.S. holder, those withholding taxes may be set off against payments of cash on the Shares or pre-funded warrants or sales proceeds received by or other funds or assets of such non-U.S. holder. A non-U.S. holder that does not timely furnish the required documentation, but that qualifies for a reduced treaty rate of U.S. federal withholding tax, may obtain a refund of any excess amounts withheld by timely filing an appropriate claim for refund with the IRS. Non-U.S. holders should consult their tax advisors regarding their entitlement to benefits under any applicable income tax treaties.

If dividends paid or deemed paid to a non-U.S. holder are effectively connected with the non-U.S. holder's conduct of a trade or business within the United States (and, if required by an applicable income tax treaty, the non-U.S. holder maintains a permanent establishment in the United States to which such dividends are attributable), the non-U.S. holder will be exempt from the U.S. federal withholding tax described above. To claim the exemption, the non-U.S. holder must furnish to the applicable withholding agent a valid IRS Form W-8ECI, certifying that the dividends are effectively connected with the non-U.S. holder's conduct of a trade or business within the United States. Any such effectively connected dividends will be subject to U.S. federal income tax on a net income basis at the regular rates. A non-U.S. holder that is a corporation also may be subject to a branch profits tax at a rate of 30% (or such lower rate specified by an applicable income tax treaty) on such effectively connected dividends, as adjusted for certain items.

Non-U.S. holders should consult their tax advisors regarding any applicable income tax treaties that may provide for different rules.

Material U.S. Federal Income Tax Considerations

Sale or Other Taxable Disposition of Our Securities

Subject to the discussions below regarding backup withholding and FATCA, a non-U.S. holder will not be subject to U.S. federal income tax on any gain realized upon the sale or other taxable disposition of our securities unless:

- the gain is effectively connected with the non-U.S. holder's conduct of a trade or business within the United States (and, if required by an applicable income tax treaty, the non-U.S. holder maintains a permanent establishment in the United States to which such gain is attributable);
- the non-U.S. holder is a nonresident alien individual present in the United States for a period or periods aggregating 183 days or more during the taxable year of the disposition and certain other requirements are met; or
- we are, or have been, at any time during the five-year period preceding such disposition (or the non-U.S. holder's holding period, if shorter) a "U.S. real property holding corporation", or USRPHC, for U.S. federal income tax purposes.

Gain described in the first bullet point above generally will be subject to U.S. federal income tax on a net income basis at the regular rates applicable to United States persons (as defined in the Code). A non-U.S. holder that is a corporation also may be subject to a branch profits tax at a rate of 30% (or such lower rate specified by an applicable income tax treaty) on such effectively connected gain, as adjusted for certain items.

Gain described in the second bullet point above will be subject to U.S. federal income tax at a rate of 30% (or such lower rate specified by an applicable income tax treaty), which may be offset by certain U.S. source capital losses of the non-U.S. holder (even though the individual is not considered a resident of the United States), provided the non-U.S. holder has timely filed U.S. federal income tax returns with respect to such losses.

With respect to the third bullet point above, we believe we currently are not, and do not anticipate becoming, a USRPHC. Because the determination of whether we are a USRPHC depends, however, on the fair market value of our USRPIs relative to the fair market value of our worldwide real property interests and our other business assets, there can be no assurance we currently are not a USRPHC or that we will not become one in the future. Even if we are or were to become a USRPHC, gain arising from the sale or other taxable disposition of the shares or common stock by a non-U.S. holder will not be subject to U.S. federal income tax if our common stock is (and assuming that our pre-funded warrants are not) "regularly traded," as defined by applicable Treasury Regulations, on an established securities market, and such non-U.S. holder owned, actually and constructively, 5% or less of our common stock throughout the shorter of the five-year period ending on the date of the sale or other taxable disposition or the non-U.S. holder's holding period. It is unclear how a non-U.S. holder's ownership of pre-funded warrants impacts the determination of the 5% threshold with respect to such non-U.S. holder's actual or constructive ownership of our common stock. There can be no assurance that our common stock will be or continue to be regularly traded on an established securities market. Our pre-funded warrants are not expected to be regularly traded on an established securities market. Dispositions by a non-U.S. holder of pre-funded warrants also may not be subject to U.S. federal income tax, even if we are treated as a U.S. real property holding corporation, if on the date such pre-funded warrants were acquired by such non-U.S. holder, such holdings had a fair market value no greater than the fair market value on that date of 5% of our common stock (if it is regularly traded on an established securities market), provided that, if such non-U.S. holder subsequently acquires additional pre-funded warrants, then such interests would be aggregated and valued as of the date of the subsequent acquisition to apply this 5% limitation.

Non-U.S. holders should consult their tax advisors regarding any applicable income tax treaties that may provide for different rules.

Information Reporting and Backup Withholding

Payments of distributions on our securities (and constructive distributions deemed paid) will not be subject to backup withholding, provided the non-U.S. holder certifies its non-U.S. status, such as by furnishing a valid

Material U.S. Federal Income Tax Considerations

IRS Form W-8BEN, W-8BEN-E or W-8ECI, or otherwise establishes an exemption. However, information returns are required to be filed with the IRS in connection with any distributions paid or deemed paid to the non-U.S. holder, regardless of whether any tax was actually withheld. In addition, proceeds of the sale or other taxable disposition of our securities within the United States or conducted through certain U.S.-related brokers generally will not be subject to backup withholding or information reporting if the applicable withholding agent receives the certification described above or the non-U.S. holder otherwise establishes an exemption. Proceeds of a disposition of our common stock or pre-funded warrants conducted through a non-U.S. office of a non-U.S. broker that does not have certain enumerated relationships with the United States generally will not be subject to backup withholding or information reporting.

Copies of information returns that are filed with the IRS may also be made available under the provisions of an applicable treaty or agreement to the tax authorities of the country in which the non-U.S. holder resides or is established.

Backup withholding is not an additional tax. Any amounts withheld under the backup withholding rules may be allowed as a refund or a credit against a non-U.S. holder's U.S. federal income tax liability, provided the required information is timely furnished to the IRS.

Additional Withholding Tax on Payments Made to Foreign Accounts

Withholding taxes may be imposed under Sections 1471 to 1474 of the Code (such Sections commonly referred to as the Foreign Account Tax Compliance Act, or FATCA) on certain types of payments made to non-U.S. financial institutions and certain other non-U.S. entities. Specifically, a 30% withholding tax may be imposed on actual or deemed dividends on, or (subject to the proposed Treasury Regulations discussed below) gross proceeds from the sale or other disposition of, our securities paid to a "foreign financial institution" or a "non-financial foreign entity" (each as defined in the Code), unless (1) the foreign financial institution undertakes certain diligence and reporting obligations, (2) the non-financial foreign entity either certifies it does not have any "substantial United States owners" (as defined in the Code) or furnishes identifying information regarding each substantial United States owner, or (3) the foreign financial institution or non-financial foreign entity otherwise qualifies for an exemption from these rules. If the payee is a foreign financial institution and is subject to the diligence and reporting requirements in (1) above, it must enter into an agreement with the U.S. Department of the Treasury requiring, among other things, that it undertake to identify accounts held by certain "specified United States persons" or "United States owned foreign entities" (each as defined in the Code), annually report certain information about such accounts, and withhold 30% on certain payments to non-compliant foreign financial institutions and certain other account holders. Foreign financial institutions located in jurisdictions that have an intergovernmental agreement with the United States governing FATCA may be subject to different rules.

Under applicable Treasury Regulations and administrative guidance, withholding under FATCA generally applies to payments of actual or deemed dividends on our securities. Proposed Treasury Regulations eliminate FATCA withholding on payments of gross proceeds from the sale or other disposition of our securities. Taxpayers generally may rely on these proposed Treasury Regulations until final Treasury Regulations are issued.

Prospective investors should consult their tax advisors regarding the potential application of withholding under FATCA to their investment in our securities.

EACH PROSPECTIVE INVESTOR SHOULD CONSULT ITS TAX ADVISOR REGARDING THE PARTICULAR U.S. FEDERAL, STATE AND LOCAL AND NON-U.S. TAX CONSEQUENCES OF THE PURCHASE, OWNERSHIP, EXERCISE, LAPSE AND DISPOSITION OF OUR SECURITIES, INCLUDING THE CONSEQUENCES OF ANY PROPOSED CHANGE IN APPLICABLE LAWS.

Underwriting

ThinkEquity is acting as the sole underwriter of this offering. We have entered into an underwriting agreement on [REDACTED], 2023, with respect to the offering of shares of our common stock. Subject to the terms and conditions of the underwriting agreement, we have agreed to sell to the underwriter, and the underwriter has agreed to purchase, at the public offering price less the underwriting discount 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:

Underwriter	Number of Shares	Number of Pre-Funded Warrants
ThinkEquity		
Total		

The underwriting agreement provides that the obligations of the underwriter to pay for and accept delivery of the shares of common stock and pre-funded warrants 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 and pre-funded warrants are offered by the underwriter, subject to prior sale, when, as and if issued to and accepted by them.

We have agreed to indemnify the underwriter against specified liabilities, including liabilities under the Securities Act, and to contribute to payments the underwriter may be required to make in respect thereof.

Over-Allotment Option

We have granted a 45-day option to the underwriter to purchase up to an aggregate of 1,721,911 additional shares of our common stock and/or pre-funded warrants (equal to 15% of the common stock and pre-funded warrants 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 underwriter exercises its option in whole or in part, then they 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 underwriter has advised us that the underwriter proposes to offer the shares of common stock and pre-funded warrants to the public at the public offering price set forth on the cover page of this prospectus. The underwriter may offer shares and/or pre-funded warrants to dealers at that price less a concession not in excess of \$ [REDACTED] per share and/or pre-funded warrant, as applicable, of which up to \$ [REDACTED] per share and/or pre-funded warrant, as applicable, may be reallocated to other dealers. After the initial offering to the public, the underwriter may change the offering price and other selling terms.

The following table summarizes the underwriting discount 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 underwriter.

	Per Share	Per Pre-Funded Warrant	With No Over-Allotment	With Full Over-Allotment
Public offering price	\$ [REDACTED]	\$ [REDACTED]	\$ [REDACTED]	\$ [REDACTED]
Underwriting discount (7.5%)	\$ [REDACTED]	\$ [REDACTED]	\$ [REDACTED]	\$ [REDACTED]
Proceeds, before expenses, to us	\$ [REDACTED]	\$ [REDACTED]	\$ [REDACTED]	\$ [REDACTED]
Non-accountable expense allowance (1%)	\$ [REDACTED]	\$ [REDACTED]	\$ [REDACTED]	\$ [REDACTED]

Underwriting

We have paid \$50,000 to the underwriter as a deposit which will be applied against out-of-pocket accountable expenses of the underwriter 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 underwriter equal to 1% of the gross proceeds received at the closing of the offering. We have also agreed to pay certain expenses of the underwriter relating to this offering as set forth in the underwriting agreement, including the fees and expenses of the underwriter's legal counsel, in an amount not to exceed \$125,000.

We estimate that our total expenses of this offering, including registration, filing and listing fees, printing fees and legal and accounting expenses, but excluding underwriting discounts, commissions and reimbursements, will be approximately \$495,000.

Underwriter's Warrants

Upon closing of this offering, we have agreed to issue warrants, or the underwriter's warrants, as additional compensation to the underwriter, providing for the purchase up to 573,970 shares (660,066 if the over-allotment option is exercised in full) of our common stock (5% of the aggregate number of shares of common stock sold in the offering). The underwriter's warrants will be exercisable at a per share price equal to 125% of the public offering price per share in this offering. The underwriter'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 underwriter's warrants have been deemed compensation by the Financial Industry Regulatory Authority, or FINRA, and are therefore subject to a 180-day lock-up pursuant to FINRA Rule 5110(g)(1). The underwriter (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 is exercisable only one time by the underwriter. 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 per share price below the warrant exercise price.

Discretionary Accounts

The underwriter does not intend to confirm sales of the securities offered hereby to any accounts over which they have discretionary authority.

Lock-Up Agreements

The company and our directors, officers and certain of our stockholders have agreed, subject to certain exceptions, for a period of 90 days (or 60 days if gross proceeds from this offering are less than \$10 million), after the date of this prospectus, without the prior written consent of the underwriter, not to directly or indirectly:

- > in the case of us, issue, 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,

Underwriting

- 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;
- > 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;
- > 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;
- > 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

For the 12 months beginning February 18, 2024, we have granted the underwriter an irrevocable right of first refusal, in its sole discretion, to act as sole investment banker, sole book-runner, and/or sole placement agent, at the underwriter's sole discretion, 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 underwriter. The right of first refusal shall not apply to company transactions with strategic partners or other sources of non-dilutive funding, including government agencies and private foundations, or for which no broker-dealer is proposed to be engaged by the company. The underwriter 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 underwriter 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

Our common stock is traded on the Nasdaq Capital Market under the symbol "RNAZ." There is no established trading market for the pre-funded warrants nor do we expect a market for such securities to develop. In addition, we do not intend to apply to list the pre-funded warrants on any national securities exchange or other trading market. Without an active trading market, the liquidity of the pre-funded warrants will be limited.

Price Stabilization, Short Positions and Penalty Bids

In connection with this offering, the underwriter 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.

Underwriting

Over-allotment transactions involve sales by the underwriter of shares in excess of the number of shares the underwriter is 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 underwriter is not greater than the number of shares of common stock that it 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 syndicate short position, the underwriter may elect to exercise all or part of the over-allotment option. The underwriter may also elect to stabilize the price of our common stock or reduce any syndicate short position by bidding for, and purchasing, common stock in the open market.

Syndicate short covering transactions may involve purchases of shares in the open market after the distribution has been completed. In determining the source of shares to close out the short position, the underwriter 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 underwriter sells more shares than could be covered by exercise of the over-allotment option and, therefore, has a naked short position, the naked short 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 underwriter is 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 underwriter 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 short 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 underwriter 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, the underwriter and/or its affiliates may in the future provide investment banking, commercial banking and other various financial services for us for which they may receive customary fees. In the course of their businesses, the underwriter and its affiliates may actively trade our securities or loans for their own account or for the accounts of customers, and, accordingly, the underwriter and its 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 underwriter 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 underwriter 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 underwriter or selling group members. The underwriter may agree to allocate a number of securities to selling group members for sale to their online brokerage account holders.
Internet

Underwriting

distributions will be allocated by the underwriter and selling group members making 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 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 underwriter 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, or the

Underwriting

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 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 underwriter is 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 québécois 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 securities offered by this prospectus will be passed upon for us by Goodwin Procter LLP. Certain legal matters will be passed upon for the underwriter by McGuireWoods LLP.

Experts

Our financial statements as of and for the years ended December 31, 2022 and 2021, included in our Annual Report on Form 10-K have been audited by Withum Smith+Brown, PC, independent registered public accounting firm, as stated in their report incorporated herein by reference (which report includes an explanatory paragraph about the existence of substantial doubt concerning the Company's ability to continue as a going concern). Such financial statements have been so included in reliance upon the authority of said firm as experts in accounting and auditing.

**11,479,408 Shares of Common Stock
Up to 11,479,408 Pre-Funded Warrants to Purchase Shares of Common Stock**



TransCode Therapeutics, Inc.

PRELIMINARY PROSPECTUS

ThinkEquity

, 2023

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, commissions and reimbursements, payable in connection with the registration of the securities hereunder. All amounts are estimates except the SEC registration fee and the FINRA filing fee.

	Amount paid or to be paid
SEC registration fee	\$ 1,347
FINRA filing fee	2,333
Printing and mailing	40,000
Legal fees and expenses	250,000
Accounting fees and expenses	30,000
Miscellaneous	171,320
Total	<u>\$495,000</u>

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

Part II

- 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 underwriter 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) 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 was 6% per annum. At the closing of our IPO on July 13, 2021, all of our outstanding convertible promissory notes plus accrued interest converted into 53,406 shares of our common stock.
- (b) In June and July 2020, we granted to our directors, officers, employees, consultants and other service providers stock options to purchase an aggregate of 76,592 shares of common stock upon the exercise of options under our 2020 Plan at exercise prices per share of approximately \$1.65 to \$1.81.
- (c) In December 2020, we granted to our independent directors stock options to purchase an aggregate of 3,639 shares of common stock upon the exercise of options under our 2020 Plan at an exercise price per share of \$78.15.
- (d) In January 2021, we granted to an independent director stock options to purchase an aggregate of 1,819 shares of common stock at an exercise price of \$78.15 per share pursuant to our 2020 Plan.
- (e) In February 2023, in connection with an agreement we entered into with a consultant, we agreed to issue warrants to purchase up to 12,500 shares of common stock at \$10.00 per share. These warrants are exercisable any time after six months from the effective date of the agreement (February 23, 2023) through the fifth anniversary thereof, subject to our right in our sole discretion exercisable not later than August 22, 2023, to reduce the number of warrants to 6,250. This right was exercised on May 31, 2023.

Part II

- (f) In February 2023, in connection with our registered direct offering, we issued as compensation to the placement agent warrants to purchase up to 9,962 shares of common stock exercisable at \$13.18 per share. These warrants are exercisable beginning six months after the closing of the offering and expire five years after issuance.

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

The Exhibit Index set forth below is incorporated by reference in response to this Item.

Exhibit number	Description
1.1*	Form of Underwriting Agreement.
3.1	Amended and Restated Certificate of Incorporation of TransCode Therapeutics, Inc. (Incorporated by reference to Exhibit 3.3 to the Registrant's Registration Statement on Form S-1, filed on February 26, 2021 (File No. 333-253599)).
3.2	Certificate of Amendment to Amended and Restated Certificate of Incorporation of TransCode Therapeutics, Inc. (Incorporated by Reference to Exhibit 1.1 to the Registrant's Quarterly Report on Form 10-Q, filed on August 14, 2023).
3.3	Amended and Restated Bylaws of TransCode Therapeutics, Inc. (Incorporated by reference to Exhibit 3.5 to the Registrant's Registration Statement on Form S-1, filed on February 26, 2021 (File No. 333-253599)).
4.1	Specimen Common Stock Certificate (Incorporated by reference to Exhibit 4.1 to the Registrant's Registration Statement on Form S-1, filed on April 8, 2021 (File No. 333-253599)).
4.2**	Form of Pre-funded Warrant.
4.3**	Form of Underwriter's Warrant (Included as Exhibit B to Exhibit 1.1 hereto).
4.4	Form of Underwriter Warrant (incorporated by reference to Exhibit 4.2 to the Registrant's Amendment No. 1 to Registration Statement on Form S-1, filed on March 24, 2021 (File No. 333-253599)).
4.5	Form of Placement Agent Warrant (incorporated by reference to Exhibit 4.1 to the Registrant's Current Report on Form 8-K, filed on February 17, 2023 (File No. 001-40363)).
4.6	Form of Common Stock Purchase Warrant (Incorporated by reference to Exhibit 4.2 to the Registrant's Amendment No. 2 to Registration Statement on Form S-1, filed on June 6, 2023 (File No. 333-272082)).
4.7	Form of Pre-Funded Warrant (Incorporated by reference to Exhibit 4.3 to the Registrant's Amendment No. 1 to Registration Statement on Form S-1, filed on June 5, 2023 (File No. 333-272082)).
4.8	Form of Placement Agent Warrant (Incorporated by reference to Exhibit 4.4 to the Registrant's Amendment No. 1 to Registration Statement on Form S-1, filed on June 5, 2023 (File No. 333-272082)).
5.1*	Opinion of Goodwin Procter LLP.
10.1#	2020 Stock Option and Incentive Plan and form of award agreements thereunder (Incorporated by reference to Exhibit 10.1 to the Registrant's Registration Statement on Form S-1, filed on February 26, 2021 (File No. 333-253599)).
10.2#	2021 Stock Option and Incentive Plan and form of award agreements thereunder (Incorporated by reference to Exhibit 10.2 to the Registrant's Amendment No. 1 to Registration Statement on Form S-1, filed on March 24, 2021 (File No. 333-253599)).

Part II

Exhibit number	Description
10.3#	Senior Executive Cash Incentive Bonus Plan (Incorporated by reference to Exhibit 10.3 to the Registrant's Amendment No. 1 to Registration Statement on Form S-1, filed on March 24, 2021 (File No. 333-253599)).
10.4#	Form of Indemnification Agreement between the Registrant and each of its executive officers (Incorporated by reference to Exhibit 10.4 to the Registrant's Amendment No. 1 to Registration Statement on Form S-1, filed on March 24, 2021 (File No. 333-253599)).
10.5#	Form of Indemnification Agreement between the Registrant and each of its directors (Incorporated by reference to Exhibit 10.5 to the Registrant's Amendment No. 1 to Registration Statement on Form S-1, filed on March 24, 2021 (File No. 333-253599)).
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 (Incorporated by reference to Exhibit 10.7 to the Registrant's Registration Statement on Form S-1, filed on February 26, 2021 (File No. 333-253599)).
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 (Incorporated by reference to Exhibit 10.8 to the Registrant's Registration Statement on Form S-1, filed on February 26, 2021 (File No. 333-253599)).
10.8#	2021 Employee Stock Purchase Plan (Incorporated by reference to Exhibit 10.8 to the Registrant's Registration Statement on Form S-1, filed on March 24, 2021 (File No. 333-253599)).
10.9#	Employment Agreement, dated as of March 24, 2021, by and Between TransCode Therapeutics, Inc. and Robert Michael Dudley (Incorporated by reference to Exhibit 10.9 to the Registrant's Registration Statement on Form S-1, filed on April 8, 2021 (File No. 333-253599)).
10.10#	Letter Agreement, dated as of March 24, 2021, by and Between TransCode Therapeutics, Inc. and Robert Michael Dudley (Incorporated by reference to Exhibit 10.10 to the Registrant's Amendment No. 2 to Registration Statement on Form S-1, filed on April 8, 2021 (File No. 333-253599)).
10.11#	Employment Agreement, dated as of March 24, 2021, by and Between TransCode Therapeutics, Inc. and Thomas A. Fitzgerald (Incorporated by reference to Exhibit 10.11 to the Registrant's Amendment No. 2 to Registration Statement on Form S-1, filed on April 8, 2021 (File No. 333-253599)).
10.12#	Letter Agreement, dated as of March 24, 2021, by and Between TransCode Therapeutics, Inc. and Thomas A. Fitzgerald (Incorporated by reference to Exhibit 10.12 to the Registrant's Amendment No. 2 to Registration Statement on Form S-1, filed on April 8, 2021 (File No. 333-253599)).
10.13	Form of Securities Purchase Agreement (Incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K, filed on February 17, 2023).
10.14	Common Stock Purchase Agreement, dated April 13, 2023, by and between TransCode Therapeutics, Inc. and White Lion Capital LLC (Incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K, filed on April 13, 2023).
10.15	Form of Securities Purchase Agreement (Incorporated by reference to Exhibit 10.1 to the Registrant's Quarterly Report on Form 8-K, filed on June 6, 2023 (File No. 001-40363)).
21.1**	List of Subsidiaries of the Registrant.
23.1*	Consent of Withum Smith+Brown, PC, independent registered public accounting firm.
23.2*	Consent of Goodwin Procter LLP (included in Exhibit 5.1).
24.1**	Power of Attorney (included on signature page).
107*	Filing Fee Table.

Indicates a management contract or any compensatory plan, contract or arrangement.

* Filed herewith.

** Previously filed.

(b) Financial Statements Schedules: None.

Part II

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 underwriter at the closing specified in the securities placement agreement, certificates in such denominations and registered in such names as required by the underwriter 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 22nd day of September, 2023.

TRANSCODE THERAPEUTICS, INC.

By: /s/ Robert Michael Dudley

Robert Michael Dudley
Chief Executive Officer

Pursuant to the requirements of the Securities Act of 1933, as amended, this Amendment No. 2 to the Registration Statement 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	<i>Director and Chief Executive Officer (Principal Executive Officer)</i>	September 22, 2023
/s/ Thomas A. Fitzgerald Thomas A. Fitzgerald, MBA	<i>Director and Chief Financial Officer (Principal Financial and Accounting Officer)</i>	September 22, 2023
* _____ Philippe P. Calais, PhD	<i>Director</i>	September 22, 2023
* _____ Erik Manting, PhD	<i>Director</i>	September 22, 2023
* _____ Magda Marquet, PhD	<i>Director</i>	September 22, 2023
By: /s/ Robert Michael Dudley _____ Robert Michael Dudley Attorney-in-Fact		

UNDERWRITING AGREEMENT

between

TRANSCODE THERAPEUTICS, INC.

and

THINKEQUITY LLC

as Representative of the Several Underwriters

TRANSCODE THERAPEUTICS, INC.

