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

FORM 8-K

CURRENT REPORT
Pursuant to Section 13 or 15(d)
of the Securities Exchange Act of 1934

Date of Report (Date of earliest event reported): December 7, 2020

ARCTURUS THERAPEUTICS HOLDINGS INC.

(Exact name of registrant as specified in its charter)

Delaware	**001-38942**	**32-0595345**
(State or other jurisdiction of incorporation)	**(Commission File Number)**	**(I.R.S. Employer Identification No.)**

10628 Science Center Drive, Suite 250
San Diego, California 92121
(Address of principal executive offices)

Registrant's telephone number, including area code: (858) 900-2660

(Former name or former address, if changed since last report)

Check the appropriate box below if the Form 8-K filing is intended to simultaneously satisfy the filing obligation of the registrant under any of the following provisions:

☐ Written communications pursuant to Rule 425 under the Securities Act (17 CFR 230.425)
☐ Soliciting material pursuant to Rule 14a-12 under the Exchange Act (17 CFR 240.14a-12)
☐ Pre-commencement communications pursuant to Rule 14d-2(b) under the Exchange Act (17 CFR 240.14d-2(b))
☐ Pre-commencement communications pursuant to Rule 13e-4(c) under the Exchange Act (17 CFR 240.13e-4(c))

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

Title of each class	**Trading Symbol(s)**	**Name of each exchange on which registered**
Common stock, par value $0.001 per share	**ARCT**	**The Nasdaq Stock Market LLC**

Indicate by check mark whether the registrant is an emerging growth company as defined in Rule 405 of the Securities Act of 1933 (§230.405 of this chapter) or Rule 12b-2 of the Securities Exchange Act of 1934 (§240.12b-2 of this chapter).

Emerging growth company ☐

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

Item 1.01. Entry Into a Material Definitive Agreement.

On December 7, 2020, Arcturus Therapeutics Holdings Inc. (the "Company") entered into an underwriting agreement (the "Underwriting Agreement") with Piper Sandler & Co., Guggenheim Securities, LLC and Wells Fargo Securities, LLC, as representatives of the several underwriters identified in Schedule I thereto (the "Underwriters"), in connection with the Company's previously announced public offering (the "Offering") of 1,365,000 shares (the "Firm Shares") of the Company's common stock, $0.001 par value per share (the "Common Stock"), at a public offering price of $110.00 per share. Under the terms of the Underwriting Agreement, the Company granted the Underwriters an option, exercisable for 30 days, to purchase up to an additional 204,750 shares of Common Stock at the public offering price (the "Option Shares," and together with the Firm Shares, the "Shares").

The net proceeds to the Company from the Offering, excluding any exercise by the Underwriters of their option to purchase any of the Option Shares, are expected to be approximately $140.5 million, after deducting underwriting discounts and commissions and estimated offering expenses payable by the Company.

The Offering is being made pursuant to a prospectus supplement dated December 7, 2020 and an accompanying prospectus dated December 7, 2020, pursuant to a Registration Statement (File No. 333-251175) on Form S-3, which was initially filed by the Company with the Securities and Exchange Commission ("SEC") on December 7, 2020 and which registration statement became automatically effective upon filing under the Securities Act of 1933, as amended (the "Securities Act").

The Underwriting Agreement contains customary representations, warranties and covenants by the Company, customary conditions to closing, indemnification obligations of the Company and the Underwriters, including for liabilities under the Securities Act, other obligations of the parties and termination provisions. The representations, warranties, and covenants contained in the Underwriting Agreement were made only for purposes of such agreement and as of specific dates, were solely for the benefit of the parties to such agreement, and may be subject to limitations agreed upon by the contracting parties.

The foregoing summary of the Underwriting Agreement is qualified in its entirety by reference to the Underwriting Agreement attached hereto as Exhibit 1.1 and which is hereby incorporated by reference. Dentons US LLP, counsel to the Company, delivered an opinion as to legality of the issuance and sale of the Shares in the Offering, a copy of which is attached hereto as Exhibit 5.1 and is hereby incorporated by reference.

Item 7.01. Regulation FD Disclosure.

On December 7, 2020, the Company issued a press release with respect to the Offering. A copy of the press release is furnished as Exhibit 99.1 and is hereby incorporated by reference. The press release is furnished herewith and shall not be deemed "filed" for the purposes of Section 18 of the Securities Exchange Act of 1934, as amended (the "Exchange Act") or otherwise subject to the liability of that section or Sections 11 and 12(a)(2) of the Securities Act. In addition, the press release shall not be deemed incorporated by reference into any of the Company's filings with the SEC, except as shall be expressly set forth by specific reference in any such filing.

The Company has made available a presentation about its business (the "Presentation"), a copy of which is included as Exhibit 99.2 to this Current Report on Form 8-K (the "Report"). The Presentation is furnished herewith and shall not be deemed "filed" for the purposes of Section 18 of the Exchange Act, or otherwise subject to the liability of that section or Sections 11 and 12(a)(2) of the Securities Act. In addition, the Presentation shall not be deemed incorporated by reference into any of the Company's filings with the SEC, except as shall be expressly set forth by specific reference in any such filing.

The furnishing of the Presentation is not an admission as to the materiality of any information therein. The information contained in the Presentation is summary information that should be considered in the context of the Company's filings with the SEC and other public announcements the Company may make by press release or otherwise from time to time. The Presentation speaks as of the date of this Report. While the Company may elect to update the Presentation in the future to reflect events and circumstances occurring or existing after the date of this Report, the Company specifically disclaims any obligation to do so.

The Presentation contains forward-looking statements, and as a result, investors should not place undue reliance on these forward-looking statements.