UNDERWRITING AGREEMENT

New York, New York
[·], 2023

ThinkEquity LLC
as Representative of the several Underwriters named on Schedule 1 attached hereto
17 State Street, 41st Fl
New York, NY 10004

Ladies and Gentlemen:

The undersigned, TransCode Therapeutics, Inc., a corporation formed under the laws of the State of Delaware (the “**Company**”), hereby confirms its agreement (this “**Agreement**”) with ThinkEquity LLC (hereinafter referred to as “you” (including its correlatives) or the “**Representative**”) and with the other underwriters named on Schedule 1 hereto for which the Representative is acting as representative (the Representative and such other underwriters being collectively called the “**Underwriters**” or, individually, an “**Underwriter**”) as follows:

1. Purchase and Sale of Shares.

1.1 Firm Shares.

1.1.1. Nature and Purchase of Firm Securities.

(i) On the basis of the representations and warranties herein contained, but subject to the terms and conditions herein set forth, the Company agrees to issue and sell to the several Underwriters, an aggregate of (i) [·] shares (“**Firm Shares**”) of the Company’s common stock, par value \$0.0001 per share (the “**Common Stock**”), and Pre-funded warrants, in substantially the form attached hereto as Exhibit A (“**Pre-funded Warrants**”) to purchase [·] shares of Common Stock (the “**Firm Pre-funded Warrants**”).

(ii) The Underwriters, severally and not jointly, agree to purchase from the Company the number of Firm Shares and Firm Pre-funded Warrants set forth opposite their respective names on Schedule 1 attached hereto and made a part hereof at a purchase price of \$[·] per share (92.5% of the per Firm Share offering price) and \$[·] per Pre-funded Warrant (93% of the per Firm Share offering price, less \$0.01). The Firm Shares and the Firm Pre-funded Warrants (together, the “**Firm Securities**”) are to be offered initially to the public at the offering prices set forth on the cover page of the Prospectus (as defined in Section 2.1.1).

1.1.2. Shares Payment and Delivery.

(i) Delivery and payment for the Firm Securities shall be made at 10:00 a.m., Eastern time, on the second (2nd) Business Day following the effective date (the “**Effective Date**”) of the Registration Statement (as defined in Section 2.1.1) (or the third (3rd) Business Day following the Effective Date if the Registration Statement is declared effective after 4:01 p.m., Eastern time) or at such earlier time as shall be agreed upon by the Representative and the Company, at the offices of McGuireWoods LLP, 1251 Avenue of the Americas, 20th Floor, New York, New York 10020 (“**Representative Counsel**”), or at such other place (or remotely by e-mail or other electronic transmission) as shall be agreed upon by the Representative and the Company. The hour and date of delivery and payment for the Firm Securities is called the “**Closing Date.**”

(ii) Payment for the Firm Securities shall be made on the Closing Date by wire transfer in Federal (same day) funds, payable to the order of the Company upon delivery of the certificates (in form and substance satisfactory to the Underwriters) representing the Firm Securities (or through the facilities of the Depository Trust Company (“**DTC**”)) for the account of the Underwriters. The Firm Securities shall be registered in such name or names and in such authorized denominations as the Representative may request in writing at least two (2) full Business Days prior to the Closing Date. The Company shall not be obligated to sell or deliver the Firm Securities except upon tender of payment by the Representative for all of the Firm Securities. The term “**Business Day**” means any day other than a Saturday, a Sunday or a legal holiday or a day on which banking institutions are authorized or obligated by law to close in New York, New York.

1.2 Over-allotment Option.

1.2.1. Option Securities. For the purposes of covering any over-allotments in connection with the distribution and sale of the Firm Shares, the Company hereby grants to the Underwriters an option to purchase up to [·] additional shares of Common Stock and/or additional Pre-funded Warrants to purchase up to [·] shares of Common Stock, together representing an aggregate of fifteen percent (15%) of the Firm Securities sold in the offering, from the Company (the “**Over-allotment Option**”). Such [·] additional shares of Common Stock, the net proceeds of which will be deposited with the Company’s account, are hereinafter referred to as “**Option Shares**.” Such additional Pre-funded Warrants to purchase [·] shares of Common Stock are hereinafter referred to as “**Option Pre-funded Warrants**.” The Option Shares and Option Pre-funded Warrants may be referred to herein collectively as the “**Option Securities**.” The purchase price to be paid per Option Share and per Option Pre-funded Warrant shall be equal to the price per Firm Share and per Firm Pre-funded Warrant set forth in Section 1.1.1. The Firm Securities and the Option Securities are hereinafter referred to together as the “**Public Securities**.” The offering and sale of the Public Securities is hereinafter referred to as the “**Offering**.”

1.2.2. Exercise of Option. The Over-allotment Option granted pursuant to Section 1.2.1 may be exercised by the Representative as to all (at any time) or any part (from time to time) of the Option Securities within 45 days after the Effective Date. The Underwriters shall not be under any obligation to purchase any Option Securities prior to the exercise of the Over-allotment Option. The Over-allotment Option granted hereby may be exercised by the giving of oral notice to the Company from the Representative, which must be confirmed in writing by overnight mail or facsimile or other electronic transmission setting forth the number of Option Securities to be purchased and the date and time for delivery of and payment for the Option Securities (the “**Option Closing Date**”), which shall not be later than one (1) full Business Day after the date of the notice or such other time as shall be agreed upon by the Company and the Representative, at the offices of Representative Counsel or at such other place (including remotely by e-mail or other electronic transmission) as shall be agreed upon by the Company and the Representative. If such delivery and payment for the Option Securities does not occur on the Closing Date, the Option Closing Date will be as set forth in the notice. Upon exercise of the Over-allotment Option with respect to all or any portion of the Option Securities, subject to the terms and conditions set forth herein, (i) the Company shall become obligated to sell to the Underwriters the number of Option Securities specified in such notice and (ii) each of the Underwriters, acting severally and not jointly, shall purchase that portion of the total number of Option Securities then being purchased as set forth in Schedule 1 opposite the name of such Underwriter.

1.2.3. Payment and Delivery. Payment for the Option Securities shall be made on the Option Closing Date by wire transfer in Federal (same day) funds, payable to the order of the Company upon delivery to you of certificates (in form and substance satisfactory to the Underwriters) representing the Option Shares (or through the facilities of DTC) and/or Option Pre-funded Warrants for the account of the Underwriters. The Option Securities shall be registered in such name or names and in such authorized denominations as the Representative may request in writing at least one (1) full Business Day prior to the Option Closing Date. The Company shall not be obligated to sell or deliver the Option Securities except upon tender of payment by the Representative for applicable Option Securities. The Option Closing Date may be simultaneous with, but not earlier than, the Closing Date, and in the event that such time and date are simultaneous with the Closing Date, the term “Closing Date” shall refer to the time and date of delivery of the Firm Securities and the Option Securities.

1.3 Representative’s Warrants.

1.3.1. Purchase Warrants. The Company hereby agrees to issue and sell to the Representative (and/or its designees) on the Closing Date and Option Closing Date, as applicable, an option (“**Representative’s Warrant**”) for the purchase of an aggregate number of shares of Common Stock representing 5% of the Public Securities, for an aggregate purchase price of \$100.00. The Representative’s Warrant agreement, in the form attached hereto as Exhibit B (the “**Representative’s Warrant Agreement**”), shall be exercisable, in whole or in part, commencing on a date that is one hundred eighty (180) days after the Effective Date and expiring on the five-year anniversary of the Effective Date at an initial exercise price per share of Common Stock of \$[·], which is equal to 125% of the initial public offering price of the Firm Shares. The Representative’s Warrant Agreement and the shares of Common Stock issuable upon exercise thereof are hereinafter referred to together as the “**Representative’s Securities.**” The Representative understands and agrees that there are significant restrictions pursuant to FINRA Rule 5110 against transferring the Representative’s Warrant Agreement and the underlying shares of Common Stock during the one hundred eighty (180) days after the Effective Date and by its acceptance thereof shall agree that it will not sell, transfer, assign, pledge or hypothecate the Representative’s Warrant Agreement, or any portion thereof, or be the subject of any hedging, short sale, derivative, put or call transaction that would result in the effective economic disposition of such securities for a period of one hundred eighty (180) days following the Effective Date to anyone other than (i) an Underwriter or a selected dealer in connection with the Offering, or (ii) a bona fide officer or partner of the Representative or of any such Underwriter or selected dealer; and only if any such transferee agrees to the foregoing lock-up restrictions.

1.3.2. Delivery. Delivery of the Representative’s Warrant Agreement shall be made on the Closing Date and shall be issued in the name or names and in such authorized denominations as the Representative may request.

2. Representations and Warranties of the Company. The Company represents and warrants to the Underwriters as of the Applicable Time (as defined below), as of the Closing Date and as of each Option Closing Date, if any, as follows:

2.1 Filing of Registration Statement.

2.1.1. Pursuant to the Securities Act. The Company has filed with the U.S. Securities and Exchange Commission (the “**Commission**”) a registration statement, and an amendment or amendments thereto, on Form S-1 (File No. 333-274251), including any related prospectus or prospectuses, for the registration of the Offering of the Public Securities and the Representative’s Securities under the Securities Act of 1933, as amended (the “**Securities Act**”), which registration statement and amendment or amendments have been prepared by the Company in all material respects in conformity with the requirements of the Securities Act and the rules and regulations of the Commission under the Securities Act (the “**Securities Act Regulations**”) and will contain all material statements that are required to be stated therein in accordance with the Securities Act and the Securities Act Regulations. Except as the context may otherwise require, such registration statement, as amended, on file with the Commission at the time the registration statement became effective (including the Preliminary Prospectus included in the registration statement, financial statements, schedules, exhibits and all other documents filed as a part thereof or incorporated therein and all information deemed to be a part thereof as of the Effective Date pursuant to paragraph (b) of Rule 430A of the Securities Act Regulations (the “**Rule 430A Information**”), is referred to herein as the “**Registration Statement.**” If the Company files any registration statement pursuant to Rule 462(b) of the Securities Act Regulations, then after such filing, the term “Registration Statement” shall include such registration statement filed pursuant to Rule 462(b). The Registration Statement has been declared effective by the Commission on the date hereof.

Each prospectus used prior to the effectiveness of the Registration Statement, and each prospectus that omitted the Rule 430A Information that was used after such effectiveness and prior to the execution and delivery of this Agreement, is herein called a “**Preliminary Prospectus**.” The Preliminary Prospectus, subject to completion, dated [·], 2023, that was included in the Registration Statement immediately prior to the Applicable Time is hereinafter called the “**Pricing Prospectus**.” The final prospectus in the form first furnished to the Underwriters for use in the Offering is hereinafter called the “**Prospectus**.” Any reference to the “most recent Preliminary Prospectus” shall be deemed to refer to the latest Preliminary Prospectus included in the Registration Statement.

As used herein, the terms “Registration Statement,” “Preliminary Prospectus,” “Pricing Prospectus” and “Prospectus” shall include the documents, if any, incorporated by reference therein. The terms “**supplement**,” “**amendment**,” and “**amend**” as used herein with respect to the Registration Statement, the Pricing Prospectus, the Prospectus, any preliminary prospectus or free writing prospectus shall include all documents subsequently filed by the Company with the Commission pursuant to the Securities Exchange Act of 1934, as amended (the “**Exchange Act**”), that are deemed to be incorporated by reference therein.

“**Applicable Time**” means [TIME] [a.m./p.m.], Eastern time, on the date of this Agreement.

“**Issuer Free Writing Prospectus**” means any “issuer free writing prospectus,” as defined in Rule 433 of the Securities Act Regulations (“**Rule 433**”), including without limitation any “free writing prospectus” (as defined in Rule 405 of the Securities Act Regulations) relating to the Public Securities that is (i) required to be filed with the Commission by the Company, (ii) a “road show that is a written communication” within the meaning of Rule 433(d)(8)(i), whether or not required to be filed with the Commission, or (iii) exempt from filing with the Commission pursuant to Rule 433(d)(5) (i) because it contains a description of the Public Securities or of the Offering that does not reflect the final terms, in each case in the form filed or required to be filed with the Commission or, if not required to be filed, in the form retained in the Company’s records pursuant to Rule 433(g).

“**Issuer General Use Free Writing Prospectus**” means any Issuer Free Writing Prospectus that is intended for general distribution to prospective investors (other than a “*bona fide* electronic road show,” as defined in Rule 433), as evidenced by its being specified in Schedule 2-B hereto.

“**Issuer Limited Use Free Writing Prospectus**” means any Issuer Free Writing Prospectus that is not an Issuer General Use Free Writing Prospectus.

“**Pricing Disclosure Package**” means any Issuer General Use Free Writing Prospectus issued at or prior to the Applicable Time, the Pricing Prospectus and the information included on Schedule 2-A hereto, all considered together.

2.1.2. Pursuant to the Exchange Act. The Common Stock is registered pursuant to Section 12(b) under the Exchange Act. The Company has taken no action designed to, or likely to have the effect of, terminating the registration of the shares of Common Stock under the Exchange Act, nor has the Company received any notification that the Commission is contemplating terminating such registration.

2.2 Stock Exchange Listing. The shares of Common Stock have been approved for listing on the NASDAQ Capital Market (the “Exchange”), and the Company has taken no action designed to, or likely to have the effect of, delisting the shares of Common Stock from the Exchange, nor has the Company received any notification that the Exchange is contemplating terminating such listing except as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus.

2.3 No Stop Orders, etc. Neither the Commission nor, to the Company’s knowledge, any state regulatory authority has issued any order preventing or suspending the use of the Registration Statement, any Preliminary Prospectus or the Prospectus or has instituted or, to the Company’s knowledge, threatened to institute, any proceedings with respect to such an order. The Company has complied with each request (if any) from the Commission for additional information.

2.4 Disclosures in Registration Statement.

2.4.1. Compliance with Securities Act and 10b-5 Representation.

(i) Each of the Registration Statement and any post-effective amendment thereto, at the time it became effective complied in all material respects with the requirements of the Securities Act and the Securities Act Regulations. Each Preliminary Prospectus, including the prospectus filed as part of the Registration Statement as originally filed or as part of any amendment or supplement thereto, and the Prospectus, at the time each was filed with the Commission, complied in all material respects with the requirements of the Securities Act and the Securities Act Regulations. Each Preliminary Prospectus delivered to the Underwriters for use in connection with this Offering and the Prospectus was or will be identical to the electronically transmitted copies thereof filed with the Commission pursuant to the Commission’s Electronic Data Gathering, Analysis, and Retrieval (“EDGAR”) system, except to the extent permitted by Regulation S-T.

(ii) Neither the Registration Statement nor any amendment thereto, at its effective time, as of the Applicable Time, at the Closing Date or at any Option Closing Date (if any), contained, contains or will contain an untrue statement of a material fact or omitted, omits or will omit to state a material fact required to be stated therein or necessary to make the statements therein not misleading.

(iii) The Pricing Disclosure Package, as of the Applicable Time, at the Closing Date or at any Option Closing Date (if any), did not, does not and will not include an untrue statement of a material fact or omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading; and each Issuer Limited Use Free Writing Prospectus hereto does not conflict with the information contained in the Registration Statement, any Preliminary Prospectus, the Pricing Prospectus or the Prospectus, and each such Issuer Limited Use Free Writing Prospectus, as supplemented by and taken together with the Pricing Prospectus as of the Applicable Time, did not include an untrue statement of a material fact or omit to state a material fact necessary in order to make the statements therein, in light of the circumstances under which they were made, not misleading; *provided, however*, that this representation and warranty shall not apply to statements made or statements omitted in reliance upon and in conformity with written information furnished to the Company with respect to the Underwriters by the Representative expressly for use in the Registration Statement, the Pricing Prospectus or the Prospectus or any amendment thereof or supplement thereto. The parties acknowledge and agree that such information provided by or on behalf of any Underwriter consists solely of the following disclosure contained in the “Underwriting” section of the Prospectus: the first paragraph under the subheading “Discounts, Commissions and Reimbursement,” the first sentence of the first paragraph, the last sentence of the second paragraph and the first sentence of the fourth paragraph under the subheading “Price Stabilization, Short Positions and Penalty Bids,” the paragraph under the subheading “Electronic Offer, Sale and Distribution of Securities” (the “**Underwriters’ Information**”); and

(iv) Neither the Prospectus nor any amendment or supplement thereto (including any prospectus wrapper), as of its issue date, at the time of any filing with the Commission pursuant to Rule 424(b), at the Closing Date or at any Option Closing Date, included, includes or will include an untrue statement of a material fact or omitted, omits or will omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading; provided, however, that this representation and warranty shall not apply to the Underwriters' Information.

2.4.2. Disclosure of Agreements. The agreements and documents described in the Registration Statement, the Pricing Disclosure Package and the Prospectus conform in all material respects to the descriptions thereof contained therein and there are no agreements or other documents required by the Securities Act and the Securities Act Regulations to be described in the Registration Statement, the Pricing Disclosure Package and the Prospectus or to be filed with the Commission as exhibits to the Registration Statement, that have not been so described or filed. Each agreement or other instrument (however characterized or described) to which the Company is a party or by which it is or may be bound or affected and (i) that is referred to or incorporated by reference in the Registration Statement, the Pricing Disclosure Package and the Prospectus, or (ii) is material to the Company's business, has been duly authorized and validly executed by the Company, is in full force and effect in all material respects and is enforceable against the Company and, to the Company's knowledge, the other parties thereto, in accordance with its terms, except (x) as such enforceability may be limited by bankruptcy, insolvency, reorganization or similar laws affecting creditors' rights generally, (y) as enforceability of any indemnification or contribution provision may be limited under the federal and state securities laws, and (z) that the remedy of specific performance and injunctive and other forms of equitable relief may be subject to the equitable defenses and to the discretion of the court before which any proceeding therefor may be brought. None of such agreements or instruments has been assigned by the Company, and neither the Company nor, to the Company's knowledge, any other party is in default thereunder and, to the Company's knowledge, no event has occurred that, with the lapse of time or the giving of notice, or both, would constitute a default thereunder. To the Company's knowledge, performance by the Company of the material provisions of such agreements or instruments will not result in a violation of any existing applicable law, rule, regulation, judgment, order or decree of any governmental agency or court, domestic or foreign, having jurisdiction over the Company or any of its assets or businesses (each, a "**Governmental Entity**"), including, without limitation, those relating to environmental laws and regulations.

2.4.3. Prior Securities Transactions. No securities of the Company have been sold by the Company or by or on behalf of, or for the benefit of, any person or persons controlling, controlled by or under common control with the Company, except as disclosed in the Registration Statement, the Pricing Disclosure Package and the Preliminary Prospectus or in reports filed under Section 16 of the Exchange Act.

2.4.4. Regulations. The disclosures in the Registration Statement, the Pricing Disclosure Package and the Prospectus concerning the effects of federal, state, local and all foreign regulation on the Offering and the Company's business as currently contemplated are correct in all material respects and no other such regulations are required to be disclosed in the Registration Statement, the Pricing Disclosure Package and the Prospectus which are not so disclosed.

2.4.5. No Other Distribution of Offering Materials. The Company has not, directly or indirectly, distributed and will not distribute any offering material in connection with the Offering other than any Preliminary Prospectus, the Pricing Disclosure Package, the Prospectus and other materials, if any, permitted under the Securities Act and consistent with Section 3.2.

2.5 Changes After Dates in Registration Statement.

2.5.1. No Material Adverse Change. Since the respective dates as of which information is given in the Registration Statement, the Pricing Disclosure Package and the Prospectus, except as otherwise specifically stated therein: (i) there has been no material adverse change in the financial position or results of operations of the Company, nor any change or development that, singularly or in the aggregate, would involve a material adverse change or a prospective material adverse change, in or affecting the condition (financial or otherwise), results of operations, business, assets or prospects of the Company (a “**Material Adverse Change**”); (ii) there have been no material transactions entered into by the Company, other than as contemplated pursuant to this Agreement; and (iii) no officer or director of the Company has resigned from any position with the Company.

2.5.2. Recent Securities Transactions, etc. Subsequent to the respective dates as of which information is given in the Registration Statement, the Pricing Disclosure Package and the Prospectus, and except as may otherwise be indicated or contemplated herein or disclosed in the Registration Statement, the Pricing Disclosure Package and the Prospectus, the Company has not: (i) issued any securities or incurred any liability or obligation, direct or contingent, for borrowed money; or (ii) declared or paid any dividend or made any other distribution on or in respect to its capital stock.

2.6 Disclosures in Commission Filings. Since January 1, 2021, (i) none of the Company’s filings with the Commission contained any untrue statement of a material fact or omitted to state any material fact necessary in order to make the statements therein, in light of the circumstances under which they were made, not misleading; and (ii) the Company has made all filings with the Commission required under the Exchange Act and the rules and regulations of the Commission promulgated thereunder (the “**Exchange Act Regulations**”).

2.7 Independent Accountants. To the knowledge of the Company, WithumSmith+Brown, PC (the “**Auditor**”), whose report is included or incorporated by reference in the Registration Statement, the Pricing Disclosure Package and the Prospectus, is an independent registered public accounting firm as required by the Securities Act and the Securities Act Regulations and the Public Company Accounting Oversight Board. The Auditor has not, during the periods covered by the financial statements included or incorporated by reference in the Registration Statement, the Pricing Disclosure Package and the Prospectus, provided to the Company any non-audit services prohibited by Section 10A(g) of the Exchange Act.

2.8 Financial Statements, etc. The financial statements, including the notes thereto and supporting schedules included or incorporated by reference in the Registration Statement, the Pricing Disclosure Package and the Prospectus, fairly present the financial position and the results of operations of the Company at the dates and for the periods to which they apply; and such financial statements have been prepared in conformity with U.S. generally accepted accounting principles (“GAAP”), consistently applied throughout the periods involved (provided that unaudited interim financial statements are subject to year-end audit adjustments that are not expected to be material in the aggregate and do not contain all footnotes required by GAAP); and the supporting schedules included in the Registration Statement present fairly the information required to be stated therein. Except as included therein, no historical or pro forma financial statements are required to be included in the Registration Statement, the Pricing Disclosure Package or the Prospectus under the Securities Act or the Securities Act Regulations. The pro forma and pro forma as adjusted financial information and the related notes, if any, included or incorporated by reference in the Registration Statement, the Pricing Disclosure Package and the Prospectus have been properly compiled and prepared in accordance with the applicable requirements of the Securities Act and the Securities Act Regulations and present fairly the information shown therein, and the assumptions used in the preparation thereof are reasonable and the adjustments used therein are appropriate to give effect to the transactions and circumstances referred to therein. All disclosures contained in the Registration Statement, the Pricing Disclosure Package or the Prospectus regarding “non-GAAP financial measures” (as such term is defined by the rules and regulations of the Commission), if any, comply with Regulation G of the Exchange Act and Item 10 of Regulation S-K of the Securities Act, to the extent applicable. Each of the Registration Statement, the Pricing Disclosure Package and the Prospectus discloses all material off-balance sheet transactions, arrangements, obligations (including contingent obligations), and other relationships of the Company with unconsolidated entities or other persons that may have a material current or future effect on the Company’s financial condition, changes in financial condition, results of operations, liquidity, capital expenditures, capital resources, or significant components of revenues or expenses. Except as disclosed in the Registration Statement, the Pricing Disclosure Package and the Prospectus, (a) the Company has not incurred any material liabilities or obligations, direct or contingent, or entered into any material transactions other than in the ordinary course of business, (b) the Company has not declared or paid any dividends or made any distribution of any kind with respect to its capital stock, (c) there has not been any change in the capital stock of the Company, or, other than in the course of business, any grants under any stock compensation plan, and (d) there has not been any material adverse change in the Company’s long-term or short-term debt.

2.9 Authorized Capital; Options, etc. The Company had, at the date or dates indicated in the Registration Statement, the Pricing Disclosure Package and the Prospectus, the duly authorized, issued and outstanding capitalization as set forth therein. Based on the assumptions stated in the Registration Statement, the Pricing Disclosure Package and the Prospectus, the Company will have on the Closing Date the adjusted stock capitalization set forth therein. Except as set forth in, or contemplated by, the Registration Statement, the Pricing Disclosure Package and the Prospectus, on the Effective Date, as of the Applicable Time and on the Closing Date and any Option Closing Date, there will be no stock options, warrants, or other rights to purchase or otherwise acquire any authorized, but unissued shares of Common Stock of the Company or any security convertible or exercisable into shares of Common Stock of the Company, or any contracts or commitments to issue or sell shares of Common Stock or any such options, warrants, rights or convertible securities.

2.10 Valid Issuance of Securities, etc.

2.10.1. Outstanding Securities. All issued and outstanding securities of the Company issued prior to the transactions contemplated by this Agreement have been duly authorized and validly issued and are fully paid and non-assessable; the holders thereof have no rights of rescission with respect thereto, and are not subject to personal liability by reason of being such holders; and none of such securities were issued in violation of the preemptive rights, rights of first refusal or rights of participation of any holders of any security of the Company or similar contractual rights granted by the Company. The authorized shares of Common Stock conform in all material respects to all statements relating thereto contained in the Registration Statement, the Pricing Disclosure Package and the Prospectus. The offers and sales of the outstanding shares of Common Stock were at all relevant times either registered under the Securities Act and the applicable state securities or “blue sky” laws or, based in part on the representations and warranties of the purchasers of such shares, exempt from such registration requirements. The description of the Company’s stock option, stock bonus and other stock plans or arrangements, and the options or other rights granted thereunder, as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus, accurately and fairly present, in all material respects, the information required to be shown with respect to such plans, arrangements, options and rights.