Cautionary Note Regarding Forward-Looking Statements

Certain statements in this communication and the Presentation are "forward-looking statements" that involve substantial risks and uncertainties for purposes of the safe harbor provided by the Private Securities Litigation Reform Act of 1995. These statements relate to future events and involve known and unknown risks, uncertainties and other factors which may cause our actual results, performance or achievements to be materially different from any future performances or achievements expressed or implied by the forward-looking statements. Each of these statements is based only on current information, assumptions and expectations that are inherently subject to change and involve a number of risks and uncertainties. Forward-looking statements include, but are not limited to, statements about: expectations regarding our capitalization and resources; the adequacy of our capital to support our future operations and our ability to successfully initiate and complete clinical trials; our strategy and focus; our efforts to develop a vaccine against COVID-19, the safety, efficacy or reliability of our COVID-19 vaccine candidate; the development and commercial potential of any of our product candidates; the timing and success of our development efforts; the success of any of our trials and our ability to achieve regulatory approval for any product candidate; the entry into or modification or termination of collaborative agreements and the expected milestones and royalties from such collaborative agreements; the potential market or clinical or commercial success of the clinical development programs of Arcturus; and any statements other than statements of historical fact, including those related to Arcturus' future cash, market or financial position.

In some cases, you can identify forward-looking statements by terms such as "may," "will," "should," "could," "would," "expects," "plans," "anticipates," "believes," "estimates," "projects," "predicts," "potential" and similar expressions (including the negative thereof) intended to identify forward looking statements. Arcturus may not actually achieve the plans, carry out the intentions or meet the expectations or projections disclosed in any forward-looking statements such as the foregoing, and you should not place undue reliance on such forward-looking statements. The forward-looking statements contained or implied in the Presentation are subject to other risks and uncertainties, including those discussed under the heading "Risk Factors" in Arcturus' Annual Report on Form 10-K for the fiscal year ended December 31, 2019, filed with the SEC on March 16, 2020 and in subsequent filings with, or submissions to, the SEC. Except as otherwise required by law, the Company disclaims any intention or obligation to update or revise any forward-looking statements, which speak only as of the date they were made, whether as a result of new information, future events or circumstances or otherwise.

Item 9.01. Financial Statements and Exhibits.

(d) Exhibits.

Exhibit No.	Description
1.1	Underwriting Agreement, dated December 7, 2020, by and among Arcturus Therapeutics Holdings Inc., Piper Sandler & Co., Guggenheim Securities, LLC and Wells Fargo Securities, LLC
5.1	Opinion of Dentons US LLP
23.1	Consent of Dentons US LLP (contained in Exhibit 5.1)
99.1	Press Release of the Company dated December 7, 2020
99.2	Presentation dated December 2020

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, as amended, the registrant has duly caused this report to be signed on its behalf by the undersigned hereunto duly authorized.

Date: December 8, 2020

Arcturus Therapeutics Holdings Inc.

By: /s/ Joseph E. Payne
Name: Joseph E. Payne
Title: Chief Executive Officer

1,365,000 Shares of Common Stock

ARCTURUS THERAPEUTICS HOLDINGS INC.

UNDERWRITING AGREEMENT

December 7, 2020

Piper Sandler & Co.
Guggenheim Securities, LLC
Wells Fargo Securities, LLC
As Representatives of the
several Underwriters named in
Schedule I attached hereto

c/o Piper Sandler & Co.
800 Nicollet Mall, Suite 800
Minneapolis, Minnesota 55402

c/o Guggenheim Securities, LLC
330 Madison Avenue
New York, New York 10017

c/o Wells Fargo Securities, LLC
500 West 33rd Street, 14th Floor
New York, New York 10001

Ladies and Gentlemen:

Arcturus Therapeutics Holdings Inc., a corporation organized and existing under the laws of the State of Delaware (the "**Company**"), proposes, subject to the terms and conditions stated herein, to issue and sell to the several underwriters named in Schedule I hereto (the "**Underwriters**") an aggregate of 1,365,000 shares of its common stock, par value $0.001 per share (the "**Common Stock**"). The 1,365,000 shares of Common Stock to be sold by the Company are called the "**Firm Shares**." The Company also proposes to issue and sell to the several Underwriters up to an additional 204,750 shares (the "**Additional Shares**") of Common Stock at the option of the Underwriters as provided in Section 2(c) below. The Firm Shares and any Additional Shares purchased by the Underwriters are referred to herein as the "**Shares**." Piper Sandler & Co. ("**Piper Sandler**"), Guggenheim Securities, LLC ("**Guggenheim**") and Wells Fargo Securities, LLC ("**Wells Fargo**") are each acting as representative (the "**Representatives**") of the several Underwriters in connection with the offering and sale of the Shares contemplated herein (the "**Offering**").

As used in this underwriting agreement (the "**Agreement**"), the following defined terms shall apply:

The "**Registration Statement**" means the registration statement on Form S-3 (File No. 333-251175), including the exhibits, schedules and financial statements and any prospectus supplement relating to the Offering that is filed with the Securities and Exchange Commission (the "**Commission**") pursuant to Rule 424(b) under the Securities Act of 1933, as amended, and the rules and regulations promulgated thereunder (the "**Securities Act**") and deemed part of such registration statement pursuant to Rule 430B under the Securities Act, as amended on each Effective Date (as defined below), and, in the event any post-effective amendment thereto or any registration statement and any amendments thereto filed pursuant to Rule 462(b) under the Securities Act (a "**Rule 462(b) Registration Statement**") becomes effective prior to the Closing Date (as defined in Section 2(b) hereof), shall also mean such registration statement as so amended or such Rule 462(b) Registration Statement, as the case may be.

The "**Effective Date**" means, with respect to the Registration Statement, each date and time that such Registration Statement, and any post-effective amendment or amendments thereto or any Rule 462(b) Registration Statement became or becomes effective.

The "**Base Prospectus**" means the base prospectus contained in the Registration Statement at the date and time that this Agreement is executed and delivered by the parties hereto (the "**Execution Time**").

The "**Preliminary Prospectus**" means any preliminary prospectus supplement to the Base Prospectus which is used prior to the filing of the Prospectus (as defined below), together with the Base Prospectus.

The "**Prospectus**" means the final prospectus supplement relating to the Shares that is first filed pursuant to Rule 424(b) under the Securities Act after the Execution Time, together with the Base Prospectus.

The "**Pricing Disclosure Package**" shall mean (i) the Base Prospectus, (ii) the Preliminary Prospectus used most recently prior to the Applicable Time (as defined below), (iii) any issuer free writing prospectus, as defined in Rule 433 under the Securities Act (an "**Issuer Free Writing Prospectus**"), identified in Schedule II hereto, (iv) any other free writing prospectus, as defined in Rule 405 under the Securities Act (a "**Free Writing Prospectus**"), that the parties hereto shall hereafter expressly agree in writing to treat as part of the Pricing Disclosure Package and (v) the pricing information identified in Schedule III hereto.

As used herein, "**Applicable Time**" is 8:00 p.m. (New York City time) on December 7, 2020.

As used herein, "**Road Show**" means a "road show" (as defined in Rule 433 under the Securities Act) relating to the offering of the Shares contemplated hereby that is a "written communication" (as defined in Rule 405 under the Securities Act). All references in this Agreement to the Registration Statement, any Preliminary Prospectus, the Base Prospectus and the Prospectus shall include the documents incorporated or deemed to be incorporated by reference therein. All references in this Agreement to financial statements and schedules and other information that are "**contained in**," "**included in**," "**filed with**," "**stated in**" or "**part of**" the Registration Statement, the Rule 462(b) Registration Statement, any Preliminary Prospectus, the Pricing Disclosure Package or the Prospectus, and all other references of like import, shall be deemed to mean and include all such financial statements and schedules and other information that is or is deemed to be incorporated by reference in the Registration Statement, the Rule 462(b) Registration Statement, any Preliminary Prospectus, the Base Prospectus, the Pricing Disclosure Package or the Prospectus, as the case may be.

All references in this Agreement to amendments or supplements to the Registration Statement, the Rule 462(b) Registration Statement, any Preliminary Prospectus, the Pricing Disclosure Package or the Prospectus shall be deemed to mean and include the filing of any document under the Securities Exchange Act of 1934, as amended, and the rules and regulations promulgated thereunder (collectively, the "**Exchange Act**") that is or is deemed to be incorporated by reference in the Registration Statement, the Rule 462(b) Registration Statement, any Preliminary Prospectus, the Pricing Disclosure Package, or the Prospectus, as the case may be. All references in this Agreement to the Registration Statement, any Preliminary Prospectus, the Base Prospectus or the Prospectus, any amendments or supplements to any of the foregoing, or any free writing prospectus, shall include any copy thereof filed with the Commission pursuant to its Electronic Data Gathering, Analysis and Retrieval System ("**EDGAR**").

1. Representations and Warranties of the Company. The Company represents and warrants to, and agrees with, each of the Underwriters as of the date hereof, the Applicable Time, the Closing Date (as hereinafter defined) and any Additional Closing Date (as hereinafter defined) that:

(a) The Registration Statement is an "automatic shelf registration statement" as defined under Rule 405 of the Securities Act that has been filed with the Commission not earlier than three years prior to the date hereof; and no notice of objection of the Commission to the use of such registration statement or any post-effective amendment thereto pursuant to Rule 401(g)(2) under the Securities Act has been received by the Company. The Company has complied, to the Commission's satisfaction, with all requests of the Commission for additional or supplemental information, if any. No stop order suspending the effectiveness of either Registration Statement is in effect and no proceedings for such purpose, pursuant to Rule 401(g)(2) or pursuant to Section 8A under the Securities Act have been instituted or are pending or, to the Company's knowledge, are contemplated or threatened by the Commission. At the time the Registration Statement was originally filed with the Commission, the Company met the then-applicable requirements for use of Form S-3 under the Securities Act, including General Instruction I.B.1 of such Form S-3. The documents incorporated or deemed to be incorporated by reference in the Registration Statement, the Pricing Disclosure Package and the Prospectus, at the time they were or hereafter are filed with the Commission, or became effective under the Exchange Act, as the case may be, complied and will comply in all material respects with the requirements of the Exchange Act. The Company is a well-known seasoned issuer (as defined in Rule 405 under the Securities Act) eligible to use the Registration Statement as an automatic shelf registration statement and the Company has not received notice that the Commission objects to the use of the Registration Statement as an automatic shelf registration statement.

The Company is not an "ineligible issuer" (as such term is defined in Rule 405 under the Securities Act) as of the eligibility determination date for purposes of Rules 164 and 433 under the Securities Act with respect to the Offering of the Shares.

(b) Each of the Registration Statement, any Rule 462(b) Registration Statement and any post-effective amendment thereto, as of the applicable Effective Date, complied and, until such time as the Underwriters are no longer required to deliver a Prospectus in order to confirm sales of the Shares, will comply in all material respects with the Securities Act and the rules and regulations of the Commission thereunder (the "**Rules and Regulations**"). The Preliminary Prospectus 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 Rules and 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 EDGAR, except to the extent permitted by Regulation S-T.

(c) The Registration Statement, when it became effective, did not contain and, as amended or supplemented, if applicable, will not contain, as of the date of such amendment or supplement, an untrue statement of a material fact or omitted or will omit to state a material fact required to be stated therein or necessary to make the statements therein not misleading; provided, however, that this representation and warranty shall not apply to any information contained in or omitted from the Registration Statement or any amendment thereto in reliance upon and in conformity with information furnished in writing to the Company by or on behalf of any Underwriter through the Representatives specifically for use therein. The parties hereto agree that such information provided by or on behalf of any Underwriter through the Representatives consists solely of the material referred to in Section 19 hereof. Each "forward-looking statement" (within the meaning of Section 27A of the Securities Act or Section 21E of the Exchange Act) contained or incorporated by reference in the Registration Statement, the Preliminary Prospectus or the Prospectus has been made or reaffirmed with a reasonable basis and has been disclosed in good faith.