2.10.2. Securities Sold Pursuant to this Agreement. The Public Securities, the shares of Common Stock issuable upon the exercise of the Pre-funded Warrants and the shares of Common Stock issuable upon exercise of the Representative's Warrants (the latter two together, the "**Underlying Shares**") have been duly authorized for issuance and sale and, when issued and paid for, will be validly issued, fully paid and non-assessable; the holders thereof are not and will not be subject to personal liability by reason of being such holders; the Public Securities and the Underlying Shares are not and will not be subject to the preemptive rights of any holders of any security of the Company or similar contractual rights granted by the Company; and all corporate action required to be taken for the authorization, issuance and sale of the Public Securities and the Underlying Shares has been duly and validly taken. The Public Securities, the Pre-funded Warrants and Representative's Securities conform in all material respects to all statements with respect thereto contained in the Registration Statement, the Pricing Disclosure Package and the Prospectus. All corporate action required to be taken for the authorization, issuance and sale of the Representative's Warrant Agreement and the Pre-funded Warrants has been duly and validly taken; the Underlying Shares have been duly authorized and reserved for issuance by all necessary corporate action on the part of the Company and when paid for and issued in accordance with the Representative's Warrant, the Representative's Warrant Agreement and the Pre-funded Warrants, as applicable, such shares of Common Stock will be validly issued, fully paid and non-assessable; the holders thereof are not and will not be subject to personal liability by reason of being such holders; and such shares of Common Stock are not and will not be subject to the preemptive rights of any holders of any security of the Company or similar contractual rights granted by the Company.

2.11 Registration Rights of Third Parties. Except for holders of placement agent or underwriter warrants described in the Registration Statement, Pricing Disclosure Package and Prospectus, no holders of any securities of the Company or any rights exercisable for or convertible or exchangeable into securities of the Company have the right to require the Company to register any such securities of the Company under the Securities Act or to include any such securities in a registration statement to be filed by the Company, except as have been validly waived.

2.12 Validity and Binding Effect of Agreements. This Agreement, the Pre-funded Warrants and the Representative's Warrant Agreement have been duly and validly authorized by the Company, and, when executed and delivered, will constitute, the valid and binding agreements of the Company, enforceable against the Company in accordance with their respective terms, except: (i) as such enforceability may be limited by bankruptcy, insolvency, reorganization or similar laws affecting creditors' rights generally; (ii) as enforceability of any indemnification or contribution provision may be limited under the federal and state securities laws; and (iii) that the remedy of specific performance and injunctive and other forms of equitable relief may be subject to the equitable defenses and to the discretion of the court before which any proceeding therefor may be brought.

2.13 No Conflicts, etc. The execution, delivery and performance by the Company of this Agreement, the Pre-funded Warrants and the Representative's Warrant Agreement and all ancillary documents, the consummation by the Company of the transactions herein and therein contemplated and the compliance by the Company with the terms hereof and thereof do not and will not, with or without the giving of notice or the lapse of time or both: (i) result in a material breach of, or conflict with any of the terms and provisions of, or constitute a material default under, or result in the creation, modification, termination or imposition of any lien, charge or encumbrance upon any property or assets of the Company pursuant to the terms of any agreement or instrument to which the Company is a party; (ii) result in any violation of the provisions of the Company's Certificate of Incorporation (as the same may be amended or restated from time to time, the "**Charter**") or the by-laws of the Company; or (iii) violate any existing applicable law, rule, regulation, judgment, order or decree of any Governmental Entity as of the date hereof.

2.14 No Defaults; Violations. No material default exists and no event has occurred that, with the lapse of time or the giving of notice, or both, would constitute a default, in the due performance and observance of any term, covenant or condition of any material license, contract, indenture, mortgage, deed of trust, note, loan or credit agreement, or any other agreement or instrument evidencing an obligation for borrowed money, or any other material agreement or instrument to which the Company is a party or by which the Company may be bound or to which any of the properties or assets of the Company is subject. The Company is not in violation of any term or provision of its Charter or by-laws, or in violation of any franchise, license, permit, applicable law, rule, regulation, judgment or decree of any Governmental Entity.

2.15 Corporate Power; Licenses; Consents.

2.15.1. Conduct of Business. Except as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus, the Company has all requisite corporate power and authority, and has all necessary authorizations, approvals, orders, licenses, certificates and permits of and from all governmental regulatory officials and bodies that it needs as of the date hereof to conduct its business purpose as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus.

2.15.2. Transactions Contemplated Herein. The Company has all corporate power and authority to enter into this Agreement and to carry out the provisions and conditions hereof, and all consents, authorizations, approvals and orders required in connection therewith have been obtained. No consent, authorization or order of, and no filing with, any court, government agency or other body is required for the valid issuance, sale and delivery of the Public Securities and the consummation of the transactions and agreements contemplated by this Agreement, the Pre-funded Warrants and the Representative's Warrant Agreement and as contemplated by the Registration Statement, the Pricing Disclosure Package and the Prospectus, except with respect to applicable federal and state securities laws and the rules and regulations of the Financial Industry Regulatory Authority, Inc. ("**FINRA**").

2.16 D&O Questionnaires. To the Company's knowledge, all information contained in the questionnaires (the "**Questionnaires**") completed by each of the Company's directors and officers immediately prior to the Offering (the "**Insiders**") as supplemented by all information concerning the Company's directors, officers and principal shareholders as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus, as well as in the Lock-Up Agreements (as defined in Section 2.26), provided to the Underwriters, is true and correct in all material respects and the Company has not become aware of any information which would cause the information disclosed in the Questionnaires to become materially inaccurate and incorrect.

2.17 Litigation; Governmental Proceedings. There is no action, suit, proceeding, inquiry, arbitration, investigation, litigation or governmental proceeding pending or, to the Company's knowledge, threatened against, or involving the Company or, to the Company's knowledge, any executive officer or director which has not been disclosed in the Registration Statement, the Pricing Disclosure Package and the Prospectus.

2.18 Good Standing. The Company has been duly organized and is validly existing as a corporation and is in good standing under the laws of the State of Delaware as of the date hereof, and is duly qualified to do business and is in good standing in each other jurisdiction in which its ownership or lease of property or the conduct of business requires such qualification, except where the failure to qualify, singularly or in the aggregate, would not have or reasonably be expected to result in a Material Adverse Change.

2.19 Insurance. The Company carries or is entitled to the benefits of insurance with reputable insurers, in such amounts and covering such risks which the Company believes are adequate, including, but not limited to, directors and officers insurance coverage at least equal to \$5,000,000 and all such insurance is in full force and effect. The Company has no reason to believe that it will not be able (i) to renew its existing insurance coverage as and when such policies expire or (ii) to obtain comparable coverage from similar institutions as may be necessary or appropriate to conduct its business as now conducted and at a cost that would not result in a Material Adverse Change.

2.20 Transactions Affecting Disclosure to FINRA.

2.20.1. Finder's Fees. Except as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus, there are no claims, payments, arrangements, agreements or understandings relating to the payment of a finder's, consulting or origination fee by the Company or any Insider with respect to the sale of the Public Securities hereunder or any other arrangements, agreements or understandings of the Company or, to the Company's knowledge, any of its shareholders that may affect the Underwriters' compensation, as determined by FINRA.

2.20.2. Payments Within Twelve (12) Months. Except in connection with completed financing transactions described in the Registration Statement, the Pricing Disclosure Package and the Prospectus, the Company has not made any direct or indirect payments (in cash, securities or otherwise) to: (i) any person, as a finder's fee, consulting fee or otherwise, in consideration of such person raising capital for the Company or introducing to the Company persons who raised or provided capital to the Company; (ii) any FINRA member; or (iii) any person or entity that has any direct or indirect affiliation or association with any FINRA member, within the twelve (12) months prior to the Effective Date, other than the payment to the Underwriters as provided hereunder in connection with the Offering.

2.20.3. Use of Proceeds. None of the net proceeds of the Offering will be paid by the Company to any participating FINRA member or its affiliates, except as specifically authorized herein.

2.20.4. FINRA Affiliation. There is no (i) officer or director of the Company, (ii) beneficial owner of 10% or more of any class of the Company's securities or (iii) beneficial owner of the Company's unregistered equity securities which were acquired during the 180-day period immediately preceding the filing of the Registration Statement that is an affiliate or associated person of a FINRA member participating in the Offering (as determined in accordance with the rules and regulations of FINRA). The Company does not (within the meaning of FINRA's Conduct Rule 5121(f)(6)) directly or indirectly control, is not controlled by or under common control with, or is an associated person (within the meaning of Article 1, Section 1(ee) of the By-Laws of FINRA) of, any member of FINRA.

2.20.5. Information. All information provided by the Company in its FINRA questionnaire to Representative Counsel specifically for use by Representative Counsel in connection with its Public Offering System filings (and related disclosure) with FINRA is true, correct and complete in all material respects.

2.21 Foreign Corrupt Practices Act. Neither the Company nor, to the Company's knowledge, any director, officer, agent, employee or affiliate of the Company or any other person acting on behalf of the Company, has, directly or indirectly, given or agreed to give any money, gift or similar benefit (other than legal price concessions to customers in the ordinary course of business) to any customer, supplier, employee or agent of a customer or supplier, or official or employee of any governmental agency or instrumentality of any government (domestic or foreign) or any political party or candidate for office (domestic or foreign) or other person who was, is, or may be in a position to help or hinder the business of the Company (or assist it in connection with any actual or proposed transaction) that (i) might subject the Company to any damage or penalty in any civil, criminal or governmental litigation or proceeding, (ii) if not given in the past, might have had a Material Adverse Change or (iii) if not continued in the future, might adversely affect the assets, business, operations or prospects of the Company. The Company has taken reasonable steps to ensure that its accounting controls and procedures are sufficient to cause the Company to comply in all material respects with the Foreign Corrupt Practices Act of 1977, as amended.

2.22 Compliance with OFAC. Neither the Company nor, to the Company's knowledge, any director, officer, agent, employee or affiliate of the Company or any other person acting on behalf of the Company, is currently subject to any U.S. sanctions administered by the Office of Foreign Assets Control of the U.S. Department of the Treasury ("**OFAC**"), and the Company will not, directly or indirectly, use the proceeds of the Offering hereunder, or lend, contribute or otherwise make available such proceeds to any subsidiary, joint venture partner or other person or entity, for the purpose of financing the activities of any person currently subject to any U.S. sanctions administered by OFAC.

2.23 Money Laundering Laws. The operations of the Company are and have been conducted at all times in compliance with applicable financial recordkeeping and reporting requirements of the Currency and Foreign Transactions Reporting Act of 1970, as amended, the money laundering statutes of all jurisdictions, the rules and regulations thereunder and any related or similar rules, regulations or guidelines, issued, administered or enforced by any Governmental Entity (collectively, the "**Money Laundering Laws**"); and no action, suit or proceeding by or before any Governmental Entity involving the Company with respect to the Money Laundering Laws is pending or, to the best knowledge of the Company, threatened.

2.24 Forward-Looking Statements. No forward-looking statement (within the meaning of Section 27A of the Securities Act and Section 21E of the Exchange Act) contained in either the Registration Statement, the Pricing Disclosure Package or the Prospectus has been made or reaffirmed without a reasonable basis or has been disclosed other than in good faith.

2.25 Officers' Certificate. Any certificate signed by any duly authorized officer of the Company and delivered to you or to Representative Counsel shall be deemed a representation and warranty by the Company to the Underwriters as to the matters covered thereby.

2.26 Lock-Up Agreements. Schedule 3 hereto contains a complete and accurate list of individuals subject to a Lock-Up Agreement (as defined below), including the Company's officers and directors (collectively, the "**Lock-Up Parties**"). The Company has caused each of the Lock-Up Parties to deliver to the Representative an executed Lock-Up Agreement, in the form attached hereto as Exhibit C (the "**Lock-Up Agreement**"), prior to the execution of this Agreement.

2.27 Subsidiaries. The Company has no subsidiaries.

2.28 Related Party Transactions. There are no business relationships or related party transactions involving the Company or any other person required to be described in the Registration Statement, the Pricing Disclosure Package, the Prospectus or a document or incorporated by reference therein that have not been described as required.

2.28.1 No Unconsolidated Entities. There are no transactions, arrangements or other relationships between and/or among the Company or any of the Company's affiliates (as such term is defined in Rule 405 of the Securities Act) and any unconsolidated entity, including, but not limited to, any structured finance, special purpose or limited purpose entity that could reasonably be expected to materially affect the Company's liquidity or the availability of or requirements for its capital resources required to be described in the Registration Statement, the Pricing Disclosure Package and the Prospectus or a document incorporated by reference therein which have not been described as required.

2.29 Board of Directors. The Board of Directors of the Company is comprised of the persons set forth in the Company's filings made under the Exchange Act incorporated by reference into the Registration Statement, the Pricing Disclosure Package and the Prospectus. The qualifications of the persons serving as board members and the overall composition of the board comply with the Exchange Act, the Exchange Act Regulations, the Sarbanes-Oxley Act of 2002 and the rules promulgated thereunder (the "**Sarbanes-Oxley Act**") applicable to the Company and the listing rules of the Exchange. At least one member of the Audit Committee of the Board of Directors of the Company qualifies as an "audit committee financial expert," as such term is defined under Regulation S-K and the listing rules of the Exchange. In addition, at least a majority of the persons serving on the Board of Directors qualify as "independent," as defined under the listing rules of the Exchange.

2.30 Sarbanes-Oxley Compliance.

2.30.1. Disclosure Controls. The Company has developed and currently maintains disclosure controls and procedures that comply with Rule 13a-15 or 15d-15 under the Exchange Act Regulations, and such controls and procedures are effective to ensure that information required to be disclosed by the Company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the Commission's rules and forms and includes, without limitation, controls and procedures designed to ensure that information required to be disclosed by the Company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the Company's management, including its principal executive and principal financial officers, or persons performing similar functions, as appropriate to allow timely decisions regarding required disclosure.

2.30.2. Compliance. The Company is in material compliance with the provisions of the Sarbanes-Oxley Act applicable to it, and has implemented or will implement such programs and taken reasonable steps to ensure the Company's future compliance (not later than the relevant statutory and regulatory deadlines therefor) with all of the material provisions of the Sarbanes-Oxley Act.

2.31 Accounting Controls. The Company maintains systems of "internal control over financial reporting" (as defined under Rules 13a-15 and 15d-15 under the Exchange Act Regulations) that comply with the requirements of the Exchange Act and have been designed by, or under the supervision of, their respective principal executive and principal financial officers, or persons performing similar functions, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with GAAP, including, but not limited to, internal accounting controls sufficient to provide reasonable assurance that (i) transactions are executed in accordance with management's general or specific authorizations; (ii) transactions are recorded as necessary to permit preparation of financial statements in conformity with GAAP and to maintain asset accountability; (iii) access to assets is permitted only in accordance with management's general or specific authorization; and (iv) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action is taken with respect to any differences. Except as disclosed in the Registration Statement, the Pricing Disclosure Package and the Prospectus, the Company is not aware of any material weaknesses in its internal controls. The Company's auditors and the Audit Committee of the Board of Directors of the Company have been advised of: (i) all significant deficiencies and material weaknesses in the design or operation of internal controls over financial reporting which are known to the Company's management and that have adversely affected or are reasonably likely to adversely affect the Company's ability to record, process, summarize and report financial information; and (ii) any fraud known to the Company's management, whether or not material, that involves management or other employees who have a significant role in the Company's internal controls over financial reporting.

2.32 No Investment Company Status. The Company is not and, after giving effect to the Offering and the application of the proceeds thereof as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus, will not be, required to register as an "investment company," as defined in the Investment Company Act of 1940, as amended.

2.33 No Labor Disputes. No labor dispute with the employees of the Company exists or, to the knowledge of the Company, is imminent.

2.34 Intellectual Property Rights. The Company owns or possesses or has valid rights to use all patents, patent applications, trademarks, service marks, trade names, trademark registrations, service mark registrations, copyrights, licenses, inventions, trade secrets and similar rights (“**Intellectual Property Rights**”) necessary for the conduct of the business of the Company as currently carried on and as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus. To the knowledge of the Company, no action or use by the Company necessary for the conduct of its business as currently carried on and as described in the Registration Statement and the Prospectus will involve or give rise to any infringement of, or license or similar fees for, any Intellectual Property Rights of others. The Company has not received any notice alleging any such infringement, fee or conflict with asserted Intellectual Property Rights of others. Except as would not reasonably be expected to result, individually or in the aggregate, in a Material Adverse Change (A) to the knowledge of the Company, there is no infringement, misappropriation or violation by third parties of any of the Intellectual Property Rights owned by the Company; (B) there is no pending or, to the knowledge of the Company, threatened action, suit, proceeding or claim by others challenging the rights of the Company in or to any such Intellectual Property Rights, and the Company is unaware of any facts which would form a reasonable basis for any such claim, that would, individually or in the aggregate, together with any other claims in this Section 2.34, reasonably be expected to result in a Material Adverse Change; (C) the Intellectual Property Rights owned by the Company and, to the knowledge of the Company, the Intellectual Property Rights licensed to the Company have not been adjudged by a court of competent jurisdiction invalid or unenforceable, in whole or in part, and there is no pending or, to the Company’s knowledge, threatened action, suit, proceeding or claim by others challenging the validity or scope of any such Intellectual Property Rights, and the Company is unaware of any facts which would form a reasonable basis for any such claim that would, individually or in the aggregate, together with any other claims in this Section 2.34, reasonably be expected to result in a Material Adverse Change; (D) there is no pending or, to the Company’s knowledge, threatened action, suit, proceeding or claim by others that the Company infringes, misappropriates or otherwise violates any Intellectual Property Rights or other proprietary rights of others, the Company has not received any written notice of such claim and the Company is unaware of any other facts which would form a reasonable basis for any such claim that would, individually or in the aggregate, together with any other claims in this Section 2.34, reasonably be expected to result in a Material Adverse Change; and (E) to the Company’s knowledge, no employee of the Company is in or has ever been in violation in any material respect of any term of any employment contract, patent disclosure agreement, invention assignment agreement, non-competition agreement, non-solicitation agreement, nondisclosure agreement or any restrictive covenant to or with a former employer where the basis of such violation relates to such employee’s employment with the Company, or actions undertaken by the employee while employed with the Company and could reasonably be expected to result, individually or in the aggregate, in a Material Adverse Change. To the Company’s knowledge, all material technical information developed by and belonging to the Company which has not been patented has been kept confidential. The Company is not a party to or bound by any options, licenses or agreements with respect to the Intellectual Property Rights of any other person or entity that are required to be set forth in the Registration Statement, the Pricing Disclosure Package and the Prospectus and are not described therein. The Registration Statement, the Pricing Disclosure Package and the Prospectus contain in all material respects the same description of the matters set forth in the preceding sentence. None of the technology employed by the Company has been obtained or is being used by the Company in violation of any contractual obligation binding on the Company or, to the Company’s knowledge, any of its officers, directors or employees, or otherwise in violation of the rights of any persons.

2.35 Taxes. Except as would not reasonably be expected to have, individually or in the aggregate, a material adverse effect, the Company has filed all returns (as hereinafter defined) required to be filed with taxing authorities prior to the date hereof or has duly obtained extensions of time for the filing thereof. The Company has paid all taxes (as hereinafter defined) shown as due on such returns that were filed and has paid all taxes imposed on or assessed against the Company. The provisions for taxes payable, if any, shown on the financial statements filed with or as part of the Registration Statement are sufficient for all accrued and unpaid taxes, whether or not disputed, and for all periods to and including the dates of such consolidated financial statements. Except as disclosed in writing to the Underwriters, (i) no issues have been raised (and are currently pending) by any taxing authority in connection with any of the returns or taxes asserted as due from the Company, and (ii) no waivers of statutes of limitation with respect to the returns or collection of taxes have been given by or requested from the Company. The term “taxes” means all federal, state, local, foreign and other net income, gross income, gross receipts, sales, use, ad valorem, transfer, franchise, profits, license, lease, service, service use, withholding, payroll, employment, excise, severance, stamp, occupation, premium, property, windfall profits, customs, duties or other taxes, fees, assessments or charges of any kind whatever, together with any interest and any penalties, additions to tax or additional amounts with respect thereto. The term “returns” means all returns, declarations, reports, statements and other documents required to be filed in respect to taxes.

2.36 ERISA Compliance. The Company and any “employee benefit plan” (as defined under the Employee Retirement Income Security Act of 1974, as amended, and the regulations and published interpretations thereunder (collectively, “**ERISA**”)) established or maintained by the Company or its “ERISA Affiliates” (as defined below) are in compliance in all material respects with ERISA. “**ERISA Affiliate**” means, with respect to the Company, any member of any group of organizations described in Sections 414(b),(c),(m) or (o) of the Internal Revenue Code of 1986, as amended, and the regulations and published interpretations thereunder (the “**Code**”) of which the Company is a member. No “reportable event” (as defined under ERISA) has occurred or is reasonably expected to occur with respect to any “employee benefit plan” established or maintained by the Company or any of its ERISA Affiliates. No “employee benefit plan” established or maintained by the Company or any of its ERISA Affiliates, if such “employee benefit plan” were terminated, would have any “amount of unfunded benefit liabilities” (as defined under ERISA). Neither the Company nor any of its ERISA Affiliates has incurred or reasonably expects to incur any material liability under (i) Title IV of ERISA with respect to termination of, or withdrawal from, any “employee benefit plan” or (ii) Sections 412, 4971, 4975 or 4980B of the Code. Each “employee benefit plan” established or maintained by the Company or any of its ERISA Affiliates that is intended to be qualified under Section 401(a) of the Code is so qualified and, to the knowledge of the Company, nothing has occurred, whether by action or failure to act, which would cause the loss of such qualification.

2.37 Compliance with Laws. The Company: (A) is and at all times has been in compliance with all statutes, rules, or regulations applicable to the ownership, testing, development, manufacture, packaging, processing, use, distribution, marketing, labeling, promotion, sale, offer for sale, storage, import, export or disposal of any product manufactured or distributed by the Company (“**Applicable Laws**”), except as could not, individually or in the aggregate, reasonably be expected to have a Material Adverse Change; (B) has not received any warning letter, untitled letter or other correspondence or notice from any other governmental authority alleging or asserting noncompliance with any Applicable Laws or any licenses, certificates, approvals, clearances, authorizations, permits and supplements or amendments thereto required by any such Applicable Laws (“**Authorizations**”); (C) possesses all material Authorizations and such Authorizations are valid and in full force and effect and are not in material violation of any term of any such Authorizations; (D) has not received notice of any claim, action, suit, proceeding, hearing, enforcement, investigation, arbitration or other action from any governmental authority or third party alleging that any product operation or activity is in violation of any Applicable Laws or Authorizations and has no knowledge that any such governmental authority or third party is considering any such claim, litigation, arbitration, action, suit, investigation or proceeding; (E) has not received notice that any governmental authority has taken, is taking or intends to take action to limit, suspend, modify or revoke any Authorizations and has no knowledge that any such governmental authority is considering such action; (F) has filed, obtained, maintained or submitted all material reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments as required by any Applicable Laws or Authorizations and that all such reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments were complete and correct on the date filed (or were corrected or supplemented by a subsequent submission); and (G) has not, either voluntarily or involuntarily, initiated, conducted, or issued or caused to be initiated, conducted or issued, any recall, market withdrawal or replacement, safety alert, post-sale warning, “dear doctor” letter, or other notice or action relating to the alleged lack of safety or efficacy of any product or any alleged product defect or violation and, to the Company’s knowledge, no third party has initiated, conducted or intends to initiate any such notice or action.

2.38 Real Property. Except as set forth in the Registration Statement, the Pricing Disclosure Package and the Prospectus, the Company has good and marketable title in fee simple to, or has valid rights to lease or otherwise use, all items of real or personal property which are material to the business of the Company, in each case free and clear of all liens, encumbrances, security interests, claims and defects that do not, singly or in the aggregate, materially affect the value of such property and do not interfere with the use made and proposed to be made of such property by the Company; and all of the leases and subleases material to the business of the Company and under which the Company holds properties described in the Registration Statement, the Pricing Disclosure Package and the Prospectus, are in full force and effect, and the Company has not received any notice of any material claim of any sort that has been asserted by anyone adverse to the rights of the Company under any of the leases or subleases mentioned above, or affecting or questioning the rights of the Company to the continued possession of the leased or subleased premises under any such lease or sublease.

2.39 Contracts Affecting Capital. There are no transactions, arrangements or other relationships between and/or among the Company, any of its affiliates (as such term is defined in Rule 405 of the Securities Act Regulations) and any unconsolidated entity, including, but not limited to, any structured finance, special purpose or limited purpose entity that could reasonably be expected to materially affect the Company's liquidity or the availability of or requirements for their capital resources required to be described or incorporated by reference in the Registration Statement, the Pricing Disclosure Package and the Prospectus which have not been described or incorporated by reference as required.

2.40 Loans to Directors or Officers. There are no outstanding loans, advances (except normal advances for business expenses in the ordinary course of business) or guarantees or indebtedness by the Company to or for the benefit of any of the officers or directors of the Company or any of their respective family members, except as disclosed in the Registration Statement, the Pricing Disclosure Package and the Prospectus. All transactions by the Company with its officers or directors or control persons of the Company have been duly approved by the board of directors of the Company or the audit committee thereof.

2.41 Smaller Reporting Company. As of the time of filing of the Registration Statement, the Company was a "smaller reporting company," as defined in Rule 12b-2 of the Exchange Act Regulations.