(d) The Pricing Disclosure Package, as of the Applicable Time, did not contain 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. The Prospectus will not, as of its date, as of the Closing Date or as of any Additional Closing Date, contain 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. Each Issuer Free Writing Prospectus complies in all material respects with the applicable provisions of the Securities Act and the Rules and Regulations, and does not conflict with the information contained in the Registration Statement, the Pricing Disclosure Package or the Prospectus. No representation and warranty is made in this Section 1(d) with respect to any information contained in or omitted from the Pricing Disclosure Package, the Prospectus or any Issuer Free Writing Prospectus in reliance upon and in conformity with information furnished in writing to the Company by or on behalf of any Underwriter through the Representatives specifically for use therein. The parties hereto agree that such information provided by or on behalf of any Underwriter through the Representatives consists solely of the material referred to in Section 19 hereof.

(e) Each Issuer Free Writing Prospectus conformed or will conform in all material respects to the requirements of the Securities Act and the Rules and Regulations on the date of first use, and the Company has complied with the requirements of Rule 433 under the Securities Act with respect to each Issuer Free Writing Prospectus including, without limitation, all prospectus delivery, filing, record retention and legending requirements applicable to any such Issuer Free Writing Prospectus. The Company has not (i) distributed any offering material in connection with the Offering other than any Preliminary Prospectus, the Prospectus, and any Issuer Free Writing Prospectus set forth on Schedule II hereto, or (ii) filed, referred to, approved, used or authorized the use of any "free writing prospectus" as defined in Rule 405 under the Securities Act with respect to the Offering or the Shares, except for any Issuer Free Writing Prospectus set forth in Schedule II hereto and any electronic road show previously approved by the Representatives. The Company has retained in accordance with the Securities Act and the Rules and Regulations all Issuer Free Writing Prospectuses that were not required to be filed pursuant to the Securities Act and the Rules and Regulations.

(f) Ernst & Young LLP, which has expressed its opinion with respect to the financial statements (which term as used in this Agreement includes the related notes thereto) filed with the Commission as a part of the Registration Statement, the Pricing Disclosure Package or the Prospectus, is (i) an independent registered public accounting firm as required by the Securities Act, the Exchange Act, and the rules of the Public Company Accounting Oversight Board ("**PCAOB**"), (ii) in compliance with the applicable requirements relating to the qualification of accountants under Rule 2-01 of Regulation S-X under the Securities Act and (iii) a registered public accounting firm as defined by the PCAOB whose registration has not been suspended or revoked and who has not requested such registration to be withdrawn.

(g) Subsequent to the respective dates as of which information is given in the Registration Statement, the Pricing Disclosure Package or the Prospectus, except as disclosed therein, (i) the Company has not declared or paid any dividends, or made any other distribution of any kind, on or in respect of its capital stock, (ii) there has not been any material change in the capital stock or long-term or short-term debt of the Company or any of its subsidiaries listed in Exhibit A hereto (each, a "**Subsidiary**" and, collectively, the "**Subsidiaries**"), (iii) there have been no transactions entered into by the Company or any of its Subsidiaries, other than in the ordinary course of business, which are material with respect to the Company and its Subsidiaries, taken as a whole, (iv) neither the Company nor any Subsidiary has sustained any material loss or interference with its business or properties from fire, explosion, flood, earthquake, hurricane, accident or other calamity, whether or not covered by insurance, or from any labor dispute or any legal or governmental proceeding, and (v) there has not been any material adverse change in or affecting the business, management, condition (financial or otherwise), results of operations, stockholders' equity, properties or prospects of the Company and the Subsidiaries, taken as a whole (a "**Material Adverse Change**"). Since the date of the latest balance sheet included, or incorporated by reference, in the Registration Statement, the Pricing Disclosure Package or the Prospectus, neither the Company nor any Subsidiary has incurred or undertaken any liabilities or obligations, whether direct or indirect, liquidated or contingent, matured or unmatured, or entered into any transactions, including any acquisition or disposition of any business or asset, which are material to the Company and the Subsidiaries, taken as a whole, except for liabilities, obligations and transactions which are disclosed in the Registration Statement, the Pricing Disclosure Package and the Prospectus.

(h) The Company has an authorized capitalization as set forth in the Pricing Disclosure Package and the Prospectus, and all of the issued and outstanding shares of capital stock of the Company are fully paid and non-assessable and have been duly authorized and validly issued, in compliance with all applicable state, federal and foreign securities laws and not in violation of or subject to any preemptive or similar right that entitles any person to acquire from the Company or any Subsidiary any Common Stock or other security of the Company or any security convertible into, or exercisable or exchangeable for, Common Stock or any other such security of the Company (any "**Relevant Security**"), except for such rights as may have been fully satisfied or waived prior to the effectiveness of the Registration Statement. All of the issued shares of capital stock of or other ownership interests in each Subsidiary owned, directly or indirectly, by the Company have been duly authorized and validly issued and are fully paid and non-assessable and are owned directly or indirectly by the Company free and clear of any lien, charge, mortgage, pledge, security interest, claim, equity, trust or other encumbrance, preferential arrangement, defect or restriction of any kind whatsoever (any "**Lien**").

(i) The Shares to be delivered on the Closing Date and any Additional Closing Date, if any, have been duly authorized and, when issued and delivered in accordance with this Agreement, will be validly issued, fully paid and non-assessable, will have been issued in compliance with all applicable state, federal and foreign securities laws and will not have been issued in violation of or subject to any preemptive or similar right that entitles any person to acquire any Relevant Security from the Company. The Common Stock and the Shares conform to the descriptions thereof contained in the Registration Statement, the Pricing Disclosure Package and the Prospectus. Except as disclosed in the Registration Statement, the Pricing Disclosure Package and the Prospectus, the Company has no outstanding warrants, options to purchase, or any preemptive rights or other rights to subscribe for or to purchase, or any contracts or commitments to issue or sell, any Relevant Security. No holder of any Relevant Security has any rights to require registration under the Securities Act of any Relevant Security in connection with the offer and sale of the Shares contemplated hereby, except for any such rights that have either been fully complied with by the Company or effectively waived by the holders thereof.

(j) The Company and each Subsidiary has been duly organized and validly exists as a corporation, partnership or limited liability company (as the case may be) in good standing under the laws of its jurisdiction of organization (to the extent such good standing concept exists in such jurisdiction) and has corporate, partnership or limited liability company power and authority (as the case may be) to own or lease its property and conduct its business as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus. The Company and each Subsidiary is qualified to do business and is in good standing as a foreign corporation, partnership or limited liability company (as the case may be) in each jurisdiction (to the extent such good standing concept exists in such jurisdiction) in which the character or location of its properties (owned, leased or licensed) or the nature or conduct of its business makes such qualification necessary, except for those failures to be so qualified or in good standing which (individually and in the aggregate) would not reasonably be expected to have a material adverse effect on (i) the business, management, condition (financial or otherwise), results of operations, stockholders' equity, properties or prospects of the Company and the Subsidiaries, taken as a whole; or (ii) the ability of the Company to consummate the Offering or any other transaction contemplated by this Agreement or the Registration Statement, the Pricing Disclosure Package and the Prospectus (a "**Material Adverse Effect**"). The certificate or articles of incorporation, by-laws, partnership agreement, limited liability company agreement or other constitutive and organizational documents (as the case may be) of the Company and each Subsidiary comply with the requirements of applicable law and are in full force and effect. The Subsidiaries are the only "subsidiaries" of the Company (within the meaning of Rule 405 under the Securities Act.)

(k) Neither the Company nor any Subsidiary (i) is in violation of its certificate or articles of incorporation, by-laws, certificate of formation, limited liability company agreement, partnership agreement or other organizational documents, (ii) is in default under, and no event has occurred which, with notice or lapse of time or both, would constitute a default under or result in the creation or imposition of any Lien upon any property or assets of the Company or any Subsidiary pursuant to, any indenture, mortgage, deed of trust, note, lease, loan agreement or other agreement or instrument to which it is a party or by which it is bound or to which any of its property or assets is subject, or (iii) is in violation of any statute, law, rule, regulation, ordinance, directive, judgment, writ, decree or order of any court or judicial, regulatory or other legal or governmental agency or body, foreign or domestic, having jurisdiction over the Company or any Subsidiary except (in the case clauses (ii) and (iii) above) for violations or defaults that would not (individually or in the aggregate) reasonably be expected to have a Material Adverse Effect.

(l) Each of the Company and each Subsidiary has all requisite power and authority, and all necessary consents, approvals, authorizations, orders, registrations, qualifications, licenses, filings and permits of, with and from all judicial, regulatory and other legal or governmental agencies and bodies and all third parties, foreign and domestic (collectively, the "**Consents**"), to own, lease and operate its properties and conduct its business as it is now being conducted and as disclosed in the Registration Statement, the Pricing Disclosure Package and the Prospectus, and each such Consent is valid and in full force and effect, except in each case as would not reasonably be expected to have a Material Adverse Effect. Neither the Company nor any Subsidiary has received notice of any investigation or proceedings which, if decided adversely to the Company or any such Subsidiary, would reasonably be expected to result in the revocation of, or imposition of a materially burdensome restriction on, any such Consent.

(m) This Agreement has been duly and validly authorized, executed and delivered by the Company.

(n) The issuance and sale of the Shares (including the use of proceeds from the sale of the Shares as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus), the compliance by the Company with this Agreement and the consummation of the transactions contemplated hereby and by the Registration Statement, the Pricing Disclosure Package and the Prospectus do not and will not (i) conflict with or result in a breach or violation of any of the terms and provisions of, or constitute a default (or an event which with notice or lapse of time, or both, would constitute a default) under, or result in the creation or imposition of any Lien upon any property or assets of the Company or any Subsidiary pursuant to, any indenture, mortgage, deed of trust, note, lease, loan agreement or other agreement, instrument, franchise, license or permit to which the Company or any Subsidiary is a party or by which the Company or any Subsidiary or their respective properties, operations or assets may be bound, (ii) violate or conflict with any provision of the certificate or articles of incorporation, by-laws, certificate of formation, limited liability company agreement, partnership agreement or other organizational documents (as the case may be) of the Company or any Subsidiary, or (iii) violate or conflict with any statute, law, rule, regulation, ordinance, directive, judgment, writ, decree or order of any court or judicial, regulatory, administrative or other legal or governmental agency or body (including, without limitation, the United States Food and Drug Administration (the "**FDA**")), domestic or foreign, having jurisdiction over the Company or any Subsidiary, except (in the case of clauses (i) and (iii) above) as would not reasonably be expected to have a Material Adverse Effect.

(o) No Consent is required for the execution, delivery and performance by the Company of this Agreement, the issue and sale of the Shares (including the use of proceeds from the sale of the Shares as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus) and the consummation by the Company of the transactions contemplated hereby and by the Registration Statement, the Pricing Disclosure Package and the Prospectus, except the registration under the Securities Act of the Shares, such Consents as may be required by the Nasdaq Stock Market LLC ("**Nasdaq**") in regards to the listing of the Shares and under applicable state securities or blue sky laws and such other Consents as have been obtained.

(p) There is no judicial, regulatory, arbitral or other legal or governmental proceeding or other litigation or arbitration, domestic or foreign, pending to which the Company or any Subsidiary is a party or of which any property, operations or assets of the Company or any Subsidiary is the subject which, individually or in the aggregate, if determined adversely to the Company or any Subsidiary, would reasonably be expected to have a Material Adverse Effect; to the Company's knowledge, no such proceeding, litigation or arbitration is threatened or contemplated; and the defense of all such proceedings, litigation and arbitration against or involving the Company or any Subsidiary would not reasonably be expected to have a Material Adverse Effect.