2.42 Industry Data. The statistical and market-related data included in each of the Registration Statement, the Pricing Disclosure Package and the Prospectus are based on or derived from sources that the Company reasonably and in good faith believes are reliable and accurate or represent the Company's good faith estimates that are made on the basis of data derived from such sources.

2.43 Emerging Growth Company. From the time of the filing of the Registration Statement with the Commission through the date hereof, the Company has been and is an "emerging growth company," as defined in Section 2(a) of the Securities Act (an "**Emerging Growth Company**").

2.44 [Reserved]

2.45 Margin Securities. The Company owns no “margin securities” as that term is defined in Regulation U of the Board of Governors of the Federal Reserve System (the “**Federal Reserve Board**”), and none of the proceeds of Offering will be used, directly or indirectly, for the purpose of purchasing or carrying any margin security, for the purpose of reducing or retiring any indebtedness which was originally incurred to purchase or carry any margin security or for any other purpose which might cause any of the shares of Common Stock to be considered a “purpose credit” within the meanings of Regulation T, U or X of the Federal Reserve Board.

2.46 The Exchange Rules. The Company is and, after giving effect to the Offering will be, in compliance in all material respects with all applicable corporate governance requirements set forth in the rules of the Exchange.

3. Covenants of the Company. The Company covenants and agrees as follows:

3.1 Amendments to Registration Statement. The Company shall deliver to the Representative, prior to filing, any amendment or supplement to the Registration Statement or Prospectus proposed to be filed after the Effective Date and not file any such amendment or supplement to which the Representative shall reasonably object in writing.

3.2 Federal Securities Laws.

3.2.1. Compliance. The Company, subject to Section 3.2.2, shall comply with the requirements of Rule 430A of the Securities Act Regulations, and will during the period required to permit the completion of the distribution of the Public Securities as contemplated in this Agreement and in the Registration Statement, the Pricing Disclosure Package and the Prospectus, notify the Representative promptly, and confirm the notice in writing, (i) when any post-effective amendment to the Registration Statement shall become effective or any amendment or supplement to the Prospectus shall have been filed; (ii) of the receipt of any comments from the Commission; (iii) of any request by the Commission for any amendment to the Registration Statement or any amendment or supplement to the Prospectus or for additional information; (iv) of the issuance by the Commission of any stop order suspending the effectiveness of the Registration Statement or any post-effective amendment or of any order preventing or suspending the use of any Preliminary Prospectus or the Prospectus, or of the suspension of the qualification of the Public Securities and Representative’s Securities for offering or sale in any jurisdiction, or of the initiation or threatening of any proceedings for any of such purposes or of any examination pursuant to Section 8(d) or 8(e) of the Securities Act concerning the Registration Statement and (v) if the Company becomes the subject of a proceeding under Section 8A of the Securities Act in connection with the Offering of the Public Securities and Representative’s Securities. The Company shall effect all filings required under Rule 424(b) of the Securities Act Regulations, in the manner and within the time period required by Rule 424(b) (without reliance on Rule 424(b)(8)), and shall take such steps as it deems necessary to ascertain promptly whether the form of prospectus transmitted for filing under Rule 424(b) was received for filing by the Commission and, in the event that it was not, it will promptly file such prospectus. The Company shall use its commercially reasonable efforts to prevent the issuance of any stop order, prevention or suspension and, if any such order is issued, to obtain the lifting thereof at the earliest possible moment.

3.2.2. Continued Compliance. The Company shall comply with the Securities Act, the Securities Act Regulations, the Exchange Act and the Exchange Act Regulations so as to permit the completion of the distribution of the Public Securities as contemplated in this Agreement and in the Registration Statement, the Pricing Disclosure Package and the Prospectus. If at any time when a prospectus relating to the Public Securities is (or, but for the exception afforded by Rule 172 of the Securities Act Regulations (“**Rule 172**”), would be) required by the Securities Act to be delivered in connection with sales of the Public Securities, any event shall occur or condition shall exist as a result of which it is necessary, in the opinion of counsel for the Underwriters or for the Company, to (i) amend the Registration Statement in order that the Registration Statement will not include an untrue statement of a material fact or omit to state a material fact required to be stated therein or necessary to make the statements therein not misleading; (ii) amend or supplement the Pricing Disclosure Package or the Prospectus in order that the Pricing Disclosure Package or the Prospectus, as the case may be, will not include any untrue statement of a material fact or omit to state a material fact necessary in order to make the statements therein not misleading in the light of the circumstances existing at the time it is delivered to a purchaser or (iii) amend the Registration Statement or amend or supplement the Pricing Disclosure Package or the Prospectus, as the case may be, in order to comply with the requirements of the Securities Act or the Securities Act Regulations, the Company will promptly (A) give the Representative notice of such event; (B) prepare any amendment or supplement as may be necessary to correct such statement or omission or to make the Registration Statement, the Pricing Disclosure Package or the Prospectus comply with such requirements and, a reasonable amount of time prior to any proposed filing or use, furnish the Representative with copies of any such amendment or supplement and (C) file with the Commission any such amendment or supplement; provided that the Company shall not file or use any such amendment or supplement to which the Representative or counsel for the Underwriters shall reasonably object. The Company will furnish to the Underwriters such number of copies of such amendment or supplement as the Underwriters may reasonably request. The Company has given the Representative notice of any filings made pursuant to the Exchange Act or the Exchange Act Regulations within 48 hours prior to the Applicable Time. The Company shall give the Representative notice of its intention to make any such filing from the Applicable Time until the later of the Closing Date and the exercise in full or expiration of the Over-allotment Option specified in Section 1.2 and will furnish the Representative with copies of the related document(s) a reasonable amount of time prior to such proposed filing, as the case may be, and will not file or use any such document to which the Representative or counsel for the Underwriters shall reasonably object.

3.2.3. Exchange Act Registration. For a period of three (3) years after the date of this Agreement, the Company shall use its best efforts to maintain the registration of the shares of Common Stock under the Exchange Act. The Company shall not deregister the shares of Common Stock under the Exchange Act during this period without the prior written consent of the Representative.

3.2.4. Free Writing Prospectuses. The Company agrees that, unless it obtains the prior written consent of the Representative, it shall not make any offer relating to the Public Securities that would constitute an Issuer Free Writing Prospectus or that would otherwise constitute a “free writing prospectus,” or a portion thereof, required to be filed by the Company with the Commission or retained by the Company under Rule 433; provided that the Representative shall be deemed to have consented to each Issuer General Use Free Writing Prospectus hereto and any “road show that is a written communication” within the meaning of Rule 433(d)(8)(i) that has been reviewed by the Representative. The Company represents that it has treated or agrees that it will treat each such free writing prospectus consented to, or deemed consented to, by the Underwriters as an “issuer free writing prospectus,” as defined in Rule 433, and that it has complied and will comply with the applicable requirements of Rule 433 with respect thereto, including timely filing with the Commission where required, legending and record keeping. If at any time following issuance of an Issuer Free Writing Prospectus there occurred or occurs an event or development as a result of which such Issuer Free Writing Prospectus conflicted or would conflict with the information contained in the Registration Statement or included or would include an untrue statement of a material fact or omitted or would omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances existing at that subsequent time, not misleading, the Company will promptly notify the Underwriters and will promptly amend or supplement, at its own expense, such Issuer Free Writing Prospectus to eliminate or correct such conflict, untrue statement or omission.

3.2.5. [Reserved]

3.3 Delivery to the Underwriters of Registration Statements. The Company has delivered or made available or shall deliver or make available to the Representative and counsel for the Representative, without charge, signed copies of the Registration Statement as originally filed and each amendment thereto (including exhibits filed therewith) and signed copies of all consents and certificates of experts, and will also deliver to the Underwriters, without charge, a conformed copy of the Registration Statement as originally filed and each amendment thereto (without exhibits) for each of the Underwriters. The copies of the Registration Statement and each amendment thereto furnished to the Underwriters will be identical to the electronically transmitted copies thereof filed with the Commission pursuant to EDGAR, except to the extent permitted by Regulation S-T.

3.4 Delivery to the Underwriters of Prospectuses. The Company has delivered or made available or will deliver or make available to each Underwriter, without charge, as many copies of each Preliminary Prospectus as such Underwriter reasonably requested, and the Company hereby consents to the use of such copies for purposes permitted by the Securities Act. The Company will furnish to each Underwriter, without charge, during the period when a prospectus relating to the Public Securities is (or, but for the exception afforded by Rule 172, would be) required to be delivered under the Securities Act, such number of copies of the Prospectus (as amended or supplemented) as such Underwriter may reasonably request. The Prospectus and any amendments or supplements thereto furnished to the Underwriters will be identical to the electronically transmitted copies thereof filed with the Commission pursuant to EDGAR, except to the extent permitted by Regulation S-T.

3.5 Effectiveness and Events Requiring Notice to the Representative. The Company shall notify the Representative promptly and confirm the notice in writing: (i) of the effectiveness of the Registration Statement and any amendment thereto; (ii) of the issuance by the Commission of any stop order or of the initiation, or the threatening, of any proceeding for that purpose; (iii) of the issuance by any state securities commission of any proceedings for the suspension of the qualification of the Public Securities for offering or sale in any jurisdiction or of the initiation, or the threatening, of any proceeding for that purpose; (iv) of the mailing and delivery to the Commission for filing of any amendment or supplement to the Registration Statement or Prospectus; (v) of the receipt of any comments or request for any additional information from the Commission; and (vi) of the happening of any event during the Prospectus Delivery Period (defined below) that, in the judgment of the Company, makes any statement of a material fact made in the Registration Statement, the Pricing Disclosure Package or the Prospectus untrue or that requires the making of any changes in (a) the Registration Statement in order to make the statements therein not misleading, or (b) in the Pricing Disclosure Package or the Prospectus in order to make the statements therein, in light of the circumstances under which they were made, not misleading. If the Commission or any state securities commission shall enter a stop order or suspend such qualification at any time, the Company shall make every reasonable effort to obtain promptly the lifting of such order. As used herein, the term "Prospectus Delivery Period" means such period of time after the first date of the public offering of the Public Securities is required by law to be delivered (or required to be delivered but for Rule 172 under the Securities Act) in connection with sales of the Public Securities by any underwriter or dealer. If during the Prospectus Delivery Period (i) any event or development shall occur or condition statement of a material fact or omit to state any material fact necessary in order to make the statements therein, in the light of the circumstances existing when the Prospectus is delivered to a purchaser, not misleading or (ii) it is necessary to amend or supplement the Prospectus to comply with applicable law, the Company will promptly notify the Underwriters thereof and forthwith prepare and file with the Commission and furnish to the Underwriters and to such dealers as the Representative may designate such amendments or supplements to the Prospectus as may be necessary so that the statements in the Prospectus as so amended or supplemented will not, in the light of the circumstances existing when the Prospectus is delivered to a purchaser, be misleading or so that the Prospectus will comply with applicable law.

3.6 Review of Financial Statements. For a period of three (3) years after the date of this Agreement, the Company, at its expense, shall cause its regularly engaged independent registered public accounting firm to review (but not audit) the Company's financial statements for each of the three fiscal quarters immediately preceding the announcement of any quarterly financial information.

3.7 Listing. The Company shall use its best efforts to maintain the listing of the shares of Common Stock (including the Public Securities) on the Exchange for at least three years from the date of this Agreement.

3.8 Financial Public Relations Firm. As of the Effective Date or as soon thereafter as practical, the Company shall have retained a financial public relations firm reasonably acceptable to the Representative and the Company, which firm shall be experienced in assisting issuers in public offerings of securities and in their relations with their security holders, and shall retain such firm or another firm reasonably acceptable to the Representative for a period of not less than two (2) years after the Effective Date.

3.9 Reports to the Representative.

3.9.1. Periodic Reports, etc. For a period of three (3) years after the date of this Agreement, the Company shall furnish or make available to the Representative copies of such financial statements and other periodic and special reports as the Company from time to time furnishes generally to holders of any class of its securities and also promptly furnish to the Representative: (i) a copy of each periodic report the Company shall be required to file with the Commission under the Exchange Act and the Exchange Act Regulations; (ii) a copy of every press release and every news item and article with respect to the Company or its affairs which was released by the Company; (iii) a copy of each Form 8-K prepared and filed by the Company; (iv) five copies of each registration statement filed by the Company under the Securities Act; and (v) such additional documents and information with respect to the Company and the affairs of any future subsidiaries of the Company as the Representative may from time to time reasonably request; provided the Representative shall sign, if requested by the Company, a Regulation FD compliant confidentiality agreement which is reasonably acceptable to the Representative and Representative Counsel in connection with the Representative's receipt of such information. Documents filed with the Commission pursuant to its EDGAR system shall be deemed to have been delivered to the Representative pursuant to this Section 3.9.1.

3.9.2. Transfer Agent; Transfer Sheets. For a period of three (3) years after the date of this Agreement, the Company shall retain a transfer agent and registrar acceptable to the Representative (the "**Transfer Agent**") and shall furnish to the Representative at the Company's sole cost and expense such transfer sheets of the Company's securities as the Representative may reasonably request, including the daily and monthly consolidated transfer sheets of the Transfer Agent and DTC. Vstock Transfer, LLC is acceptable to the Representative to act as Transfer Agent for the shares of Common Stock.

3.9.3. Trading Reports. During such time as the Public Securities are listed on the Exchange, the Company shall provide to the Representative, at the Company's expense, such reports published by Exchange relating to price trading of the Public Securities, as the Representative shall reasonably request.

3.10 Payment of Expenses

3.10.1. General Expenses Related to the Offering. The Company hereby agrees to pay on each of the Closing Date and the Option Closing Date, if any, to the extent not paid at the Closing Date, all expenses incident to the performance of the obligations of the Company under this Agreement, including, but not limited to: (a) all filing fees and communication expenses relating to the registration of the shares of Common Stock to be sold in the Offering (including the Option Securities) with the Commission; (b) all Public Offering System filing fees associated with the review of the Offering by FINRA; (c) all fees and expenses relating to the listing of such Public Securities on the Exchange and such other stock exchanges as the Company and the Representative together determine, including any fees charged by The Depository Trust Company (DTC) for new securities; (d) all fees, expenses and disbursements relating to background checks of the Company's officers and directors in an amount not to exceed \$15,000 in the aggregate; (e) all fees, expenses and disbursements relating to the registration or qualification of the Public Securities under the "blue sky" securities laws of such states and other jurisdictions as the Representative may reasonably designate; (f) all fees, expenses and disbursements relating to the registration, qualification or exemption of the Public Securities under the securities laws of such foreign jurisdictions as the Representative may reasonably designate; (g) the costs of all mailing and printing of the underwriting documents (including, without limitation, this Agreement, any Blue Sky Surveys and, if appropriate, any Agreement Among Underwriters, Selected Dealers' Agreement, Underwriters' Questionnaire and Power of Attorney), Registration Statements, Prospectuses and all amendments, supplements and exhibits thereto and as many preliminary and final Prospectuses as the Representative may reasonably deem necessary; (h) the costs of preparing, printing and delivering certificates representing the Public Securities; (i) fees and expenses of the transfer agent for the shares of Common Stock; (j) stock transfer and/or stamp taxes, if any, payable upon the transfer of securities from the Company to the Underwriters; (k) the costs associated with post-closing advertising of the Offering in the national editions of the Wall Street Journal and New York Times not to exceed \$30,000 in the aggregate; (l) the costs associated with bound volumes of the public offering materials as well as commemorative mementos and lucite tombstones, each of which the Company or its designee shall provide within a reasonable time after the Closing Date in such quantities as the Representative may reasonably request, in an amount not to exceed \$3,000; (m) the fees and expenses of the Company's accountants; (n) the fees and expenses of the Company's legal counsel and other agents and representatives; (o) fees and expenses of the Representative's legal counsel not to exceed \$125,000; (p) the \$29,500 cost associated with the Underwriter's use of Ipreo's book-building, prospectus tracking and compliance software for the Offering; (q) \$10,000 for data services and communications expenses; (r) up to \$10,000 of the Representative's actual accountable "road show" expenses; and (s) up to \$30,000 of the Representative's market making and trading, and clearing firm settlement expenses for the Offering. The Representative may deduct from the net proceeds of the Offering payable to the Company on the Closing Date, or the Option Closing Date, if any, the expenses set forth herein to be paid by the Company to the Underwriters.

3.10.2. Non-accountable Expenses. The Company further agrees that, in addition to the expenses payable pursuant to Section 3.10.1, on the Closing Date it shall pay to the Representative, by deduction from the net proceeds of the Offering contemplated herein, a non-accountable expense allowance equal to one percent (1%) of the gross proceeds received by the Company from the sale of the Public Securities, less the Advance (as such term is defined in Section 8.3), *provided, however*, that in the event that the Offering is terminated, the Company agrees to reimburse the Underwriters pursuant to Section 8.3.

3.11 Application of Net Proceeds. The Company shall apply the net proceeds from the Offering received by it in a manner consistent with the application thereof described under the caption "Use of Proceeds" in the Registration Statement, the Pricing Disclosure Package and the Prospectus.

3.12 Delivery of Earnings Statements to Security Holders. The Company shall make generally available to its security holders as soon as practicable, but not later than the first day of the fifteenth (15th) full calendar month following the date of this Agreement, an earnings statement (which need not be certified by independent registered public accounting firm unless required by the Securities Act or the Securities Act Regulations, but which shall satisfy the provisions of Rule 158(a) under Section 11(a) of the Securities Act) covering a period of at least twelve (12) consecutive months beginning after the date of this Agreement. If such earnings statement is available on EDGAR it shall be deemed to have been delivered to the Representative pursuant to this Section 3.12.

3.13 Stabilization. Neither the Company nor, to its knowledge, any of its employees or directors has taken or shall take, directly or indirectly, any action designed to or that has constituted or that might reasonably be expected to cause or result in, under Regulation M of the Exchange Act, or otherwise, stabilization or manipulation of the price of any security of the Company to facilitate the sale or resale of the Public Securities.

3.14 Internal Controls. The Company shall maintain a system of internal accounting controls sufficient to provide reasonable assurances that: (i) transactions are executed in accordance with management's general or specific authorization; (ii) transactions are recorded as necessary in order to permit preparation of financial statements in accordance with GAAP and to maintain accountability for assets; (iii) access to assets is permitted only in accordance with management's general or specific authorization; and (iv) the recorded accountability for assets is compared with existing assets at reasonable intervals and appropriate action is taken with respect to any differences.

3.15 Accountants. As of the date of this Agreement, the Company shall retain an independent registered public accounting firm reasonably acceptable to the Representative, and the Company shall continue to retain a nationally recognized independent registered public accounting firm for a period of at least three (3) years after the date of this Agreement. The Representative acknowledges that the Auditor is acceptable to the Representative.

3.16 FINRA. The Company shall advise the Representative (who shall make an appropriate filing with FINRA) if it is or becomes aware that (i) any officer or director of the Company, (ii) any beneficial owner of 10% or more of any class of the Company's securities or (iii) any beneficial owner of the Company's unregistered equity securities which were acquired during the 180 days immediately preceding the filing of the Registration Statement is or becomes an affiliate or associated person of a FINRA member participating in the Offering (as determined in accordance with the rules and regulations of FINRA).

3.17 No Fiduciary Duties. The Company acknowledges and agrees that the Underwriters' responsibility to the Company is solely contractual in nature and that none of the Underwriters or their affiliates or any selling agent shall be deemed to be acting in a fiduciary capacity, or otherwise owes any fiduciary duty to the Company or any of its affiliates in connection with the Offering and the other transactions contemplated by this Agreement.

3.18 Company Lock-Up Agreements.

3.18.1. Restriction on Sales of Capital Stock. The Company, on behalf of itself and any successor entity, agrees that, without the prior written consent of the Representative, it will not, for a period of (A) 90 days after the date of this Agreement if the gross proceeds of the Offering are at least \$10 million or (B) 60 days after the date of this Agreement if the gross proceeds of the Offering are less than \$10 million (in either case, the "**Lock-Up Period**"), (i) offer, pledge, 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; (ii) file or caused to be filed any registration statement with the Commission relating to the offering of 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; (iii) complete any offering of debt securities of the Company, other than entering into a line of credit with a traditional bank or (iv) enter into any swap or other arrangement that transfers to another, in whole or in part, any of the economic consequences of ownership of capital stock of the Company, whether any such transaction described in clause (i), (ii), (iii) or (iv) above is to be settled by delivery of shares of capital stock of the Company or such other securities, in cash or otherwise.

The restrictions contained in this Section 3.18.1 shall not apply to (i) the shares of Common Stock to be sold hereunder; (ii) the issuance by the Company of shares of Common Stock upon the exercise of a stock option or warrant or the conversion of a security outstanding on the date hereof, which is disclosed in the Registration Statement, Pricing Disclosure Package and Prospectus, provided that such options, warrants, and securities have not been amended since the date of this Agreement to increase the number of such securities or to decrease the exercise price, exchange price or conversion price of such securities or to extend the term of such securities, in each case, without the prior written consent of the Representative; (iii) the issuance by the Company of stock options or shares of capital stock of the Company under any equity compensation plan of the Company; (iv) the filing of any registration statement on Form S-8 or a successor form thereto relating to the shares of Common Stock granted pursuant to or reserved for issuance under the equity compensation plans of the Company referred to in clause (iii); (v) the issuance up to 10% of the Company's outstanding shares of Common Stock in the aggregate in connection with one or more acquisitions or other similar strategic transactions or Collaboration Agreements (as defined below); provided that (a) in each of clauses (ii) and (iii) above, the underlying shares shall be restricted from sale during the entire Lock-Up Period and (b) in case of clause (v) above, the shares of Common Stock are issued as "restricted securities" (as defined in Rule 144) and carry no registration rights that require or permit the filing of any registration statement in connection therewith during the Lock-Up Period, and provided further that any such issuance shall only be to a person (or to equityholders of a person) which is, itself or through its subsidiaries, an operating company or an owner of an asset in a business synergistic with the business of the Company and shall provide to the Company additional benefits in addition to the investment of funds, but shall not include a transaction in which the Company is issuing securities primarily for the purpose of raising capital or to an entity whose primary business is investing in securities. For the purposes of this Agreement, a "**Collaboration Agreement**" shall mean a licensing or collaboration agreement with one or more third parties involving the Company.

3.18.2. Restriction on Continuous Offerings and Variable Rate Transactions. The Company agrees that (i) for a period of six (6) months after the Closing Date, it will not directly or indirectly enter into any continuous equity or Variable Rate Transaction without the prior written consent of the Representative. For purposes of this Agreement, "**Variable Rate Transactions**" means transactions involving an offer to sell, sale, contract to sell, grant of any option to sell or other disposition of shares of capital stock of the Company or any securities convertible into or exercisable or exchangeable for shares of capital stock of the Company at a price that is based upon and/or varies with the trading prices of or quotations for the Company's capital stock at any time after the initial issuance of such debt or equity securities, including, without limitation, any equity-line-of-credit transactions or at-the-market transactions or programs.

3.19 [Reserved]

3.20 Blue Sky Qualifications. The Company shall use its commercially reasonable efforts, in cooperation with the Underwriters, if necessary, to qualify the Public Securities for offering and sale under the applicable securities laws of such states and other jurisdictions (domestic or foreign) as the Representative may designate and to maintain such qualifications in effect so long as required to complete the distribution of the Public Securities; *provided, however*, that the Company shall not be obligated to file any general consent to service of process or to qualify as a foreign corporation or as a dealer in securities in any jurisdiction in which it is not so qualified or to subject itself to taxation in respect of doing business in any jurisdiction in which it is not otherwise so subject.

3.21 Reporting Requirements. The Company, during the period when a prospectus relating to the Public Securities is (or, but for the exception afforded by Rule 172, would be) required to be delivered under the Securities Act, will file all documents required to be filed with the Commission pursuant to the Exchange Act within the time periods required by the Exchange Act and Exchange Act Regulations.

3.22 Emerging Growth Company Status. The Company shall promptly notify the Representative if the Company ceases to be an Emerging Growth Company at any time prior to the later of (i) completion of the distribution of the Public Securities within the meaning of the Securities Act and (ii) fifteen (15) days following the completion of the Lock-Up Period.

4. Conditions of Underwriters' Obligations. The obligations of the Underwriters to purchase and pay for the Public Securities, as provided herein, shall be subject to (i) the continuing accuracy of the representations and warranties of the Company as of the date hereof and as of each of the Closing Date and the Option Closing Date, if any; (ii) the accuracy of the statements of officers of the Company made pursuant to the provisions hereof; (iii) the performance by the Company of its obligations hereunder; and (iv) the following conditions:

4.1 Regulatory Matters.

4.1.1. Effectiveness of Registration Statement; Rule 430A Information. The Registration Statement has become effective not later than 5:00 p.m., Eastern time, on the date of this Agreement or such later date and time as shall be consented to in writing by you, and, at each of the Closing Date and any Option Closing Date, no stop order suspending the effectiveness of the Registration Statement or any post-effective amendment thereto has been issued under the Securities Act, no order preventing or suspending the use of any Preliminary Prospectus or the Prospectus has been issued and no proceedings for any of those purposes have been instituted or are pending or, to the Company's knowledge, contemplated by the Commission. The Company has complied with each request (if any) from the Commission for additional information. The Prospectus containing the Rule 430A Information shall have been filed with the Commission in the manner and within the time frame required by Rule 424(b) (without reliance on Rule 424(b)(8)) or a post-effective amendment providing such information shall have been filed with, and declared effective by, the Commission in accordance with the requirements of Rule 430A.