(q) The financial statements, including the notes thereto, and the supporting schedules included or incorporated by reference in the Registration Statement, the Pricing Disclosure Package and the Prospectus present fairly in all material respects the consolidated financial position as of the dates indicated and the cash flows and results of operations for the periods specified of the Company and its consolidated Subsidiaries; said financial statements have been prepared in conformity with United States generally accepted accounting principles ("**GAAP**") applied on a consistent basis throughout the periods involved; and the supporting schedules, if any, included in the Registration Statement, the Pricing Disclosure Package and the Prospectus present fairly in all material respects in accordance with GAAP the information required to be stated therein. No other historical or pro forma financial statements or supporting schedules are required to be included in the Registration Statement, the Pricing Disclosure Package or the Prospectus by the Securities Act, the Exchange Act or the Rules and Regulations. The other financial and statistical information included or incorporated by reference in the Registration Statement, the Pricing Disclosure Package and the Prospectus present fairly in all material respects the information included therein and have been prepared on a basis consistent with that of the financial statements that are included or incorporated by reference in the Registration Statement, the Pricing Disclosure Package and the Prospectus and the books and records of the respective entities presented therein. All disclosures contained in the Registration Statement, the Pricing Disclosure Package and the Prospectus, or incorporated by reference therein, regarding "non-GAAP financial measures" (as such term is defined by the rules and regulations of the Commission) comply with Regulation G of the Exchange Act and Item 10 of Regulation S-K of the Securities Act, to the extent applicable. The interactive data in eXtensible Business Reporting Language included or incorporated by reference in the Registration Statement, the Pricing Disclosure Package and the Prospectus fairly presents the information called for in all material respects and has been prepared in accordance with the Commission's rules and guidelines applicable thereto.

(r) The statistical, industry-related and market-related data included in the Registration Statement, the Pricing Disclosure Package and the Prospectus are based on or derived from sources which the Company reasonably and in good faith believes are reliable and accurate, and such data agree with the sources from which they are derived.

(s) The Company has submitted a Listing of Additional Shares notification to Nasdaq. The Company has not received an oral or written notification from Nasdaq or any court or any other federal, state, local or foreign governmental or regulatory authority having jurisdiction over the Company or any of its Subsidiaries or any of their properties or assets ("**Governmental Authority**") of any inquiry or investigation or other action that would cause the Shares to stop being quoted on Nasdaq.

(t) There are no contracts or documents which are required to be described in the Registration Statement, the Pricing Disclosure Package or the Prospectus or to be filed as exhibits to the Registration Statement which have not been so described and filed as required.

(u) The Company and its Subsidiaries maintain a system of internal accounting and other controls sufficient to provide reasonable assurances 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 accountability for assets, (iii) access to assets is permitted only in accordance with management's general or specific authorization, (iv) the recorded accounting for assets is compared with existing assets at reasonable intervals and appropriate action is taken with respect to any differences and (v) the interactive data in eXtensible Business Reporting Language included or incorporated by reference in the Registration Statement, the Pricing Disclosure Package and the Prospectus fairly presents the information called for in all material respects and has been prepared in accordance with the Commission's rules and guidelines applicable thereto.

(v) The Company maintains a system of internal control over financial reporting (as such term is defined in Rule 13a-15(f) under the Exchange Act) that complies with the requirements of the Exchange Act and has been designed by the Company's principal executive officer and principal financial officer, or under their supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with GAAP. The Company's internal control over financial reporting is effective and the Company is not aware of any material weaknesses in its internal control over financial reporting. Since the date of the latest audited financial statements included or incorporated by reference in the Pricing Disclosure Package, there has been no change in the Company's internal control over financial reporting that has materially affected, or is reasonably likely to materially affect, the Company's internal control over financial reporting.

(w) The Company maintains disclosure controls and procedures (as such term is defined in Rule 13a-15(e) under the Exchange Act) that comply with the requirements of the Exchange Act; such disclosure controls and procedures have been designed to ensure that material information relating to the Company and its Subsidiaries is made known to the Company's principal executive officer and principal financial officer by others within those entities; and such disclosure controls and procedures are effective.

(x) There is and has been no failure on the part of the Company or any of the Company's directors or officers, in their capacities as such, to comply in all material respects with any provision of the Sarbanes-Oxley Act of 2002 and the rules and regulations promulgated in connection therewith (the "**Sarbanes-Oxley Act**"), including Section 402 related to loans and Sections 302 and 906 related to certifications.

(y) The shares of Common Stock are registered pursuant to Section 12(b) or 12(g) of the Exchange Act and are listed on the Nasdaq Global Market, and 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 or delisting the shares of Common Stock from the Nasdaq Global Market, nor has the Company received any notification that the Commission or Nasdaq is contemplating terminating such registration or listing. The Company is in compliance with all applicable listing requirements of Nasdaq.

(z) To the Company's knowledge, no relationship, direct or indirect, exists between or among any of the Company or any affiliate of the Company, on the one hand, and any director, officer, shareholder, customer or supplier of the Company or any affiliate of the Company, on the other hand, which is required by the Securities Act or the Exchange Act to be described in the Registration Statement or the Prospectus that is not so described as required. There are no outstanding loans, advances (except normal advances for business expenses in the ordinary course of business) or guarantees of 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. The Company has not, in violation of the Sarbanes-Oxley Act, directly or indirectly, including through any affiliate of the Company, extended or maintained credit, arranged for the extension of credit, or renewed an extension of credit, in the form of a personal loan to or for any director or executive officer of the Company.

(aa) Neither the Company nor any of its affiliates (within the meaning of Rule 144 under the Securities Act) has taken, directly or indirectly, any action which constitutes or is designed to cause or result in, or which would reasonably be expected to constitute, cause or result in, the stabilization or manipulation of the price of any security to facilitate the sale or resale of the Shares or to result in a violation of Regulation M under the Exchange Act.