4.1.2. FINRA Clearance. On or before the date of this Agreement, the Representative shall have received clearance from FINRA as to the amount of compensation allowable or payable to the Underwriters as described in the Registration Statement.

4.1.3. Exchange Stock Market Clearance. The Company shall have submitted the Listing of Additional Shares Notification Form to the Nasdaq with respect to the Offering of the Public Securities and the Exchange shall not have raised any objection to the submission prior the Closing Date or each Option Closing Date, as applicable.

4.2 Company Counsel Matters.

4.2.1. Closing Date Opinion of Counsel. On the Closing Date, the Representative shall have received the favorable opinion of Goodwin Procter LLP, counsel to the Company, dated the Closing Date and addressed to the Representative, substantially in form and substance reasonably satisfactory to the Representative.

4.2.2. Option Closing Date Opinions of Counsel. On the Option Closing Date, if any, the Representative shall have received the favorable opinion of the counsel listed in Section 4.2.1. dated the Option Closing Date, addressed to the Representative and in form and substance reasonably satisfactory to the Representative, confirming as of the Option Closing Date, the statements made by such counsels in their respective opinions delivered on the Closing Date.

4.2.3. Reliance. In rendering such opinions, such counsel may rely: (i) as to matters involving the application of laws other than the laws of the United States and jurisdictions in which they are admitted, to the extent such counsel deems proper and to the extent specified in such opinion, if at all, upon an opinion or opinions (in form and substance reasonably satisfactory to the Representative) of other counsel reasonably acceptable to the Representative, familiar with the applicable laws; and (ii) as to matters of fact, to the extent they deem proper, on certificates or other written statements of officers of the Company and officers of departments of various jurisdictions having custody of documents respecting the corporate existence or good standing of the Company, provided that copies of any such statements or certificates shall be delivered to Representative Counsel if requested. The opinion of Goodwin Procter LLP and any opinion relied upon by Goodwin Procter LLP shall include a statement to the effect that it may be relied upon by Representative Counsel in its opinion delivered to the Underwriters.

4.3 Comfort Letters.

4.3.1. Cold Comfort Letter. At the time this Agreement is executed you shall have received a cold comfort letter containing statements and information of the type customarily included in accountants' comfort letters with respect to the financial statements and certain financial information contained in the Registration Statement, the Pricing Disclosure Package and the Prospectus, addressed to the Representative and in form and substance satisfactory in all respects to you and to the Auditor, dated as of the date of this Agreement.

4.3.2. Bring-down Comfort Letter. At each of the Closing Date and the Option Closing Date, if any, the Representative shall have received from the Auditor a letter, dated as of the Closing Date or the Option Closing Date, as applicable, to the effect that the Auditor reaffirms the statements made in the letter furnished pursuant to Section 4.3.1. except that the specified date referred to shall be a date not more than three (3) business days prior to the Closing Date or the Option Closing Date, as applicable.

4.4 Officers' Certificates.

4.4.1. Officers' Certificate. The Company shall have furnished to the Representative a certificate, dated the Closing Date and any Option Closing Date (if such date is other than the Closing Date), of its Chief Executive Officer, its President and its Chief Financial Officer stating that (i) such officers have carefully examined the Registration Statement, the Pricing Disclosure Package, any Issuer Free Writing Prospectus and the Prospectus and, in their opinion, the Registration Statement and each amendment thereto, as of the Applicable Time and as of the Closing Date (or any Option Closing Date if such date is other than the Closing Date) did not include any untrue statement of a material fact and did not omit to state a material fact required to be stated therein or necessary to make the statements therein not misleading, and the Pricing Disclosure Package, as of the Applicable Time and as of the Closing Date (or any Option Closing Date if such date is other than the Closing Date), any Issuer Free Writing Prospectus as of its date and as of the Closing Date (or any Option Closing Date if such date is other than the Closing Date), the Prospectus and each amendment or supplement thereto, as of the respective date thereof and as of the Closing Date, did not include any untrue statement of a material fact and did not omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances in which they were made, not misleading, (ii) since the effective date of the Registration Statement, no event has occurred which should have been set forth in a supplement or amendment to the Registration Statement, the Pricing Disclosure Package or the Prospectus, (iii) to the best of their knowledge after reasonable investigation, as of the Closing Date (or any Option Closing Date if such date is other than the Closing Date), the representations and warranties of the Company in this Agreement are true and correct and the Company has complied with all agreements and satisfied all conditions on its part to be performed or satisfied hereunder at or prior to the Closing Date (or any Option Closing Date if such date is other than the Closing Date), and (iv) there has not been, subsequent to the date of the most recent audited financial statements included or incorporated by reference in the Pricing Disclosure Package, any material adverse change in the financial position or results of operations of the Company, or any change or development that, singularly or in the aggregate, would involve a material adverse change or a prospective material adverse change, in or affecting the condition (financial or otherwise), results of operations, business, assets or prospects of the Company, except as set forth in the Prospectus.

4.4.2. Secretary's Certificate. At each of the Closing Date and the Option Closing Date, if any, the Representative shall have received a certificate of the Company signed by the Secretary of the Company, dated the Closing Date or the Option Closing Date, as the case may be, respectively, certifying: (i) that each of the Charter and Bylaws is true and complete, has not been modified and is in full force and effect; (ii) that the resolutions of the Company's Board of Directors relating to the Offering are in full force and effect and have not been modified; (iii) completeness of all correspondence between the Company or its counsel and the Commission; and (iv) as to the incumbency of the officers of the Company. The documents referred to in such certificate shall be attached to such certificate.

4.5 No Material Changes. Prior to and on each of the Closing Date and each Option Closing Date, if any: (i) there shall have been no material adverse change or development involving a prospective material adverse change in the condition or prospects or the business activities, financial or otherwise, of the Company from the latest dates as of which such condition is set forth in the Registration Statement, the Pricing Disclosure Package and the Prospectus; (ii) no action, suit or proceeding, at law or in equity, shall have been pending or threatened against the Company or any Insider before or by any court or federal or state commission, board or other administrative agency wherein an unfavorable decision, ruling or finding may materially adversely affect the business, operations, prospects or financial condition or income of the Company, except as set forth in the Registration Statement, the Pricing Disclosure Package and the Prospectus; (iii) no stop order shall have been issued under the Securities Act and no proceedings therefor shall have been initiated or threatened by the Commission; and (iv) the Registration Statement, the Pricing Disclosure Package and the Prospectus and any amendments or supplements thereto shall contain all material statements which are required to be stated therein in accordance with the Securities Act and the Securities Act Regulations and shall conform in all material respects to the requirements of the Securities Act and the Securities Act Regulations, and neither the Registration Statement, the Pricing Disclosure Package nor the Prospectus nor any amendment or supplement thereto shall contain any untrue statement of a material fact or omit to state any material fact required to be stated therein or necessary to make the statements therein, in light of the circumstances under which they were made, not misleading.

4.6 Delivery of Agreements.

4.6.1. Lock-Up Agreements. On or before the date of this Agreement, the Company shall have delivered to the Representative executed copies of the Lock-Up Agreements from each of the persons listed in Schedule 3 hereto.

4.6.2. Representative's Warrant Agreement. On the Closing Date, the Company shall have delivered to the Representative executed copies of the Representative's Warrant Agreement.

4.7 Additional Documents. At the Closing Date and at each Option Closing Date (if any) Representative Counsel shall have been furnished with such documents and opinions as they may require for the purpose of enabling Representative Counsel to deliver an opinion to the Underwriters, or in order to evidence the accuracy of any of the representations or warranties, or the fulfillment of any of the conditions, herein contained; and all proceedings taken by the Company in connection with the issuance and sale of the Public Securities and the Representative's Securities as herein contemplated shall be satisfactory in form and substance to the Representative and Representative Counsel.

5. Indemnification.

5.1 Indemnification of the Underwriters.

5.1.1. General. Subject to the conditions set forth below, the Company agrees to indemnify and hold harmless each Underwriter, its affiliates and each of its and their respective directors, officers, members, employees, representatives, partners, shareholders, affiliates, counsel, and agents and each person, if any, who controls any such Underwriter within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act (collectively the "**Underwriter Indemnified Parties,**" and each an "**Underwriter Indemnified Party**"), against any and all loss, liability, claim, damage and expense whatsoever (including but not limited to any and all legal or other expenses reasonably incurred in investigating, preparing or defending against any litigation, commenced or threatened, or any claim whatsoever, whether arising out of any action between any of the Underwriter Indemnified Parties and the Company or between any of the Underwriter Indemnified Parties and any third party, or otherwise) to which they or any of them may become subject under the Securities Act, the Exchange Act or any other statute or at common law or otherwise or under the laws of foreign countries (a "**Claim**"), (i) arising out of or based upon any untrue statement or alleged untrue statement of a material fact contained in (A) the Registration Statement, the Pricing Disclosure Package, any Preliminary Prospectus, the Prospectus, or in any Issuer Free Writing Prospectus or any document incorporated by reference therein (as from time to time each may be amended and supplemented); (B) any materials or information provided to investors by, or with the approval of, the Company in connection with the marketing of the Offering, including any "road show" or investor presentations made to investors by the Company (whether in person or electronically); or (C) any application or other document or written communication (in this Section 5, collectively called "**application**") executed by the Company or based upon written information furnished by the Company in any jurisdiction in order to qualify the Public Securities and Representative's Securities under the securities laws thereof or filed with the Commission, any state securities commission or agency, the Exchange or any other national securities exchange; or the omission or alleged omission therefrom of a material fact required to be stated therein or necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading, unless such statement or omission was made in reliance upon, and in conformity with, the Underwriters' Information or (ii) otherwise arising in connection with or allegedly in connection with the Offering. The Company also agrees that it will reimburse each Underwriter Indemnified Party for all fees and expenses (including but not limited to any and all legal or other expenses reasonably incurred in investigating, preparing or defending against any litigation, commenced or threatened, or any claim whatsoever, whether arising out of any action between any of the Underwriter Indemnified Parties and the Company or between any of the Underwriter Indemnified Parties and any third party, or otherwise) (collectively, the "**Expenses**"), and further agrees wherever and whenever possible to advance payment of Expenses as they are incurred by an Underwriter Indemnified Party in investigating, preparing, pursuing or defending any Claim.

5.1.2. Procedure. If any action is brought against an Underwriter Indemnified Party in respect of which indemnity may be sought against the Company pursuant to Section 5.1.1, such Underwriter Indemnified Party shall promptly notify the Company in writing of the institution of such action and the Company shall assume the defense of such action, including the employment and fees of counsel (subject to the approval of such Underwriter Indemnified Party) and payment of actual expenses if an Underwriter Indemnified Party requests that the Company do so. Such Underwriter Indemnified Party shall have the right to employ its or their own counsel in any such case, but the fees and expenses of such counsel shall be at the expense of the Company, and shall be advanced by the Company. The Company shall not be liable for any settlement of any action effected without its consent (which shall not be unreasonably withheld). In addition, the Company shall not, without the prior written consent of the Underwriters, settle, compromise or consent to the entry of any judgment in or otherwise seek to terminate any pending or threatened action in respect of which advancement, reimbursement, indemnification or contribution may be sought hereunder (whether or not such Underwriter Indemnified Party is a party thereto) unless such settlement, compromise, consent or termination (i) includes an unconditional release of each Underwriter Indemnified Party, acceptable to such Underwriter Indemnified Party, from all liabilities, expenses and claims arising out of such action for which indemnification or contribution may be sought and (ii) does not include a statement as to or an admission of fault, culpability or a failure to act, by or on behalf of any Underwriter Indemnified Party.

5.2 Indemnification of the Company. Each Underwriter, severally and not jointly, agrees to indemnify and hold harmless the Company, its directors, its officers who signed the Registration Statement and persons who control the Company within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act against any and all loss, liability, claim, damage and expense described in the foregoing indemnity from the Company to the several Underwriters, as incurred, but only with respect to untrue statements or omissions made in the Registration Statement, any Preliminary Prospectus, the Pricing Disclosure Package or Prospectus or any amendment or supplement thereto or in any application, in reliance upon, and in strict conformity with, the Underwriters' Information. In case any action shall be brought against the Company or any other person so indemnified based on any Preliminary Prospectus, the Registration Statement, the Pricing Disclosure Package or Prospectus or any amendment or supplement thereto or any application, and in respect of which indemnity may be sought against any Underwriter, such Underwriter shall have the rights and duties given to the Company, and the Company and each other person so indemnified shall have the rights and duties given to the several Underwriters by the provisions of Section 5.1.2. The Company agrees promptly to notify the Representative of the commencement of any litigation or proceedings against the Company or any of its officers, directors or any person, if any, who controls the Company within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act, in connection with the issuance and sale of the Public Securities or in connection with the Registration Statement, the Pricing Disclosure Package, the Prospectus, or any Issuer Free Writing Prospectus.

5.3 Contribution.

5.3.1. Contribution Rights. If the indemnification provided for in this Section 5 shall for any reason be unavailable to or insufficient to hold harmless an indemnified party under Section 5.1 or 5.2 in respect of any loss, claim, damage or liability, or any action in respect thereof, referred to therein, then each indemnifying party shall, in lieu of indemnifying such indemnified party, contribute to the amount paid or payable by such indemnified party as a result of such loss, claim, damage or liability, or action in respect thereof, (i) in such proportion as shall be appropriate to reflect the relative benefits received by the Company, on the one hand, and the Underwriters, on the other, from the Offering of the Public Securities, or (ii) if the allocation provided by clause (i) above is not permitted by applicable law, in such proportion as is appropriate to reflect not only the relative benefits referred to in clause (i) above but also the relative fault of the Company, on the one hand, and the Underwriters, on the other, with respect to the statements or omissions that resulted in such loss, claim, damage or liability, or action in respect thereof, as well as any other relevant equitable considerations. The relative benefits received by the Company, on the one hand, and the Underwriters, on the other, with respect to such Offering shall be deemed to be in the same proportion as the total net proceeds from the Offering of the Public Securities purchased under this Agreement (before deducting expenses) received by the Company, as set forth in the table on the cover page of the Prospectus, on the one hand, and the total underwriting discounts and commissions received by the Underwriters with respect to the shares of the Common Stock purchased under this Agreement, as set forth in the table on the cover page of the Prospectus, on the other hand. The relative fault shall be determined by reference to whether the untrue or alleged untrue statement of a material fact or omission or alleged omission to state a material fact relates to information supplied by the Company or the Underwriters, the intent of the parties and their relative knowledge, access to information and opportunity to correct or prevent such statement or omission. The Company and the Underwriters agree that it would not be just and equitable if contributions pursuant to this Section 5.3.1 were to be determined by pro rata allocation (even if the Underwriters were treated as one entity for such purpose) or by any other method of allocation that does not take into account the equitable considerations referred to herein. The amount paid or payable by an indemnified party as a result of the loss, claim, damage or liability, or action in respect thereof, referred to above in this Section 5.3.1 shall be deemed to include, for purposes of this Section 5.3.1, any legal or other expenses reasonably incurred by such indemnified party in connection with investigating or defending any such action or claim. Notwithstanding the provisions of this Section 5.3.1 in no event shall an Underwriter be required to contribute any amount in excess of the amount by which the total underwriting discounts and commissions received by such Underwriter with respect to the Offering of the Public Securities exceeds the amount of any damages that such Underwriter has otherwise been required to pay by reason of such untrue or alleged untrue statement or omission or alleged omission. No person guilty of fraudulent misrepresentation (within the meaning of Section 11(f) of the Securities Act) shall be entitled to contribution from any person who was not guilty of such fraudulent misrepresentation.

5.3.2. Contribution Procedure. Within fifteen (15) days after receipt by any party to this Agreement (or its representative) of notice of the commencement of any action, suit or proceeding, such party will, if a claim for contribution in respect thereof is to be made against another party (“**contributing party**”), notify the contributing party of the commencement thereof, but the failure to so notify the contributing party will not relieve it from any liability which it may have to any other party other than for contribution hereunder. In case any such action, suit or proceeding is brought against any party, and such party notifies a contributing party or its representative of the commencement thereof within the aforesaid 15 days, the contributing party will be entitled to participate therein with the notifying party and any other contributing party similarly notified. Any such contributing party shall not be liable to any party seeking contribution on account of any settlement of any claim, action or proceeding affected by such party seeking contribution without the written consent of such contributing party. The contribution provisions contained in this Section 5.3.2 are intended to supersede, to the extent permitted by law, any right to contribution under the Securities Act, the Exchange Act or otherwise available. Each Underwriter’s obligations to contribute pursuant to this Section 5.3 are several and not joint.

6. Default by an Underwriter.

6.1 Default Not Exceeding 10% of Firm Securities or Option Securities. If any Underwriter or Underwriters shall default in its or their obligations to purchase the Firm Securities or the Option Securities, if the Over-allotment Option is exercised hereunder, and if the number of the Firm Securities or Option Securities with respect to which such default relates does not exceed in the aggregate 10% of the number of Firm Securities or Option Securities that all Underwriters have agreed to purchase hereunder, then such Firm Securities or Option Securities to which the default relates shall be purchased by the non-defaulting Underwriters in proportion to their respective commitments hereunder.

6.2 Default Exceeding 10% of Firm Securities or Option Securities. In the event that the default addressed in Section 6.1 relates to more than 10% of the Firm Securities or Option Securities, you may in your discretion arrange for yourself or for another party or parties to purchase such Firm Securities or Option Securities to which such default relates on the terms contained herein. If, within one (1) Business Day after such default relating to more than 10% of the Firm Securities or Option Securities, you do not arrange for the purchase of such Firm Securities or Option Securities, then the Company shall be entitled to a further period of one (1) Business Day within which to procure another party or parties satisfactory to you to purchase said Firm Securities or Option Securities on such terms. In the event that neither you nor the Company arrange for the purchase of the Firm Securities or Option Securities to which a default relates as provided in this Section 6, this Agreement will automatically be terminated by you or the Company without liability on the part of the Company (except as provided in Sections 3.8 and 5) or the several Underwriters (except as provided in Section 5); *provided, however*, that if such default occurs with respect to the Option Securities, this Agreement will not terminate as to the Firm Securities; and provided, further, that nothing herein shall relieve a defaulting Underwriter of its liability, if any, to the other Underwriters and to the Company for damages occasioned by its default hereunder.

6.3 Postponement of Closing Date. In the event that the Firm Securities or Option Securities to which the default relates are to be purchased by the non-defaulting Underwriters, or are to be purchased by another party or parties as aforesaid, you or the Company shall have the right to postpone the Closing Date or Option Closing Date for a reasonable period, but not in any event exceeding five (5) Business Days, in order to effect whatever changes may thereby be made necessary in the Registration Statement, the Pricing Disclosure Package or the Prospectus or in any other documents and arrangements, and the Company agrees to file promptly any amendment to the Registration Statement, the Pricing Disclosure Package or the Prospectus that in the opinion of counsel for the Underwriter may thereby be made necessary. The term “Underwriter” as used in this Agreement shall include any party substituted under this Section 6 with like effect as if it had originally been a party to this Agreement with respect to such shares of Common Stock.

7. Additional Covenants.

7.1 Board Composition and Board Designations. The Company shall ensure that: (i) the qualifications of the persons serving as members of the Company’s Board of Directors and the overall composition of its Board of Directors comply with the Sarbanes-Oxley Act, with the Exchange Act and with the listing rules of the Exchange or any other national securities exchange, as the case may be, in the event the Company seeks to have its Public Securities listed on another exchange or quoted on an automated quotation system, and (ii) if applicable, at least one member of the Audit Committee of the Board of Directors qualifies as an “audit committee financial expert,” as such term is defined under Regulation S-K and the listing rules of the Exchange.

7.2 Prohibition on Press Releases and Public Announcements. The Company shall not issue press releases or engage in any other publicity, without the Representative’s prior written consent, for a period ending at 5:00 p.m., Eastern time, on the first (1st) Business Day following the forty-fifth (45th) day after the Closing Date, other than normal and customary releases issued in the ordinary course of the Company’s business.

7.3 Right of First Refusal. Provided that the Firm Securities are sold in accordance with the terms of this Agreement, the Representative shall have an irrevocable right of first refusal (the “**Right of First Refusal**”), from February 18, 2024 to February 17, 2025 (the “**ROFR Period**”), to act as sole and exclusive investment banker, sole and exclusive book-runner, sole and exclusive financial advisor, sole and exclusive underwriter and/or sole and exclusive placement agent, at the Representative’s sole and exclusive discretion, for each and every future public and private equity and debt offering, including all equity linked financings (each, a “**Subject Transaction**”), during the ROFR Period, of the Company, or any successor to or subsidiary of the Company, on terms and conditions customary to the Representative for such Subject Transactions, provided that, for clarity, this Right of First Refusal shall not apply to (1) Company transactions with strategic partners or other sources of non-dilutive funding, including government agencies and private foundations, or (2) transactions for which no broker-dealer is proposed to be engaged by the Company. For the avoidance of any doubt, the Company shall not retain, engage or solicit any additional investment banker, book-runner, financial advisor, underwriter and/or placement agent in a Subject Transaction without the express written consent of the Representative.

The Company shall notify the Representative of its intention to pursue a Subject Transaction, including the material terms thereof, by providing written notice thereof by registered mail or overnight courier service addressed to the Representative. If the Representative fails to exercise its Right of First Refusal with respect to any Subject Transaction within ten (10) Business Days after the mailing of such written notice, then the Representative shall have no further claim or right with respect to the Subject Transaction. The Representative may elect, in its sole and absolute discretion, not to exercise its Right of First Refusal with respect to any Subject Transaction; provided that any such election by the Representative shall not adversely affect the Representative's Right of First Refusal with respect to any other Subject Transaction during the ROFR Period agreed to above.

8. Effective Date of this Agreement and Termination Thereof.

8.1 Effective Date. This Agreement shall become effective when both the Company and the Representative have executed the same and delivered counterparts of such signatures to the other party.

8.2 Termination. The Representative shall have the right to terminate this Agreement at any time prior to any Closing Date, (i) if any domestic or international event or act or occurrence has materially disrupted, or in your opinion will in the immediate future materially disrupt, general securities markets in the United States; or (ii) if trading on the New York Stock Exchange or the Nasdaq Stock Market LLC shall have been suspended or materially limited, or minimum or maximum prices for trading shall have been fixed, or maximum ranges for prices for securities shall have been required by FINRA or by order of the Commission or any other government authority having jurisdiction; or (iii) if the United States shall have become involved in a new war or an increase in major hostilities; or (iv) if a banking moratorium has been declared by a New York State or federal authority; or (v) if a moratorium on foreign exchange trading has been declared which materially adversely impacts the United States securities markets; or (vi) if the Company shall have sustained a material loss by fire, flood, accident, hurricane, earthquake, theft, sabotage or other calamity or malicious act which, whether or not such loss shall have been insured, will, in your opinion, make it inadvisable to proceed with the delivery of the Firm Securities or Option Securities; or (vii) if the Company is in material breach of any of its representations, warranties or covenants hereunder; or (viii) if the Representative shall have become aware after the date hereof of such a material adverse change in the conditions or prospects of the Company, or such adverse material change in general market conditions as in the Representative's judgment would make it impracticable to proceed with the offering, sale and/or delivery of the Public Securities or to enforce contracts made by the Underwriters for the sale of the Public Securities.

8.3 Expenses. Notwithstanding anything to the contrary in this Agreement, except in the case of a default by the Underwriters, pursuant to Section 6.2, in the event that this Agreement shall not be carried out for any reason whatsoever, within the time specified herein or any extensions thereof pursuant to the terms herein, the Company shall be obligated to pay to the Underwriters their actual and accountable out-of-pocket expenses related to the transactions contemplated herein then due and payable (including the fees and disbursements of Representative Counsel) up to \$200,000, inclusive of the \$50,000 advance for accountable expenses previously paid by the Company to the Representative (the "**Advance**") and upon demand the Company shall pay the full amount thereof to the Representative on behalf of the Underwriters; *provided, however*, that such expense cap in no way limits or impairs the indemnification and contribution provisions of this Agreement. Notwithstanding the foregoing, any advance received by the Representative will be reimbursed to the Company to the extent not actually incurred in compliance with FINRA Rule 5110(g)(4)(A).

8.4 Indemnification. Notwithstanding any contrary provision contained in this Agreement, any election hereunder or any termination of this Agreement, and whether or not this Agreement is otherwise carried out, the provisions of Section 5 shall remain in full force and effect and shall not be in any way affected by, such election or termination or failure to carry out the terms of this Agreement or any part hereof.

8.5 Representations, Warranties, Agreements to Survive. All representations, warranties and agreements contained in this Agreement or in certificates of officers of the Company submitted pursuant hereto, shall remain operative and in full force and effect regardless of (i) any investigation made by or on behalf of any Underwriter or its affiliates or selling agents, any person controlling any Underwriter, its officers or directors or any person controlling the Company or (ii) delivery of and payment for the Public Securities.

9. Miscellaneous.

9.1 Notices. All communications hereunder, except as herein otherwise specifically provided, shall be in writing and shall be mailed (registered or certified mail, return receipt requested), personally delivered or sent by electronic mail transmission and confirmed and shall be deemed given when so delivered and confirmed or if mailed, two (2) days after such mailing.

If to the Representative:

ThinkEquity
17 State Street, 41st Fl
New York, NY 10004
Attn: Head of Investment Banking
Fax: (212) 349-2550
e-mail: Notices@think-equity.com

with a copy (which shall not constitute notice) to:

McGuireWoods LLP
1251 Avenue of the Americas, 20th Floor
New York, New York 10020

Attn: Stephen Older, Esq.
Rakesh Gopalan, Esq.

Email: solder@mcguirewoods.com
rgopalan@mcguirewoods.com

If to the Company:

TransCode Therapeutics, Inc.
6 Liberty Square, #2382
Boston, MA
Attn: R. Michael Dudley, Chief Executive Officer

with a copy (which shall not constitute notice) to:

Goodwin Procter LLP
100 Northern Avenue
Boston, MA 02210
Attn: Michael Bison, Esq.

9.2 Headings. The headings contained herein are for the sole purpose of convenience of reference, and shall not in any way limit or affect the meaning or interpretation of any of the terms or provisions of this Agreement.

9.3 Amendment. This Agreement may only be amended by a written instrument executed by each of the parties hereto.

9.4 Entire Agreement. This Agreement (together with the other agreements and documents being delivered pursuant to or in connection with this Agreement) constitutes the entire agreement of the parties hereto with respect to the subject matter hereof and thereof, and supersedes all prior agreements and understandings of the parties, oral and written, with respect to the subject matter hereof. Notwithstanding anything to the contrary set forth herein, it is understood and agreed by the parties hereto that all other terms and conditions of that certain engagement letter between the Company and ThinkEquity LLC dated August 25, 2023, shall remain in full force and effect.

9.5 Binding Effect. This Agreement shall inure solely to the benefit of and shall be binding upon the Representative, the Underwriters, the Company and the controlling persons, directors and officers referred to in Section 5, and their respective successors, legal representatives, heirs and assigns, and no other person shall have or be construed to have any legal or equitable right, remedy or claim under or in respect of or by virtue of this Agreement or any provisions herein contained. The term "successors and assigns" shall not include a purchaser, in its capacity as such, of securities from any of the Underwriters.

9.6 Governing Law; Consent to Jurisdiction; Trial by Jury. This Agreement shall be governed by and construed and enforced in accordance with the laws of the State of New York, without giving effect to conflict of laws principles thereof. The Company hereby agrees that any action, proceeding or claim against it arising out of, or relating in any way to this Agreement shall be brought and enforced in the New York Supreme Court, County of New York, or in the United States District Court for the Southern District of New York, and irrevocably submits to such jurisdiction, which jurisdiction shall be exclusive. The Company hereby waives any objection to such exclusive jurisdiction and that such courts represent an inconvenient forum. Any such process or summons to be served upon the Company may be served by transmitting a copy thereof by registered or certified mail, return receipt requested, postage prepaid, addressed to it at the address set forth in Section 9.1. Such mailing shall be deemed personal service and shall be legal and binding upon the Company in any action, proceeding or claim. The Company agrees that the prevailing party(ies) in any such action shall be entitled to recover from the other party(ies) all of its reasonable attorneys' fees and expenses relating to such action or proceeding and/or incurred in connection with the preparation therefor. The Company (on its behalf and, to the extent permitted by applicable law, on behalf of its stockholders and affiliates) and each of the Underwriters hereby irrevocably waives, to the fullest extent permitted by applicable law, any and all right to trial by jury in any legal proceeding arising out of or relating to this Agreement or the transactions contemplated hereby.

9.7 Execution in Counterparts. This Agreement may be executed in one or more counterparts, and by the different parties hereto in separate counterparts, each of which shall be deemed to be an original, but all of which taken together shall constitute one and the same agreement, and shall become effective when one or more counterparts has been signed by each of the parties hereto and delivered to each of the other parties hereto. Delivery of a signed counterpart of this Agreement by facsimile or email/pdf transmission shall constitute valid and sufficient delivery thereof.

9.8 Waiver, etc. The failure of any of the parties hereto to at any time enforce any of the provisions of this Agreement shall not be deemed or construed to be a waiver of any such provision, nor to in any way effect the validity of this Agreement or any provision hereof or the right of any of the parties hereto to thereafter enforce each and every provision of this Agreement. No waiver of any breach, non-compliance or non-fulfillment of any of the provisions of this Agreement shall be effective unless set forth in a written instrument executed by the party or parties against whom or which enforcement of such waiver is sought; and no waiver of any such breach, non-compliance or non-fulfillment shall be construed or deemed to be a waiver of any other or subsequent breach, non-compliance or non-fulfillment.

[Signature Page Follows]

If the foregoing correctly sets forth the understanding between the Underwriters and the Company, please so indicate in the space provided below for that purpose, whereupon this letter shall constitute a binding agreement between us.

Very truly yours,

TRANSCODE THERAPEUTICS, INC.

By: _____
Name:
Title:

Confirmed as of the date first written above mentioned, on behalf of itself and as Representative of the several Underwriters named on Schedule 1 hereto:

THINKEQUITY LLC

By: _____
Name:
Title:

[SIGNATURE PAGE]
TRANSCODE THERAPEUTICS, INC. – UNDERWRITING AGREEMENT

SCHEDULE 1

Underwriter	Total Number of Firm Shares	Total Number of Firm Pre-funded Warrants	Number of Option Shares	Number of Option Pre-funded Warrants
ThinkEquity LLC	[.]	[.]	[.]	[.]
TOTAL	[.]	[.]	[.]	[.]

SCHEDULE 2-A

Pricing Information

Number of Firm Shares:	[·]
Number of Firm Pre-funded Warrants:	[·]
Number of Option Shares:	[·]
Number of Option Pre-funded Warrants:	[·]
Public Offering Price per Share:	[\$·]
Public Offering Price per Pre-funded Warrant:	[\$·]
Underwriting Discount per Share:	[\$·]
Underwriting Discount per Pre-funded Warrant:	[\$·]
Proceeds to Company per Share (before expenses):	[\$·]
Proceeds to Company per Pre-funded Warrant (before expenses):	[\$·]

Sch. 2-A

SCHEDULE 2-B

Issuer General Use Free Writing Prospectuses

[None.]

Sch. 2-B

SCHEDULE 3

List of Lock-Up Parties

1. R. Michael Dudley
2. Thomas A. Fitzgerald
3. Philippe P. Calais
4. Erik Manting
5. Magda Marquet
6. Zdravka Medarova

EXHIBIT A

Form of Pre-funded Warrant

Ex. A-1

EXHIBIT B

Form of Representative's Warrant Agreement

THE REGISTERED HOLDER OF THIS PURCHASE WARRANT BY ITS ACCEPTANCE HEREOF, AGREES THAT IT WILL NOT SELL, TRANSFER OR ASSIGN THIS PURCHASE WARRANT EXCEPT AS HEREIN PROVIDED AND THE REGISTERED HOLDER OF THIS PURCHASE WARRANT AGREES THAT IT WILL NOT SELL, TRANSFER, ASSIGN, PLEDGE OR HYPOTHECATE THIS PURCHASE WARRANT FOR A PERIOD OF ONE HUNDRED EIGHTY DAYS FOLLOWING THE EFFECTIVE DATE (DEFINED BELOW) TO ANYONE OTHER THAN (I) THINKEQUITY LLC, OR AN UNDERWRITER OR A SELECTED DEALER IN CONNECTION WITH THE OFFERING, OR (II) A BONA FIDE OFFICER OR PARTNER OF THINKEQUITY LLC OR OF ANY SUCH UNDERWRITER OR SELECTED DEALER.

THIS PURCHASE WARRANT IS NOT EXERCISABLE PRIOR TO [_____] [DATE THAT IS 180 DAYS FROM THE EFFECTIVE DATE OF THE OFFERING]. VOID AFTER 5:00 P.M., EASTERN TIME, [_____] [DATE THAT IS FIVE YEARS FROM THE EFFECTIVE DATE OF THE OFFERING].

WARRANT TO PURCHASE COMMON STOCK

TRANSCODE THERAPEUTICS, INC.

Warrant Shares: _____

Initial Exercise Date: _____, 2024

THIS WARRANT TO PURCHASE COMMON STOCK (the "**Warrant**") certifies that, for value received, _____ or its assigns (the "**Holder**") is entitled, upon the terms and subject to the limitations on exercise and the conditions hereinafter set forth, at any time on or after _____, 2023 (the "**Initial Exercise Date**") and, in accordance with FINRA Rule 5110(g)(8)(A), prior to at 5:00 p.m. (New York time) on the date that is five (5) years following the Effective Date (the "**Termination Date**") but not thereafter, to subscribe for and purchase from TransCode Therapeutics, Inc., a Delaware corporation (the "**Company**"), up to _____ shares of Common Stock, par value \$0.0001 per share, of the Company (the "**Warrant Shares**"), as subject to adjustment hereunder. The purchase price of one share of Common Stock under this Warrant shall be equal to the Exercise Price, as defined in Section 2(b).

Section 1. Definitions. In addition to the terms defined elsewhere in this Agreement, the following terms have the meanings indicated in this Section 1:

"**Affiliate**" means any Person that, directly or indirectly through one or more intermediaries, controls or is controlled by or is under common control with a Person, as such terms are used in and construed under Rule 405 under the Securities Act.

“**Business Day**” means any day except any Saturday, any Sunday, any day which is a federal legal holiday in the United States or any day on which banking institutions in the State of New York are authorized or required by law or other governmental action to close.

“**Commission**” means the United States Securities and Exchange Commission.

“**Effective Date**” means the effective date of the registration statement on Form S-1 (File No. 333-274251), including any related prospectus or prospectuses, for the registration of the Company’s common stock, par value \$0.0001 per share and the Warrant Shares under the Securities Act, that the Company has filed with the Commission.

“**Exchange Act**” means the Securities Exchange Act of 1934, as amended, and the rules and regulations promulgated thereunder.

“**Person**” means an individual or corporation, partnership, trust, incorporated or unincorporated association, joint venture, limited liability company, joint stock company, government (or an agency or subdivision thereof) or other entity of any kind.

“**Rule 144**” means Rule 144 promulgated by the Commission pursuant to the Securities Act, as such Rule may be amended or interpreted from time to time, or any similar rule or regulation hereafter adopted by the Commission having substantially the same purpose and effect as such Rule.

“**Securities Act**” means the Securities Act of 1933, as amended, and the rules and regulations promulgated thereunder.

“**Trading Day**” means a day on which the Nasdaq Capital Market is open for trading.

“**Trading Market**” means any of the following markets or exchanges on which the Common Stock is listed or quoted for trading on the date in question: the NYSE American, the Nasdaq Capital Market, the Nasdaq Global Market, the Nasdaq Global Select Market, or the New York Stock Exchange (or any successors to any of the foregoing).

“**VWAP**” means, for any date, the price determined by the first of the following clauses that applies: (a) if the Common Stock then listed or quoted on a Trading Market, the daily volume weighted average price of the Common Stock for such date (or the nearest preceding date) on the Trading Market on which the Common Stock is then listed or quoted as reported by Bloomberg L.P. (based on a Trading Day from 9:30 a.m. (New York City time) to 4:02 p.m. (New York City time)), (b) if OTCQB or OTCQX is not a Trading Market, the volume weighted average price of a share of Common Stock for such date (or the nearest preceding date) on the OTCQB or OTCQX as applicable, (c) if Common Stock is not then listed or quoted for trading on the OTCQB or OTCQX and if prices for Common Stock are then reported in the “Pink Sheets” published by OTC Markets Group, Inc. (or a similar organization or agency succeeding to its functions of reporting prices), the most recent bid price per share of Common Stock so reported, or (d) in all other cases, the fair market value of the Common Stock as determined by an independent appraiser selected in good faith by the Holder and reasonably acceptable to the Company, the fees and expenses of which shall be paid by the Company.

Section 2. Exercise.

a) Exercise of the purchase rights represented by this Warrant may be made, in whole or in part, at any time or times on or after the Initial Exercise Date and on or before the Termination Date by delivery to the Company (or such other office or agency of the Company as it may designate by notice in writing to the registered Holder at the address of the Holder appearing on the books of the Company) of a duly executed facsimile copy (or e-mail attachment) of the Notice of Exercise Form annexed hereto. Within two (2) Trading Days following the date of exercise as aforesaid, the Holder shall deliver the aggregate Exercise Price for the shares specified in the applicable Notice of Exercise by wire transfer or cashier's check drawn on a United States bank unless the cashless exercise procedure specified in Section 2(c) is specified in the applicable Notice of Exercise. No ink-original Notice of Exercise shall be required, nor shall any medallion guarantee (or other type of guarantee or notarization) of any Notice of Exercise form be required. Notwithstanding anything herein to the contrary, the Holder shall not be required to physically surrender this Warrant to the Company until the Holder has purchased all of the Warrant Shares available hereunder and the Warrant has been exercised in full, in which case, the Holder shall surrender this Warrant to the Company for cancellation within five (5) Trading Days of the date the final Notice of Exercise is delivered to the Company. Partial exercises of this Warrant resulting in purchases of a portion of the total number of Warrant Shares available hereunder shall have the effect of lowering the outstanding number of Warrant Shares purchasable hereunder in an amount equal to the applicable number of Warrant Shares purchased. The Holder and the Company shall maintain records showing the number of Warrant Shares purchased and the date of such purchases. The Company shall deliver any objection to any Notice of Exercise Form within two (2) Business Days of receipt of such notice. **The Holder and any assignee, by acceptance of this Warrant, acknowledge and agree that, by reason of the provisions of this paragraph, following the purchase of a portion of the Warrant Shares hereunder, the number of Warrant Shares available for purchase hereunder at any given time may be less than the amount stated on the face hereof.**

b) Exercise Price. The exercise price per share of the Common Stock under this Warrant shall be \$_____¹, subject to adjustment hereunder (the "**Exercise Price**").

c) Cashless Exercise. In lieu of exercising this Warrant by delivering the aggregate Exercise Price by wire transfer or cashier's check, at the election of the Holder this Warrant may also be exercised, in whole or in part, at such time by means of a "cashless exercise" in which the Holder shall be entitled to receive the number of Warrant Shares equal to the quotient obtained by dividing [(A-B) (X)] by (A), where:

(A) = as applicable: (i) the VWAP on the Trading Day immediately preceding the date of the applicable Notice of Exercise if such Notice of Exercise is (1) both executed and delivered pursuant to Section 2(a) on a day that is not a Trading Day or (2) both executed and delivered pursuant to Section 2(a) on a Trading Day prior to the opening of "regular trading hours" (as defined in Rule 600(b)(64) of Regulation NMS promulgated under the federal securities laws) on such Trading Day, (ii) the VWAP on the Trading Day immediately preceding the date of the applicable Notice of Exercise if such Notice of Exercise is executed during "regular trading hours" on a Trading Day and is delivered within two (2) hours thereafter (including until two (2) hours after the close of "regular trading hours" on a Trading Day) pursuant to Section 2(a) or (iii) the VWAP on the date of the applicable Notice of Exercise if the date of such Notice of Exercise is a Trading Day and such Notice of Exercise is both executed and delivered pursuant to Section 2(a) after the close of "regular trading hours" on such Trading Day;

¹ 125% of the public offering price per share of common stock in the offering.

(B)=the Exercise Price of this Warrant, as adjusted hereunder; and

(X)=the number of Warrant Shares that would be issuable upon exercise of this Warrant in accordance with the terms of this Warrant if such exercise were by means of a cash exercise rather than a cashless exercise.

If Warrant Shares are issued in such a “cashless exercise,” the parties acknowledge and agree that in accordance with Section 3(a)(9) of the Securities Act, the Warrant Shares shall take on the registered characteristics of the Warrants being exercised, and the holding period of the Warrants being exercised may be tacked on to the holding period of the Warrant Shares. The Company agrees not to take any position contrary to this Section 2(c).

Notwithstanding anything herein to the contrary, on the Termination Date, this Warrant shall be automatically exercised via cashless exercise pursuant to this Section 2(c).

d) Mechanics of Exercise.

(i) Delivery of Warrant Shares Upon Exercise. The Company shall cause the Warrant Shares purchased hereunder to be transmitted by its transfer agent to the Holder by crediting the account of the Holder’s or its designee’s balance account with The Depository Trust Company through its Deposit or Withdrawal at Custodian system (“**DWAC**”) if the Company is then a participant in such system and either (A) there is an effective registration statement permitting the issuance of the Warrant Shares to or resale of the Warrant Shares by Holder, or (B) the Warrant Shares are eligible for resale by the Holder without volume or manner-of-sale limitations pursuant to Rule 144 and, in either case, the Warrant Shares have been sold by the Holder prior to the Warrant Share Delivery Date (as defined below), and otherwise by physical delivery of a certificate, registered in the Company’s share register in the name of the Holder or its designee, for the number of Warrant Shares to which the Holder is entitled pursuant to such exercise to the address specified by the Holder in the Notice of Exercise by the date that is two (2) Trading Days after the delivery to the Company of the Notice of Exercise (such date, the “**Warrant Share Delivery Date**”). If the Warrant Shares can be delivered via DWAC, the transfer agent shall have received from the Company, at the expense of the Company, any legal opinions or other documentation required by it to deliver such Warrant Shares without legend (subject to receipt by the Company of reasonable back up documentation from the Holder, including with respect to affiliate status) and, if applicable and requested by the Company prior to the Warrant Share Delivery Date, the transfer agent shall have received from the Holder a confirmation of sale of the Warrant Shares (provided the requirement of the Holder to provide a confirmation as to the sale of Warrant Shares shall not be applicable to the issuance of unlegended Warrant Shares upon a cashless exercise of this Warrant if the Warrant Shares are then eligible for resale pursuant to Rule 144(b)(1)). The Warrant Shares shall be deemed to have been issued, and Holder or any other person so designated to be named therein shall be deemed to have become a holder of record of such shares for all purposes, as of the date the Warrant has been exercised, with payment to the Company of the Exercise Price (or by cashless exercise, if permitted) and all taxes required to be paid by the Holder, if any, pursuant to Section 2(d)(vi) prior to the issuance of such shares, having been paid. If the Company fails for any reason to deliver to the Holder the Warrant Shares subject to a Notice of Exercise by the second Trading Day following the Warrant Share Delivery Date, the Company shall pay to the Holder, in cash, as liquidated damages and not as a penalty, for each \$1,000 of Warrant Shares subject to such exercise (based on the VWAP of the Common Stock on the date of the applicable Notice of Exercise), \$10 per Trading Day (increasing to \$20 per Trading Day on the fifth Trading Day after such liquidated damages begin to accrue) for each Trading Day after the second Trading Day following such Warrant Share Delivery Date until such Warrant Shares are delivered or Holder rescinds such exercise.

(ii) Delivery of New Warrants Upon Exercise. If this Warrant shall have been exercised in part, the Company shall, at the request of a Holder and upon surrender of this Warrant certificate, at the time of delivery of the Warrant Shares, deliver to the Holder a new Warrant evidencing the rights of the Holder to purchase the unpurchased Warrant Shares called for by this Warrant, which new Warrant shall in all other respects be identical with this Warrant.

(iii) Rescission Rights. If the Company fails to cause its transfer agent to deliver to the Holder the Warrant Shares pursuant to Section 2(d)(i) by the Warrant Share Delivery Date, then the Holder will have the right to rescind such exercise; *provided, however*, that the Holder shall be required to return any Warrant Shares or Common Stock subject to any such rescinded exercise notice concurrently with the return to Holder of the aggregate Exercise Price paid to the Company for such Warrant Shares and the restoration of Holder's right to acquire such Warrant Shares pursuant to this Warrant (including, issuance of a replacement warrant certificate evidencing such restored right).

(iv) Compensation for Buy-In on Failure to Timely Deliver Warrant Shares Upon Exercise. In addition to any other rights available to the Holder, if the Company fails to cause its transfer agent to transmit to the Holder the Warrant Shares pursuant to an exercise on or before the Warrant Share Delivery Date, and if after such date the Holder is required by its broker to purchase (in an open market transaction or otherwise) or the Holder's brokerage firm otherwise purchases, shares of Common Stock to deliver in satisfaction of a sale by the Holder of the Warrant Shares which the Holder anticipated receiving upon such exercise (a "**Buy-In**"), then the Company shall (A) pay in cash to the Holder the amount, if any, by which (x) the Holder's total purchase price (including brokerage commissions, if any) for the shares of Common Stock so purchased exceeds (y) the amount obtained by multiplying (1) the number of Warrant Shares that the Company was required to deliver to the Holder in connection with the exercise at issue times (2) the price at which the sell order giving rise to such purchase obligation was executed, and (B) at the option of the Holder, either reinstate the portion of the Warrant and equivalent number of Warrant Shares for which such exercise was not honored (in which case such exercise shall be deemed rescinded) or deliver to the Holder the number of shares of Common Stock that would have been issued had the Company timely complied with its exercise and delivery obligations hereunder. For example, if the Holder purchases Common Stock having a total purchase price of \$11,000 to cover a Buy-In with respect to an attempted exercise of shares of Common Stock with an aggregate sale price giving rise to such purchase obligation of \$10,000, under clause (A) of the immediately preceding sentence the Company shall be required to pay the Holder \$1,000. The Holder shall provide the Company written notice indicating the amounts payable to the Holder in respect of the Buy-In and, upon request of the Company, evidence of the amount of such loss. Nothing herein shall limit a Holder's right to pursue any other remedies available to it hereunder, at law or in equity including, without limitation, a decree of specific performance and/or injunctive relief with respect to the Company's failure to timely deliver shares of Common Stock upon exercise of the Warrant as required pursuant to the terms hereof.

(v) No Fractional Shares or Scrip. No fractional shares or scrip representing fractional shares shall be issued upon the exercise of this Warrant. As to any fraction of a share which the Holder would otherwise be entitled to purchase upon such exercise, the Company shall, at its election, either pay a cash adjustment in respect of such final fraction in an amount equal to such fraction multiplied by the Exercise Price or round up to the next whole share.

(vi) Charges, Taxes and Expenses. Issuance of Warrant Shares shall be made without charge to the Holder for any issue or transfer tax or other incidental expense in respect of the issuance of such Warrant Shares, all of which taxes and expenses shall be paid by the Company, and such Warrant Shares shall be issued in the name of the Holder or in such name or names as may be directed by the Holder; *provided, however*, that in the event that Warrant Shares are to be issued in a name other than the name of the Holder, this Warrant when surrendered for exercise shall be accompanied by the Assignment Form attached hereto duly executed by the Holder and the Company may require, as a condition thereto, the payment of a sum sufficient to reimburse it for any transfer tax incidental thereto. The Company shall pay all transfer agent fees required for same-day processing of any Notice of Exercise and all fees to the Depository Trust Company (or another established clearing corporation performing similar functions) required for same-day electronic delivery of the Warrant Shares.

(vii) Closing of Books. The Company will not close its stockholder books or records in any manner which prevents the timely exercise of this Warrant, pursuant to the terms hereof.