(bb) Neither the Company nor any of its affiliates (within the meaning of Rule 144 under the Securities Act) has, prior to the date hereof, made any offer or sale of any securities which could be "integrated" (within the meaning of the Securities Act and the Rules and Regulations) with the offer and sale of the Shares pursuant to the Registration Statement.

(cc) All of the information provided to the Underwriters or to counsel for the Underwriters by the Company, its officers and directors and to the Company's knowledge the holders of any securities (debt or equity) or options to acquire any securities of the Company in connection with the offering of the Shares is true, complete and correct in all material respects and compliant with Financial Industry Regulatory Authority, Inc.'s ("**FINRA**") rules and any letters, filings or other supplemental information provided to FINRA pursuant to FINRA Rules or NASD Conduct Rules is true, complete and correct in all material respects. In accordance with FINRA Conduct Rule 5110(h)(1)(C), the Shares have been registered with the Commission on Form S-3 under the Securities Act.

(dd) The statements set forth in the Pricing Disclosure Package and Prospectus under the caption "Description of Capital Stock We May Offer", insofar as it purports to constitute a summary of the terms of the Common Stock, are accurate and complete in all material respects. The statements set forth in the Company's Annual Report on Form 10-K for the year ended December 31, 2019 under the caption "Business—Product Approval and Government Regulation" and "Risk Factors" and as set forth in the Pricing Disclosure Package and the Prospectus under the caption "Risk Factors", insofar as they purport to describe the provisions of the laws and documents referred to therein, are accurate and complete in all material respects.

(ee) The Company is not and, at all times up to and including consummation of the transactions contemplated by this Agreement, and after giving effect to application of the net proceeds of the Offering as described in the Pricing Disclosure Package and the Prospectus, will not be, required to register as an "investment company" under the Investment Company Act of 1940, as amended, and is not and will not be an entity "controlled" by an "investment company" within the meaning of such act.

(ff) Except as disclosed in the Registration Statement, Pricing Disclosure Package and the Prospectus, there are no contracts, agreements or understandings between the Company and any person that would give rise to a valid claim against the Company or any Underwriter for a brokerage commission, finder's fee or other like payment in connection with the transactions contemplated by this Agreement or, to the Company's knowledge, any arrangements, agreements, understandings, payments or issuance with respect to the Company or any of its officers, directors, shareholders, partners, employees, Subsidiaries or affiliates that may affect the Underwriters' compensation as determined by FINRA Rule 5110.

(gg) The Company and each Subsidiary owns or leases all such properties as are necessary to the conduct of its business as presently operated and as proposed to be operated as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus. The Company and the Subsidiaries have good and marketable title in fee simple to all real property and good and marketable title to all personal property owned by them, in each case free and clear of any and all Liens except such as are described in the Registration Statement, the Pricing Disclosure Package and the Prospectus or such as do not (individually or in the aggregate) materially affect the value of such property or materially interfere with the use made or proposed to be made of such property by the Company and the Subsidiaries; and any real property and buildings held under lease or sublease by the Company and the Subsidiaries are held by them under valid, subsisting and enforceable leases with such exceptions as are not material to, and do not materially interfere with, the use made and proposed to be made of such property and buildings by the Company and the Subsidiaries. Neither the Company nor any Subsidiary has received any notice of any claim adverse to its ownership of any real or personal property or of any claim against the continued possession of any real property, whether owned or held under lease or sublease by the Company or any Subsidiary.

(hh) The Company and each Subsidiary: (i) owns or possesses valid and adequate rights to use any and all patents and patent applications; trademarks, service marks, domain names, social media accounts and identifiers, trade names, brand names, trademark registrations, service mark registrations, and all goodwill arising from the foregoing; rights of publicity; copyrights, works of authorship, software, data, databases, systems, and technology; licenses, formulae, customer lists, know-how, trade secrets and other unpatented and/or unpatentable proprietary or confidential information, systems or procedures; and all other intellectual, industrial, or proprietary property or rights (collectively, "**Intellectual Property**") used in or necessary for the conduct of their respective businesses as presently conducted and as described as proposed to be conducted in the Registration Statement, the Pricing Disclosure Package and the Prospectus (collectively, the "**Company Intellectual Property**"), and none of the foregoing will be adversely affected by the consummation of the transactions contemplated hereby; and (ii) except as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus, exclusively own free and clear of all Liens all right, title, and interest in and to all Intellectual Property described in the Pricing Disclosure Package and the Prospectus as being owned by them or that is otherwise purported to be owned by them (collectively, the "**Owned Intellectual Property**"). All material registrations and applications for Owned Intellectual Property are subsisting, unexpired and have not been abandoned in any applicable jurisdiction. The Company and the Subsidiaries have not received any notice of any claim of infringement, misappropriation or violation of the Intellectual Property rights of others that would, individually or in the aggregate, reasonably be expected to have a Material Adverse Effect. The Company and Subsidiaries have taken reasonable measures consistent with industry standards to protect the confidentiality of their material trade secrets and confidential or proprietary information (including the source code for all material proprietary software). No such material trade secrets or information (including source code) has ever been disclosed or released to any third party (except pursuant to reasonable confidentiality obligations) and, to the Company's knowledge, no event has occurred, and no circumstances or conditions exist (including the execution of this Agreement or the consummation of the transactions contemplated hereby) that (with or without notice or lapse of time, or both) will, or would reasonably be expected to, result in the disclosure or release thereof to a third party. To the Company's knowledge, all such trade secrets and information (including source code) which has not been patented is and has been kept confidential. Except as disclosed in the Registration Statement, the Pricing Disclosure Package and the Prospectus, neither the Company nor any Subsidiary has granted, licensed or assigned to any other person or entity any right to manufacture, have manufactured, assemble, offer to sell, or sell the current products and services of the Company and its Subsidiaries or those products and services described in the Registration Statement, the Pricing Disclosure Package and the Prospectus. There is and has been no infringement, misappropriation, or other violation (i) by the Company or any Subsidiary (including by the operation of its respective business or its products or services) of any Intellectual Property rights of any third party or (ii) by third parties of any Owned Intellectual Property, except, in each case, as would not reasonably be expected to have a Material Adverse Effect. There is no pending or, to the Company's knowledge, threatened action, suit, proceeding, or claim either (x) challenging (A) the Company's or any Subsidiary's rights in or to any Company Intellectual Property or (B) the validity, enforceability, scope, ownership, or use of any Owned Intellectual Property, or (y) alleging any infringement, misappropriation, or other violation by the Company or any Subsidiary of any patent, trademark, copyright, trade secret or other Intellectual Property right of any third party, and in each case of (x) and (y), the Company is unaware of any fact which would form a reasonable basis for any such claim. None of the Company's or any Subsidiary's material proprietary software contains, incorporates, includes or is linked to, derived from, embedded with or distributed with any "copyleft" or similar software in any manner that would require that any source code for such material proprietary software to be disclosed, licensed, or distributed to others.