(viii) Signature. This Section 2 and the exercise form attached hereto set forth the totality of the procedures required of the Holder in order to exercise this Warrant. Without limiting the preceding sentences, no ink-original exercise form shall be required, nor shall any medallion guarantee (or other type of guarantee or notarization) of any exercise form be required in order to exercise this Warrant. No additional legal opinion, other information or instructions shall be required of the Holder to exercise this Warrant. The Company shall honor exercises of this Warrant and shall deliver Shares underlying this Warrant in accordance with the terms, conditions and time periods set forth herein.

e) Holder's Exercise Limitations. The Company shall not effect any exercise of this Warrant, and a Holder shall not have the right to exercise any portion of this Warrant, pursuant to Section 2 or otherwise, to the extent that after giving effect to such issuance after exercise as set forth on the applicable Notice of Exercise, the Holder (together with the Holder's Affiliates, and any other Persons acting as a group together with the Holder or any of the Holder's Affiliates), would beneficially own in excess of the Beneficial Ownership Limitation (as defined below). For purposes of the foregoing sentence, the number of shares of Common Stock beneficially owned by the Holder and its Affiliates shall include the number of shares of Common Stock issuable upon exercise of this Warrant with respect to which such determination is being made, but shall exclude the number of shares of Common Stock which would be issuable upon (i) exercise of the remaining, nonexercised portion of this Warrant beneficially owned by the Holder or any of its Affiliates and (ii) exercise or conversion of the unexercised or nonconverted portion of any other securities of the Company (including, without limitation, any other Common Stock Equivalents) subject to a limitation on conversion or exercise analogous to the limitation contained herein beneficially owned by the Holder or any of its Affiliates. Except as set forth in the preceding sentence, for purposes of this Section 2(e), beneficial ownership shall be calculated in accordance with Section 13(d) of the Exchange Act and the rules and regulations promulgated thereunder, it being acknowledged by the Holder that the Company is not representing to the Holder that such calculation is in compliance with Section 13(d) of the Exchange Act and the Holder is solely responsible for any schedules required to be filed in accordance therewith. To the extent that the limitation contained in this Section 2(e) applies, the determination of whether this Warrant is exercisable (in relation to other securities owned by the Holder together with any Affiliates) and of which portion of this Warrant is exercisable shall be in the sole discretion of the Holder, and the submission of a Notice of Exercise shall be deemed to be the Holder's determination of whether this Warrant is exercisable (in relation to other securities owned by the Holder together with any Affiliates) and of which portion of this Warrant is exercisable, in each case subject to the Beneficial Ownership Limitation, and the Company shall have no obligation to verify or confirm the accuracy of such determination. In addition, a determination as to any group status as contemplated above shall be determined in accordance with Section 13(d) of the Exchange Act and the rules and regulations promulgated thereunder. For purposes of this Section 2(e), in determining the number of outstanding shares of Common Stock, a Holder may rely on the number of outstanding shares of Common Stock as reflected in (A) the Company's most recent periodic or annual report filed with the Commission, as the case may be, (B) a more recent public announcement by the Company or (C) a more recent written notice by the Company or the Company's transfer agent setting forth the number of shares of Common Stock outstanding. Upon the written or oral request of a Holder, the Company shall within two Trading Days confirm orally and in writing to the Holder the number of shares of Common Stock then outstanding. In any case, the number of outstanding shares of Common Stock shall be determined after giving effect to the conversion or exercise of securities of the Company, including this Warrant, by the Holder or its Affiliates since the date as of which such number of outstanding shares of Common Stock was reported. The "**Beneficial Ownership Limitation**" shall be 9.99% of the number of shares of the Common Stock outstanding immediately after giving effect to the issuance of shares of Common Stock issuable upon exercise of this Warrant. The Holder, upon notice to the Company, may increase or decrease the Beneficial Ownership Limitation provisions of this Section 2(e), provided that the Beneficial Ownership Limitation in no event exceeds 9.99% of the number of shares of the Common Stock outstanding immediately after giving effect to the issuance of shares of Common Stock upon exercise of this Warrant held by the Holder and the provisions of this Section 2(e) shall continue to apply. Any increase in the Beneficial Ownership Limitation will not be effective until the 61st day after such notice is delivered to the Company. The provisions of this paragraph shall be construed and implemented in a manner otherwise than in strict conformity with the terms of this Section 2(e) to correct this paragraph (or any portion hereof) which may be defective or inconsistent with the intended Beneficial Ownership Limitation herein contained or to make changes or supplements necessary or desirable to properly give effect to such limitation. The limitations contained in this paragraph shall apply to a successor holder of this Warrant.

Section 3. Certain Adjustments.

a) Stock Dividends and Splits. If the Company, at any time while this Warrant is outstanding: (i) pays a stock dividend or otherwise makes a distribution or distributions on shares of its Common Stock or any other equity or equity equivalent securities payable in shares of Common Stock (which, for avoidance of doubt, shall not include any shares of Common Stock issued by the Company upon exercise of this Warrant), (ii) subdivides outstanding shares of Common Stock into a larger number of shares, (iii) combines (including by way of reverse stock split) outstanding shares of Common Stock into a smaller number of shares, or (iv) issues by reclassification of shares of the Common Stock any shares of capital stock of the Company, then in each case the Exercise Price shall be multiplied by a fraction of which the numerator shall be the number of shares of Common Stock (excluding treasury shares, if any) outstanding immediately before such event and of which the denominator shall be the number of shares of Common Stock outstanding immediately after such event, and the number of shares issuable upon exercise of this Warrant shall be proportionately adjusted such that the aggregate Exercise Price of this Warrant shall remain unchanged. Any adjustment made pursuant to this Section 3(a) shall become effective immediately after the record date for the determination of stockholders entitled to receive such dividend or distribution and shall become effective immediately after the effective date in the case of a subdivision, combination or reclassification. For the purposes of clarification, the Exercise Price of this Warrant will not be adjusted in the event that the Company or any Subsidiary thereof, as applicable, sells or grants any option to purchase, or sell or grant any right to repurchase, or otherwise dispose of or issue (or announce any offer, sale, grant or any option to purchase or other disposition) any Common Stock or Common Stock Equivalents, at an effective price per share less than the Exercise Price then in effect.

b) [RESERVED]

c) Subsequent Rights Offerings. In addition to any adjustments pursuant to Section 3(a), if at any time the Company grants, issues or sells any Common Stock Equivalents or rights to purchase stock, warrants, securities or other property pro rata to the record holders of any class of shares of Common Stock (the "**Purchase Rights**"), then the Holder will be entitled to acquire, upon the terms applicable to such Purchase Rights, the aggregate Purchase Rights which the Holder could have acquired if the Holder had held the number of shares of Common Stock acquirable upon complete exercise of this Warrant (without regard to any limitations on exercise hereof, including without limitation, the Beneficial Ownership Limitation) immediately before the date on which a record is taken for the grant, issuance or sale of such Purchase Rights, or, if no such record is taken, the date as of which the record holders of shares of Common Stock are to be determined for the grant, issue or sale of such Purchase Rights (*provided, however,* to the extent that the Holder's right to participate in any such Purchase Right would result in the Holder exceeding the Beneficial Ownership Limitation, then the Holder shall not be entitled to participate in such Purchase Right to such extent (or beneficial ownership of such shares of Common Stock as a result of such Purchase Right to such extent) and such Purchase Right to such extent shall be held in abeyance for the Holder until such time, if ever, as its right thereto would not result in the Holder exceeding the Beneficial Ownership Limitation).

d) Pro Rata Distributions. During such time as this Warrant is outstanding, if the Company shall declare or make any dividend (other than cash dividends) or other distribution of its assets (or rights to acquire its assets) to holders of shares of Common Stock, by way of return of capital or otherwise (including, without limitation, any distribution of shares or other securities, property or options by way of a dividend, spin off, reclassification, corporate rearrangement, scheme of arrangement or other similar transaction) (a "**Distribution**"), at any time after the issuance of this Warrant, then, in each such case, the Holder shall be entitled to participate in such Distribution to the same extent that the Holder would have participated therein if the Holder had held the number of shares of Common Stock acquirable upon complete exercise of this Warrant (without regard to any limitations on exercise hereof, including without limitation, the Beneficial Ownership Limitation) immediately before the date of which a record is taken for such Distribution, or, if no such record is taken, the date as of which the record holders of shares of Common Stock are to be determined for the participation in such Distribution (*provided, however,* to the extent that the Holder's right to participate in any such Distribution would result in the Holder exceeding the Beneficial Ownership Limitation, then the Holder shall not be entitled to participate in such Distribution to such extent (or in the beneficial ownership of any shares of Common Stock as a result of such Distribution to such extent) and the portion of such Distribution shall be held in abeyance for the benefit of the Holder until such time, if ever, as its right thereto would not result in the Holder exceeding the Beneficial Ownership Limitation). To the extent that this Warrant has not been partially or completely exercised at the time of such Distribution, such portion of the Distribution shall be held in abeyance for the benefit of the Holder until the Holder has exercised this Warrant.

e) Fundamental Transaction. If, at any time while this Warrant is outstanding, (i) the Company, directly or indirectly, in one or more related transactions effects any merger or consolidation of the Company with or into another Person, (ii) the Company, directly or indirectly, effects any sale, lease, license, assignment, transfer, conveyance or other disposition of all or substantially all of its assets in one or a series of related transactions, (iii) any, direct or indirect, purchase offer, tender offer or exchange offer (whether by the Company or another Person) is completed pursuant to which holders of Common Stock are permitted to sell, tender or exchange their shares for other securities, cash or property and has been accepted by the holders of 50% or more of the outstanding Common Stock, (iv) the Company, directly or indirectly, in one or more related transactions effects any reclassification, reorganization or recapitalization of the Common Stock or any compulsory share exchange pursuant to which the Common Stock is effectively converted into or exchanged for other securities, cash or property, or (v) the Company, directly or indirectly, in one or more related transactions consummates a stock or share purchase agreement or other business combination (including, without limitation, a reorganization, recapitalization, spin-off or scheme of arrangement) with another Person or group of Persons whereby such other Person or group acquires more than 50% of the outstanding shares of Common Stock (not including any shares of Common Stock held by the other Person or other Persons making or party to, or associated or affiliated with the other Persons making or party to, such stock or share purchase agreement or other business combination) (each a “**Fundamental Transaction**”), then, upon any subsequent exercise of this Warrant, the Holder shall have the right to receive, for each Warrant Share that would have been issuable upon such exercise immediately prior to the occurrence of such Fundamental Transaction, at the option of the Holder (without regard to any limitation in Section 2(e) on the exercise of this Warrant), the number of shares of Common Stock of the successor or acquiring corporation or of the Company, if it is the surviving corporation, and any additional consideration (the “**Alternate Consideration**”) receivable by holders of Common Stock as a result of such Fundamental Transaction for each share of Common Stock for which this Warrant is exercisable immediately prior to such Fundamental Transaction (without regard to any limitation in Section 2(e) on the exercise of this Warrant). For purposes of any such exercise, the determination of the Exercise Price shall be appropriately adjusted to apply to such Alternate Consideration based on the amount of Alternate Consideration issuable in respect of one share of Common Stock in such Fundamental Transaction, and the Company shall apportion the Exercise Price among the Alternate Consideration in a reasonable manner reflecting the relative value of any different components of the Alternate Consideration. If holders of Common Stock are given any choice as to the securities, cash or property to be received in a Fundamental Transaction, then the Holder shall be given the same choice as to the Alternate Consideration it receives upon any exercise of this Warrant following such Fundamental Transaction. The Company shall cause any successor entity in a Fundamental Transaction in which the Company is not the survivor (the “**Successor Entity**”) to assume in writing all of the obligations of the Company under this Warrant in accordance with the provisions of this Section 3(e) pursuant to written agreements in form and substance reasonably satisfactory to the Holder and approved by the Holder (without unreasonable delay) prior to such Fundamental Transaction and shall, at the option of the Holder, deliver to the Holder in exchange for this Warrant a security of the Successor Entity evidenced by a written instrument substantially similar in form and substance to this Warrant which is exercisable for a corresponding number of shares of capital stock of such Successor Entity (or its parent entity) equivalent to the shares of Common Stock acquirable and receivable upon exercise of this Warrant (without regard to any limitations on the exercise of this Warrant) prior to such Fundamental Transaction, and with an exercise price which applies the exercise price hereunder to such shares of capital stock (but taking into account the relative value of the shares of Common Stock pursuant to such Fundamental Transaction and the value of such shares of capital stock, such number of shares of capital stock and such exercise price being for the purpose of protecting the economic value of this Warrant immediately prior to the consummation of such Fundamental Transaction), and which is reasonably satisfactory in form and substance to the Holder. Upon the occurrence of any such Fundamental Transaction, the Successor Entity shall succeed to, and be substituted for (so that from and after the date of such Fundamental Transaction, the provisions of this Warrant referring to the “Company” shall refer instead to the Successor Entity), and may exercise every right and power of the Company and shall assume all of the obligations of the Company under this Warrant with the same effect as if such Successor Entity had been named as the Company herein.

f) Calculations. All calculations under this Section 3 shall be made to the nearest cent or the nearest 1/100th of a share, as the case may be. For purposes of this Section 3, the number of shares of Common Stock deemed to be issued and outstanding as of a given date shall be the sum of the number of shares of Common Stock (excluding treasury shares, if any) issued and outstanding.

g) Notice to Holder.

(i) Adjustment to Exercise Price. Whenever the Exercise Price is adjusted pursuant to any provision of this Section 3, the Company shall promptly mail to the Holder a notice setting forth the Exercise Price after such adjustment and any resulting adjustment to the number of Warrant Shares and setting forth a brief statement of the facts requiring such adjustment.

- (ii) Notice to Allow Exercise by Holder. If (A) the Company shall declare a dividend (or any other distribution in whatever form) on the Common Stock, (B) the Company shall declare a special nonrecurring cash dividend on or a redemption of the Common Stock, (C) the Company shall authorize the granting to all holders of the Common Stock rights or warrants to subscribe for or purchase any shares of capital stock of any class or of any rights, (D) the approval of any stockholders of the Company shall be required in connection with any reclassification of the Common Stock, any consolidation or merger to which the Company is a party, any sale or transfer of all or substantially all of the assets of the Company, or any compulsory share exchange whereby the Common Stock is converted into other securities, cash or property, or (E) the Company shall authorize the voluntary or involuntary dissolution, liquidation or winding up of the affairs of the Company, then, in each case, the Company shall cause to be mailed a notice to the Holder at its last address as it shall appear upon the Warrant Register of the Company, at least 20 calendar days prior to the applicable record or effective date hereinafter specified, stating (x) the date on which a record is to be taken for the purpose of such dividend, distribution, redemption, rights or warrants, or if a record is not to be taken, the date as of which the holders of the Common Stock of record to be entitled to such dividend, distributions, redemption, rights or warrants are to be determined or (y) the date on which such reclassification, consolidation, merger, sale, transfer or share exchange is expected to become effective or close, and the date as of which it is expected that holders of the Common Stock of record shall be entitled to exchange their shares of the Common Stock for securities, cash or other property deliverable upon such reclassification, consolidation, merger, sale, transfer or share exchange; provided that the failure to provide such notice or any defect therein shall not affect the validity of the corporate action required to be specified in such notice. To the extent that any notice provided hereunder constitutes, or contains, material, non-public information regarding the Company or any of the Subsidiaries, the Company shall simultaneously file such notice with the Commission pursuant to a Current Report on Form 8-K. The Holder shall remain entitled to exercise this Warrant during the period commencing on the date of such notice to the effective date of the event triggering such notice except as may otherwise be expressly set forth herein.

Section 4. Transfer of Warrant.

a) Transferability. Pursuant to FINRA Rule 5110(e)(1), neither this Warrant nor any Warrant Shares issued upon exercise of this Warrant shall be sold, transferred, assigned, pledged, or hypothecated, or be the subject of any hedging, short sale, derivative, put, or call transaction that would result in the effective economic disposition of the securities by any person for a period of 180 days immediately following the date of effectiveness or commencement of sales of the offering pursuant to which this Warrant is being issued, except the transfer of any security:

- i. by operation of law or by reason of reorganization of the Company;
- ii. to any FINRA member firm participating in the offering and the officers or partners thereof, if all securities so transferred remain subject to the lock-up restriction in this Section 4(a) for the remainder of the time period;
- iii. if the aggregate amount of securities of the Company held by the Holder or related person do not exceed 1% of the securities being offered;
- iv. that is beneficially owned on a pro-rata basis by all equity owners of an investment fund, provided that no participating member manages or otherwise directs investments by the fund, and participating members in the aggregate do not own more than 10% of the equity in the fund; or
- v. the exercise or conversion of any security, if all securities received remain subject to the lock-up restriction in this Section 4(a) for the remainder of the time period.

Subject to the foregoing restriction, any applicable securities laws and the conditions set forth in Section 4(d), this Warrant and all rights hereunder (including, without limitation, any registration rights) are transferable, in whole or in part, upon surrender of this Warrant at the principal office of the Company or its designated agent, together with a written assignment of this Warrant substantially in the form attached hereto duly executed by the Holder or its agent or attorney and funds sufficient to pay any transfer taxes payable upon the making of such transfer. Upon such surrender and, if required, such payment, the Company shall execute and deliver a new Warrant or Warrants in the name of the assignee or assignees, as applicable, and in the denomination or denominations specified in such instrument of assignment, and shall issue to the assignor a new Warrant evidencing the portion of this Warrant not so assigned, and this Warrant shall promptly be cancelled. Notwithstanding anything herein to the contrary, the Holder shall not be required to physically surrender this Warrant to the Company unless the Holder has assigned this Warrant in full, in which case, the Holder shall surrender this Warrant to the Company within three (3) Trading Days of the date the Holder delivers an assignment form to the Company assigning this Warrant full. The Warrant, if properly assigned in accordance herewith, may be exercised by a new holder for the purchase of Warrant Shares without having a new Warrant issued.

b) New Warrants. This Warrant may be divided or combined with other Warrants upon presentation hereof at the aforesaid office of the Company, together with a written notice specifying the names and denominations in which new Warrants are to be issued, signed by the Holder or its agent or attorney. Subject to compliance with Section 4(a), as to any transfer which may be involved in such division or combination, the Company shall execute and deliver a new Warrant or Warrants in exchange for the Warrant or Warrants to be divided or combined in accordance with such notice. All Warrants issued on transfers or exchanges shall be dated the initial issuance date of this Warrant and shall be identical with this Warrant except as to the number of Warrant Shares issuable pursuant thereto.

c) Warrant Register. The Company shall register this Warrant, upon records to be maintained by the Company for that purpose (the "**Warrant Register**"), in the name of the record Holder hereof from time to time. The Company may deem and treat the registered Holder of this Warrant as the absolute owner hereof for the purpose of any exercise hereof or any distribution to the Holder, and for all other purposes, absent actual notice to the contrary.

d) Representation by the Holder. The Holder, by the acceptance hereof, represents and warrants that it is acquiring this Warrant and, upon any exercise hereof, will acquire the Warrant Shares issuable upon such exercise, for its own account and not with a view to or for distributing or reselling such Warrant Shares or any part thereof in violation of the Securities Act or any applicable state securities law, except pursuant to sales registered or exempted under the Securities Act.

Section 5. Registration Rights.

5.1. Demand Registration.

5.1.1 Grant of Right. The Company, upon written demand (a "**Demand Notice**") of the Holder(s) of at least 51% of the Warrants and/or the underlying Warrant Shares ("**Majority Holders**"), agrees to register, on one occasion, all or any portion of the Warrant Shares underlying the Warrants (collectively, the "**Registrable Securities**"). On such occasion, the Company will file a registration statement with the Commission covering the Registrable Securities within sixty (60) days after receipt of a Demand Notice and use its reasonable best efforts to have the registration statement declared effective promptly thereafter, subject to compliance with review by the Commission; *provided, however*, that the Company shall not be required to comply with a Demand Notice if the Company has filed a registration statement with respect to which the Holder is entitled to piggyback registration rights pursuant to Section 5.2 and either: (i) the Holder has elected to participate in the offering covered by such registration statement or (ii) if such registration statement relates to an underwritten primary offering of securities of the Company, until the offering covered by such registration statement has been withdrawn or until thirty (30) days after such offering is consummated. The demand for registration may be made at any time beginning on the Initial Exercise Date and expiring on the fifth anniversary of the Effective Date. The Company covenants and agrees to give written notice of its receipt of any Demand Notice by any Holder(s) to all other registered Holders of the Warrants and/or the Registrable Securities within ten (10) days after the date of the receipt of any such Demand Notice.

5.1.2 Terms. The Company shall bear all fees and expenses attendant to the registration of the Registrable Securities pursuant to Section 5.1.1, but the Holders shall pay any and all underwriting commissions and the expenses of any legal counsel selected by the Holders to represent them in connection with the sale of the Registrable Securities. The Company agrees to use its reasonable best efforts to cause the filing required herein to become effective promptly and to qualify or register the Registrable Securities in such States as are reasonably requested by the Holder(s); *provided, however*, that in no event shall the Company be required to register the Registrable Securities in a State in which such registration would cause: (i) the Company to be obligated to register or license to do business in such State or submit to general service of process in such State, or (ii) the principal shareholders of the Company to be obligated to escrow their shares of capital stock of the Company. The Company shall cause any registration statement filed pursuant to the demand right granted under Section 5.1.1 to remain effective for a period of at least twelve (12) consecutive months after the date that the Holders of the Registrable Securities covered by such registration statement are first given the opportunity to sell all of such securities. The Holders shall only use the prospectuses provided by the Company to sell the Warrant Shares covered by such registration statement, and will immediately cease to use any prospectus furnished by the Company if the Company advises the Holder that such prospectus may no longer be used due to a material misstatement or omission. Notwithstanding the provisions of this Section 5.1.2, the Holder shall be entitled to a demand registration under this Section 5.1.2 on only one (1) occasion and such demand registration right shall terminate on the fifth anniversary of the date of the Underwriting Agreement (as defined below) in accordance with FINRA Rules 5110(g)(8)(B) and 5110(g)(8)(C).

5.2 “Piggy-Back” Registration

5.2.1 Grant of Right. In addition to the demand right of registration described in Section 5.1, the Holder shall have the right, for a period of no more than two (2) years from the Initial Exercise Date in accordance with FINRA Rule 5110(g)(8)(D), to include the Registrable Securities as part of any other registration of securities filed by the Company (other than in connection with a transaction contemplated by Rule 145(a) promulgated under the Securities Act or pursuant to Form S-8 or any equivalent form); *provided, however*, that if, solely in connection with any primary underwritten public offering for the account of the Company, the managing underwriter(s) thereof shall, in its reasonable discretion, impose a limitation on the number of Shares which may be included in the Registration Statement because, in such underwriter(s)' judgment, marketing or other factors dictate such limitation is necessary to facilitate public distribution, then the Company shall be obligated to include in such Registration Statement only such limited portion of the Registrable Securities with respect to which the Holder requested inclusion hereunder as the underwriter shall reasonably permit. Any exclusion of Registrable Securities shall be made pro rata among the Holders seeking to include Registrable Securities in proportion to the number of Registrable Securities sought to be included by such Holders; *provided, however*, that the Company shall not exclude any Registrable Securities unless the Company has first excluded all outstanding securities, the holders of which are not entitled to inclusion of such securities in such Registration Statement or are not entitled to pro rata inclusion with the Registrable Securities.

5.2.2 Terms. The Company shall bear all fees and expenses attendant to registering the Registrable Securities pursuant to Section 5.2.1, but the Holders shall pay any and all underwriting commissions and the expenses of any legal counsel selected by the Holders to represent them in connection with the sale of the Registrable Securities. In the event of such a proposed registration, the Company shall furnish the then Holders of outstanding Registrable Securities with not less than thirty (30) days written notice prior to the proposed date of filing of such registration statement. Such notice to the Holders shall continue to be given for each registration statement filed by the Company during the two (2) year period following the Initial Exercise Date until such time as all of the Registrable Securities have been sold by the Holder. The holders of the Registrable Securities shall exercise the “piggy-back” rights provided for herein by giving written notice within ten (10) days of the receipt of the Company’s notice of its intention to file a registration statement. Except as otherwise provided in this Warrant, there shall be no limit on the number of times the Holder may request registration under this Section 5.2.2; *provided, however*, that such registration rights shall terminate on the second anniversary of the Initial Exercise Date.

5.3 General Terms

5.3.1 Indemnification. The Company shall indemnify the Holder(s) of the Registrable Securities to be sold pursuant to any registration statement hereunder and each person, if any, who controls such Holders within the meaning of Section 15 of the Securities Act or Section 20 (a) of the Exchange Act against all loss, claim, damage, expense or liability (including all reasonable attorneys’ fees and other expenses reasonably incurred in investigating, preparing or defending against any claim whatsoever) to which any of them may become subject under the Securities Act, the Exchange Act or otherwise, arising from such registration statement but only to the same extent and with the same effect as the provisions pursuant to which the Company has agreed to indemnify the Underwriters contained in Section 5.1 of the Underwriting Agreement between the Underwriters and the Company, dated as of [___], 2023. The Holder(s) of the Registrable Securities to be sold pursuant to such registration statement, and their successors and assigns, shall severally, and not jointly, indemnify the Company, against all loss, claim, damage, expense or liability (including all reasonable attorneys’ fees and other expenses reasonably incurred in investigating, preparing or defending against any claim whatsoever) to which they may become subject under the Securities Act, the Exchange Act or otherwise, arising from information furnished by or on behalf of such Holders, or their successors or assigns, in writing, for specific inclusion in such registration statement to the same extent and with the same effect as the provisions contained in Section 5.2 of the Underwriting Agreement pursuant to which the Underwriters have agreed to indemnify the Company.

5.3.2 Exercise of Warrants. Nothing contained in this Warrant shall be construed as requiring the Holder(s) to exercise their Warrants prior to or after the initial filing of any registration statement or the effectiveness thereof.

5.3.3 Documents Delivered to Holders. The Company shall furnish to each Holder participating in any of the foregoing offerings and to each underwriter of any such offering, if any, a signed counterpart, addressed to such Holder or underwriter, of: (i) an opinion of counsel to the Company, dated the effective date of such registration statement (and, if such registration includes an underwritten public offering, an opinion dated the date of the closing under any underwriting agreement related thereto), and (ii) a “cold comfort” letter dated the effective date of such registration statement (and, if such registration includes an underwritten public offering, a letter dated the date of the closing under the underwriting agreement) signed by the independent registered public accounting firm which has issued a report on the Company’s financial statements included in such registration statement, in each case covering substantially the same matters with respect to such registration statement (and the prospectus included therein) and, in the case of such accountants’ letter, with respect to events subsequent to the date of such financial statements, as are customarily covered in opinions of issuer’s counsel and in accountants’ letters delivered to underwriters in underwritten public offerings of securities. The Company shall also deliver promptly to each Holder participating in the offering requesting the correspondence and memoranda described below and to the managing underwriter, if any, copies of all correspondence between the Commission and the Company, its counsel or auditors and all memoranda relating to discussions with the Commission or its staff with respect to the registration statement and permit each Holder and underwriter to do such investigation, upon reasonable advance notice, with respect to information contained in or omitted from the registration statement as it deems reasonably necessary to comply with applicable securities laws or rules of FINRA. Such investigation shall include access to books, records and properties and opportunities to discuss the business of the Company with its officers and independent auditors, all to such reasonable extent and at such reasonable times as any such Holder shall reasonably request.

5.3.4 Underwriting Agreement. The Company shall enter into an underwriting agreement with the managing underwriter(s), if any, selected by any Holders whose Registrable Securities are being registered pursuant to this Section 5, which managing underwriter shall be reasonably satisfactory to the Company. Such agreement shall be reasonably satisfactory in form and substance to the Company, each Holder and such managing underwriters, and shall contain such representations, warranties and covenants by the Company and such other terms as are customarily contained in agreements of that type used by the managing underwriter. The Holders shall be parties to any underwriting agreement relating to an underwritten sale of their Registrable Securities and may, at their option, require that any or all the representations, warranties and covenants of the Company to or for the benefit of such underwriters shall also be made to and for the benefit of such Holders. Such Holders shall not be required to make any representations or warranties to or agreements with the Company or the underwriters except as they may relate to such Holders, their Warrant Shares and their intended methods of distribution.

5.3.5 Documents to be Delivered by Holder(s). Each of the Holder(s) participating in any of the foregoing offerings shall furnish to the Company a completed and executed questionnaire provided by the Company requesting information customarily sought of selling security holders.

5.3.6 Damages. Should the registration or the effectiveness thereof required by Sections 5.1 and 5.2 be delayed by the Company or the Company otherwise fails to comply with such provisions, the Holder(s) shall, in addition to any other legal or other relief available to the Holder(s), be entitled to obtain specific performance or other equitable (including injunctive) relief against the threatened breach of such provisions or the continuation of any such breach, without the necessity of proving actual damages and without the necessity of posting bond or other security.

Section 6. Miscellaneous.

a) No Rights as Stockholder Until Exercise. This Warrant does not entitle the Holder to any voting rights, dividends or other rights as a stockholder of the Company prior to the exercise hereof as set forth in Section 2(d)(i).

b) Loss, Theft, Destruction or Mutilation of Warrant. The Company covenants that upon receipt by the Company of evidence reasonably satisfactory to it of the loss, theft, destruction or mutilation of this Warrant or any certificate relating to the Warrant Shares, and in case of loss, theft or destruction, of indemnity or security reasonably satisfactory to it (which, in the case of the Warrant, shall not include the posting of any bond), and upon surrender and cancellation of such Warrant or stock certificate, if mutilated, the Company will make and deliver a new Warrant or stock certificate of like tenor and dated as of such cancellation, in lieu of such Warrant or stock certificate.

c) Saturdays, Sundays, Holidays, etc. If the last or appointed day for the taking of any action or the expiration of any right required or granted herein shall not be a Trading Day, then, such action may be taken or such right may be exercised on the next succeeding Trading Day.

d) Authorized Shares.

The Company covenants that, during the period the Warrant is outstanding, it will reserve from its authorized and unissued Common Stock a sufficient number of shares to provide for the issuance of the Warrant Shares upon the exercise of any purchase rights under this Warrant. The Company further covenants that its issuance of this Warrant shall constitute full authority to its officers who are charged with the duty of issuing the necessary Warrant Shares upon the exercise of the purchase rights under this Warrant. The Company will take all such reasonable action as may be necessary to assure that such Warrant Shares may be issued as provided herein without violation of any applicable law or regulation, or of any requirements of the Trading Market upon which the Common Stock may be listed. The Company covenants that all Warrant Shares which may be issued upon the exercise of the purchase rights represented by this Warrant will, upon exercise of the purchase rights represented by this Warrant and payment for such Warrant Shares in accordance herewith, be duly authorized, validly issued, fully paid and nonassessable and free from all taxes, liens and charges created by the Company in respect of the issue thereof (other than taxes in respect of any transfer occurring contemporaneously with such issue).

Except and to the extent as waived or consented to by the Holder, the Company shall not by any action, including, without limitation, amending its certificate of incorporation or through any reorganization, transfer of assets, consolidation, merger, dissolution, issue or sale of securities or any other voluntary action, avoid or seek to avoid the observance or performance of any of the terms of this Warrant, but will at all times in good faith assist in the carrying out of all such terms and in the taking of all such actions as may be necessary or appropriate to protect the rights of Holder as set forth in this Warrant against impairment. Without limiting the generality of the foregoing, the Company will (i) not increase the par value of any Warrant Shares above the amount payable therefor upon such exercise immediately prior to such increase in par value, (ii) take all such action as may be necessary or appropriate in order that the Company may validly and legally issue fully paid and nonassessable Warrant Shares upon the exercise of this Warrant and (iii) use commercially reasonable efforts to obtain all such authorizations, exemptions or consents from any public regulatory body having jurisdiction thereof, as may be, necessary to enable the Company to perform its obligations under this Warrant.

Before taking any action which would result in an adjustment in the number of Warrant Shares for which this Warrant is exercisable or in the Exercise Price, the Company shall obtain all such authorizations or exemptions thereof, or consents thereto, as may be necessary from any public regulatory body or bodies having jurisdiction thereof.

e) Jurisdiction. All questions concerning the construction, validity, enforcement and interpretation of this Warrant shall be determined in accordance with the provisions of the underwriting agreement, dated [___], 2023, by and between the Company and ThinkEquity LLC as representatives of the underwriters set forth therein (the “**Underwriting Agreement**”).

f) Restrictions. The Holder acknowledges that the Warrant Shares acquired upon the exercise of this Warrant, if not registered, and the Holder does not utilize cashless exercise, will have restrictions upon resale imposed by state and federal securities laws.

g) Nonwaiver and Expenses. No course of dealing or any delay or failure to exercise any right hereunder on the part of Holder shall operate as a waiver of such right or otherwise prejudice the Holder’s rights, powers or remedies. Without limiting any other provision of this Warrant or the Underwriting Agreement, if the Company willfully and knowingly fails to comply with any provision of this Warrant, which results in any material damages to the Holder, the Company shall pay to the Holder such amounts as shall be sufficient to cover any costs and expenses including, but not limited to, reasonable attorneys’ fees, including those of appellate proceedings, incurred by the Holder in collecting any amounts due pursuant hereto or in otherwise enforcing any of its rights, powers or remedies hereunder.

h) Notices. Any notice, request or other document required or permitted to be given or delivered to the Holder by the Company shall be delivered in accordance with the notice provisions of the Underwriting Agreement.

i) Limitation of Liability. No provision hereof, in the absence of any affirmative action by the Holder to exercise this Warrant to purchase Warrant Shares, and no enumeration herein of the rights or privileges of the Holder, shall give rise to any liability of the Holder for the purchase price of any Common Stock or as a stockholder of the Company, whether such liability is asserted by the Company or by creditors of the Company.

j) Remedies. The Holder, in addition to being entitled to exercise all rights granted by law, including recovery of damages, will be entitled to specific performance of its rights under this Warrant. The Company agrees that monetary damages would not be adequate compensation for any loss incurred by reason of a breach by it of the provisions of this Warrant and hereby agrees to waive and not to assert the defense in any action for specific performance that a remedy at law would be adequate.

k) Successors and Assigns. Subject to applicable securities laws, this Warrant and the rights and obligations evidenced hereby shall inure to the benefit of and be binding upon the successors and permitted assigns of the Company and the successors and permitted assigns of Holder. The provisions of this Warrant are intended to be for the benefit of any Holder from time to time of this Warrant and shall be enforceable by the Holder or holder of Warrant Shares.

l) Amendment. This Warrant may be modified or amended or the provisions hereof waived with the written consent of the Company and the Holder.

m) Severability. Wherever possible, each provision of this Warrant shall be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this Warrant shall be prohibited by or invalid under applicable law, such provision shall be ineffective to the extent of such prohibition or invalidity, without invalidating the remainder of such provisions or the remaining provisions of this Warrant.

n) Headings. The headings used in this Warrant are for the convenience of reference only and shall not, for any purpose, be deemed a part of this Warrant.

(Signature Page Follows)

IN WITNESS WHEREOF, the Company has caused this Warrant to be executed by its officer thereunto duly authorized as of the date first above indicated.

TRANSCODE THERAPEUTICS, INC.

By: _____
Name:
Title:

Ex. B-17

NOTICE OF EXERCISE

TO: TRANSCODE THERAPEUTICS, INC.

(1) The undersigned hereby elects to purchase _____ Warrant Shares of the Company pursuant to the terms of the attached Warrant (only if exercised in full), and tenders herewith payment of the exercise price in full, together with all applicable transfer taxes, if any.

(2) Payment shall take the form of (check applicable box):

in lawful money of the United States; or

if permitted the cancellation of such number of Warrant Shares as is necessary, in accordance with the formula set forth in subsection 2(c), to exercise this Warrant with respect to the maximum number of Warrant Shares purchasable pursuant to the cashless exercise procedure set forth in subsection 2(c).

(3) Please register and issue said Warrant Shares in the name of the undersigned or in such other name as is specified below:

The Warrant Shares shall be delivered to the following DWAC Account Number or by physical delivery of a certificate to:

(4) Accredited Investor. If the Warrant is being exercised via cash exercise, the undersigned is an “accredited investor” as defined in Regulation D promulgated under the Securities Act of 1933, as amended

[SIGNATURE OF HOLDER]

Name of Investing Entity: _____

Signature of Authorized Signatory of Investing Entity: _____

Name of Authorized
Signatory: _____

Title of Authorized Signatory: _____

Date: _____

ASSIGNMENT FORM

(To assign the foregoing warrant, execute this form and supply required information. Do not use this form to exercise the warrant.)

FOR VALUE RECEIVED, [____] all of or [_____] shares of the foregoing Warrant and all rights evidenced thereby are hereby assigned to

_____ whose address is

_____.

Dated: _____, _____

Holder's Signature: _____

Holder's Address: _____

NOTE: The signature to this Assignment Form must correspond with the name as it appears on the face of the Warrant, without alteration or enlargement or any change whatsoever. Officers of corporations and those acting in a fiduciary or other representative capacity should file proper evidence of authority to assign the foregoing Warrant.

EXHIBIT C

Lock-Up Agreement

[·], 2023

ThinkEquity LLC
17 State Street, 41st Floor
New York, NY 10004

As Representative of the several Underwriters named on Schedule 1 to the Underwriting Agreement referenced below

Ladies and Gentlemen:

The undersigned understands that ThinkEquity LLC (the “**Representative**”), proposes to enter into an Underwriting Agreement (the “**Underwriting Agreement**”) with TransCode Therapeutics, Inc., a Delaware corporation (the “**Company**”), providing for the public offering (the “**Public Offering**”) of shares of common stock, par value \$0.0001 per share, of the Company (the “**Common Shares**”) and pre-funded warrants to purchase Common Shares.

Ex. D-1

To induce the Representative to continue its efforts in connection with the Public Offering, the undersigned hereby agrees that, without the prior written consent of the Representative, the undersigned will not, during the period commencing on the date hereof and ending (A) 90 days after the date of the Underwriting Agreement if the gross proceeds of the Offering are at least \$10 million or (B) 60 days after the date of the Underwriting Agreement if the gross proceeds of the Offering are less than \$10 million (in either case, the “**Lock-Up Period**”), (1) offer, pledge, sell, contract to sell, grant, lend, or otherwise transfer or dispose of, directly or indirectly, any Common Shares or any securities convertible into or exercisable or exchangeable for Common Shares, whether now owned or hereafter acquired by the undersigned or with respect to which the undersigned has or hereafter acquires the power of disposition (collectively, the “**Lock-Up Securities**”); (2) enter into any swap or other arrangement that transfers to another, in whole or in part, any of the economic consequences of ownership of the Lock-Up Securities, whether any such transaction described in clause (1) or (2) above is to be settled by delivery of Lock-Up Securities, in cash or otherwise; (3) make any demand for or exercise any right with respect to the registration of any Lock-Up Securities; or (4) publicly disclose the intention to make any offer, sale, pledge or disposition, or to enter into any transaction, swap, hedge or other arrangement relating to any Lock-Up Securities. Notwithstanding the foregoing, and subject to the conditions below, the undersigned may transfer Lock-Up Securities without the prior written consent of the Representative in connection with (a) transactions relating to Lock-Up Securities acquired in open market transactions after the completion of the Public Offering; provided that no filing under Section 13 or Section 16(a) of the Securities Exchange Act of 1934, as amended (the “**Exchange Act**”), or other public announcement shall be required or shall be voluntarily made in connection with subsequent sales of Lock-Up Securities acquired in such open market transactions; (b) transfers of Lock-Up Securities as a *bona fide* gift, by will or intestacy or to a family member or trust for the benefit of the undersigned or a family member (for purposes of this lock-up agreement, “family member” means any relationship by blood, marriage or adoption, not more remote than first cousin); (c) transfers of Lock-Up Securities to a charity or educational institution; (d) if the undersigned is a corporation, partnership, limited liability company or other business entity, (i) any transfers of Lock-Up Securities to another corporation, partnership or other business entity that controls, is controlled by or is under common control with the undersigned or (ii) distributions of Lock-Up Securities to members, partners, stockholders, subsidiaries or affiliates (as defined in Rule 405 promulgated under the Securities Act of 1933, as amended) of the undersigned; (e) if the undersigned is a trust, to a trustee or beneficiary of the trust; provided that in the case of any transfer pursuant to the foregoing clauses (b), (c), (d) or (e), (i) any such transfer shall not involve a disposition for value, (iii) each transferee shall sign and deliver to the Representative a lock-up agreement substantially in the form of this lock-up agreement and (iv) no filing under Section 13 or Section 16(a) of the Exchange Act or other public announcement shall be required or shall be voluntarily made; (f) the receipt by the undersigned from the Company of Common Shares upon the vesting of restricted stock awards or stock units or upon the exercise of options to purchase the Company’s Common Shares issued under an equity incentive plan of the Company or an employment arrangement described in the Pricing Prospectus (as defined in the Underwriting Agreement) (the “**Plan Shares**”) or the transfer of Common Shares or any securities convertible into Common Shares to the Company upon a vesting event of the Company’s securities or upon the exercise of options to purchase the Company’s securities, in each case on a “cashless” or “net exercise” basis or to cover tax obligations of the undersigned in connection with such vesting or exercise, but only to the extent such right expires during the Lock-up Period, provided that no filing under Section 13 or Section 16(a) of the Exchange Act or other public announcement shall be required or shall be voluntarily made during the Lock-up Period, and after the end of the Lock-up Period, if the undersigned is required to file a report under Section 13 or Section 16(a) of the Exchange Act reporting a reduction in beneficial ownership of Common Shares during the Lock-Up Period, the undersigned shall include a statement in such schedule or report to the effect that the purpose of such transfer was to cover tax withholding obligations of the undersigned in connection with such vesting or exercise and, provided further, that the Plan Shares shall be subject to the terms of this lock-up agreement; (g) the establishment of a trading plan pursuant to Rule 10b5-1 under the Exchange Act for the transfer of Lock-Up Securities, provided that (i) such plan does not provide for the transfer of Lock-Up Securities during the Lock-Up Period and (ii) to the extent a public announcement or filing under the Exchange Act, if any, is required or voluntarily made by or on behalf of the undersigned or the Company regarding the establishment of such plan, such public announcement or filing shall include a statement to the effect that no transfer of Lock-Up Securities may be made under such plan during the Lock-Up Period; (h) the transfer of Lock-Up Securities that occurs by operation of law, such as pursuant to a qualified domestic order or in connection with a divorce settlement, provided that the transferee agrees to sign and deliver a lock-up agreement substantially in the form of this lock-up agreement for the balance of the Lock-Up Period, and provided further, that any filing under Section 13 or Section 16(a) of the Exchange Act that is required to be made during the Lock-Up Period as a result of such transfer shall include a statement that such transfer has occurred by operation of law; and (i) the transfer of Lock-Up Securities pursuant to a bona fide third party tender offer, merger, consolidation or other similar transaction made to all holders of the Common Shares involving a change of control (as defined below) of the Company after the closing of the Public Offering and approved by the Company’s board of directors; provided that in the event that the tender offer, merger, consolidation or other such transaction is not completed, the Lock-Up Securities owned by the undersigned shall remain subject to the restrictions contained in this lock-up agreement. For purposes of clause (j) above, “change of control” shall mean the consummation of any bona fide third party tender offer, merger, amalgamation, consolidation or other similar transaction the result of which is that any “person” (as defined in Section 13(d)(3) of the Exchange Act), or group of persons, becomes the beneficial owner (as defined in Rules 13d-3 and 13d-5 of the Exchange Act) of a majority of total voting power of the voting stock of the Company. The undersigned also agrees and consents to the entry of stop transfer instructions with the Company’s transfer agent and registrar against the transfer of the undersigned’s Lock-Up Securities except in compliance with this lock-up agreement.

The undersigned understands that the Company and the Representative are relying upon this lock-up agreement in proceeding toward consummation of the Public Offering. The undersigned further understands that this lock-up agreement is irrevocable and shall be binding upon the undersigned's heirs, legal representatives, successors and assigns.

The undersigned understands that, if the Underwriting Agreement is not executed by October 5, 2023, or if the Underwriting Agreement (other than the provisions thereof which survive termination) shall terminate or be terminated prior to payment for and delivery of the Common Shares to be sold thereunder, then this lock-up agreement shall be void and of no further force or effect.

Whether or not the Public Offering actually occurs depends on a number of factors, including market conditions. Any Public Offering will only be made pursuant to an Underwriting Agreement, the terms of which are subject to negotiation between the Company and the Representative.

Very truly yours,

(Name - Please Print)

(Signature)

(Name of Signatory, in the case of entities - Please Print)

(Title of Signatory, in the case of entities - Please Print)

Address: _____



Goodwin Procter LLP
100 Northern Avenue
Boston, MA 02210

goodwinlaw.com
+1 617 570 1000

September 22, 2023

TransCode Therapeutics, Inc.
6 Liberty Square, #2382
Boston, MA

Re: Securities Registered under Registration Statement on Form S-1

We have acted as counsel to you in connection with your filing of a Registration Statement on Form S-1 (File No. 333-274251) (as amended or supplemented, the "Registration Statement") pursuant to the Securities Act of 1933, as amended (the "Securities Act"), relating to the registration of the offering by TransCode Therapeutics, Inc., a Delaware corporation (the "Company"), of (i) up to 13,201,319 shares (the "Shares") of the Company's Common Stock, \$0.0001 par value per share (the "Common Stock"), or (ii) pre-funded warrants (the "Pre-Funded Warrants") to purchase up to 13,201,319 shares of Common Stock (such shares issuable upon exercise of the Pre-Funded Warrants, the "Pre-Funded Warrant Shares"), including Shares and Pre-Funded Warrants purchasable by the underwriter upon its exercise of an over-allotment option granted to the underwriter by the Company. The Company is also registering warrants (the "Underwriter Warrants", and together with the Pre-Funded Warrants, the "Warrants") to purchase up to 660,066 shares of Common Stock as contemplated pursuant to the Registration Statement (such shares issuable upon exercise of the Underwriter Warrants, the "Underwriter Warrant Shares", and together with the Pre-Funded Warrant Shares, the "Warrant Shares"), including Underwriter Warrants issuable to the underwriter upon its exercise of its over-allotment option. The Shares and the Warrants are being sold to the underwriter named in, and pursuant to, an underwriting agreement among the Company and such underwriter (the "Underwriting Agreement").

We have reviewed such documents and made such examination of law as we have deemed appropriate to give the opinions set forth below. We have relied, without independent verification, on certificates of public officials and, as to matters of fact material to the opinions set forth below, on certificates of officers of the Company.

The opinions in numbered paragraphs (i) and (iv) set forth below are limited to the Delaware General Corporation Law and the opinions in numbered paragraphs (ii) and (iii), as to the Warrants constituting valid and binding obligations of the Company, are limited to the law of New York.

Based on the foregoing, we are of the opinion that:

- (i) The Shares have been duly authorized and, when delivered and paid for in accordance with the terms of the Underwriting Agreement, will be validly issued, fully paid and non-assessable.
- (ii) The Pre-Funded Warrants have been duly authorized by the Company and, when delivered and paid for in accordance with the terms of the Underwriting Agreement, will be valid and binding obligations of the Company.
- (iii) The Underwriter Warrants have been duly authorized by the Company and, when delivered and paid for in accordance with the terms of the Underwriting Agreement, will be valid and binding obligations of the Company.
- (iv) Assuming the Warrant Shares were issued today upon exercise of the Warrants in accordance with their terms, the Warrant Shares would be validly issued, fully paid and nonassessable.

The opinions expressed in numbered paragraphs (ii) and (iii) above are subject to bankruptcy, insolvency, reorganization, fraudulent transfer, moratorium or other similar laws of general application affecting the rights and remedies of creditors and to general principles of equity.

This opinion letter and the opinion it contains shall be interpreted in accordance with the Core Opinion Principles as published in *74 Business Lawyer* 815 (Summer 2019).

We hereby consent to the inclusion of this opinion as Exhibit 5.1 to the Registration Statement and to the references to our firm under the caption "Legal Matters" in the Registration Statement. In giving our consent, we do not admit that we are in the category of persons whose consent is required under Section 7 of the Securities Act or the rules and regulations thereunder.

Very truly yours,

/s/ Goodwin Procter LLP

GOODWIN PROCTER LLP

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 Amendment No. 2 on Form S-1, of our report dated March 31, 2023, which includes an explanatory paragraph relating to Transcode Therapeutics, Inc.'s ability to continue as a going concern, relating to the financial statements of Transcode Therapeutics, Inc., which is incorporated by reference in that Prospectus. We also consent to the reference to us under the caption "Experts" in the Prospectus.

/s/ WithumSmith+Brown, PC

East Brunswick, New Jersey
September 22, 2023

Calculation of Filing Fee Tables

Form S-1
(Form Type)

TransCode Therapeutics, Inc.
(Exact Name of Registrant as Specified in its Charter)

Table 1: Newly Registered Securities

	Security Type	Security Class	Fee Calculation or Carry Forward Rule	Amount Registered	Proposed Maximum Offering Price Per Unit	Maximum Aggregate Offering Price ⁽¹⁾⁽²⁾⁽⁷⁾	Fee Rate	Amount of Registration Fee
Fees Previously Paid	Equity	Common Stock, \$0.0001 par value per share (7)	457(o)	–	–	\$9,200,000	0.0001102	\$1,013.84
Fees Previously Paid	Equity	Pre-funded warrants to purchase Common Stock, \$0.0001 par value per share (4)(7)(8)	457(g)	–	–	–	–	–
Fees Previously Paid	Equity	Common Stock, \$0.0001 par value per share underlying the Pre-funded warrants (5)(7)(8)	Other	–	–	–	–	–
Fees Previously Paid	Equity	Underwriter’s Warrants to Purchase Common Stock, \$0.0001 par value per share (3)(4)	457(g)	–	–	–	–	–
Fees Previously Paid	Equity	Common Stock, \$0.0001 par value per share underlying the Underwriter’s Warrants (5)(6)	457(o)	–	–	\$575,000	0.0001102	\$63.37
Total Offering Amounts						\$9,775,000		\$1,077.21
Total Fees Previously Paid								\$1,347.18
Net Fee Due								\$0.00

- (1) Estimated solely for the purpose of calculating the registration fee pursuant to Rule 457(o) under the Securities Act of 1933, as amended (the “Securities Act”).
- (2) Includes the aggregate offering price of additional shares that the underwriter has the option to purchase pursuant to its over-allotment option.
- (3) We have agreed to issue to the underwriter warrants to purchase the number of shares of our common stock (the “Underwriter’s Warrants”) in the aggregate equal to five percent (5%) of the shares of our common stock to be issued and sold in this offering, including upon exercise the option to purchase additional securities.
- (4) No registration fee is required pursuant to Rule 457(g) under the Securities Act.
- (5) In addition to the common stock set forth in this table, pursuant to Rule 416 under the Securities Act, this registration statement also registers such indeterminate number of common stock as may become issuable upon exercise of the Underwriter’s Warrants and pre-funded warrants.
- (6) The Underwriter’s Warrants are exercisable for a price per share equal to 125% of the public offering price in this offering. As estimated solely for the purpose of calculating the registration fee pursuant to Rule 457(g), the proposed maximum aggregate offering price of the Representative’s Warrants is \$575,000, which is equal to 125% of \$460,000 (5% of the proposed maximum aggregate offering price of \$9,200,000).
- (7) The proposed maximum aggregate offering price of the common stock proposed to be sold in the offering will be reduced on a dollar-for-dollar basis based on the offering price of any pre-funded warrants offered and sold in the offering, and as such the proposed maximum offering price of the common stock and pre-funded warrants (including the common stock issuable upon exercise of the pre-funded warrants) if any, is \$9,200,000.
- (8) The registrant may issue pre-funded warrants to purchase common stock in the offering. The purchase price of each pre-funded warrant will equal the price per share at which shares of common stock are being sold to the public in this offering, minus \$0.01, which constitutes the pre-funded portion of the exercise price, and the remaining unpaid exercise price of the pre-funded warrant will equal \$0.01 per share (subject to adjustment as provided for therein).