(ii) The Company and its Subsidiaries' information technology assets and equipment, computers, systems, networks, hardware, software, websites, applications, and databases (collectively, "IT Systems") are adequate for, and operate and perform in all material respects as required in connection with the operation of the business of the Company and its Subsidiaries as currently conducted, and to the best of the Company's knowledge, are free and clear of all material bugs, errors, defects, viruses, worms, Trojan horses, time bombs, malware or other similar flaws, harmful programs or corruptants. The Company and its subsidiaries have implemented and maintained commercially reasonable controls, policies, procedures, and safeguards to maintain and protect their material confidential information and the integrity, continuous operation, redundancy and security of all IT Systems and data (including all personal, personally identifiable, sensitive, confidential or regulated data ("Personal Data")) used in connection with their businesses, and there have been no breaches, violations, outages or unauthorized uses of or accesses to same, except for those that have been remedied without material cost or liability or the duty to notify any other person, nor any incidents under internal review or investigations relating to the same. The Company and its Subsidiaries are presently in material compliance with all applicable laws or statutes and all judgments, orders, rules and regulations of any court or arbitrator or governmental or regulatory authority, internal policies and contractual obligations relating to the privacy and security of IT Systems and Personal Data and to the protection of such IT Systems and Personal Data from unauthorized use, access, misappropriation or modification.

(jj) Neither the Company nor its Subsidiaries have been notified in writing, or have been required by applicable Law or a Governmental Authority to notify in writing, any person of any Personal Data or security-related incident. Neither the Company nor its Subsidiaries have received any notice of any claims, investigations, or alleged violations of Law with respect to Personal Data. To the best of the Company's knowledge, no person has commenced any proceedings relating to the Company or its Subsidiaries' information privacy or data security practices.

(kk) There has been no loss, damage, or unauthorized access, disclosure, use, or breach of security of any Company or Subsidiary information in their possession, custody, or control, or otherwise held or processed on their behalf that would reasonably be expected to have a Material Adverse Effect. The Company and its Subsidiaries have implemented, and required of their third party vendors, adequate policies and commercially reasonable security controls regarding the collection, use, disclosure, retention, confidentiality, integrity, and availability of personal and business sensitive information in their possession, custody, or control, or held or processed on their behalf, and regarding the integrity and availability of the information technology the Company and its Subsidiaries own, operate, or outsource.

(ll) The Company and the Subsidiaries maintain insurance in such amounts and covering such risks as the Company reasonably considers adequate for the conduct of its business and the value of its properties and as is customary for companies engaged in similar businesses in similar industries, all of which insurance is in full force and effect, except where the failure to maintain such insurance would not reasonably be expected to have a Material Adverse Effect. There are no material claims by the Company or any Subsidiary under any such policy or instrument as to which any insurance company is denying liability or defending under a reservation of rights clause. The Company reasonably believes that it will be able to renew its existing insurance as and when such coverage expires or will be able to obtain replacement insurance adequate for the conduct of the business and the value of its properties at a cost that would not have a Material Adverse Effect.

(mm) Except as would not reasonably be expected to result in a Material Adverse Effect, each of the Company and each Subsidiary has accurately prepared and timely filed all federal, state, foreign and other tax returns that are required to be filed by it or has been granted extensions thereof and has paid or made provision for the payment of all taxes, assessments, governmental or other similar charges, including without limitation, all sales and use taxes and all taxes which the Company or any Subsidiary is obligated to withhold from amounts owing to employees, creditors and third parties, with respect to the periods covered by such tax returns (whether or not such amounts are shown as due on any tax return). Except as would not reasonably be expected to result in a Material Adverse Effect, no deficiency assessment with respect to a proposed adjustment of the Company's or any Subsidiary' federal, state, local or foreign taxes is pending or, to the Company's knowledge, threatened. The accruals and reserves on the books and records of the Company and the Subsidiaries in respect of tax liabilities for any taxable period not finally determined are adequate to meet any assessments and related liabilities for any such period and, since December 31, 2018, the Company and the Subsidiaries have not incurred any liability for taxes other than in the ordinary course of its business, except as would not reasonably be expected to result in a Material Adverse Effect. There is no tax lien, whether imposed by any federal, state, foreign or other taxing authority, outstanding against the assets, properties or business of the Company or any Subsidiary, other than any such tax lien arising automatically under applicable law with respect to taxes not yet due and payable or being contested in good faith.

(nn) No labor disturbance by the employees of the Company or any Subsidiary exists or, to the Company's knowledge, is imminent and the Company is not aware of any existing or imminent labor disturbances by the employees of any of its or any Subsidiary's principal suppliers, manufacturers', customers or contractors, which, in either case (individually or in the aggregate), would reasonably be expected to have a Material Adverse Effect.

(oo) (i) Except as would not, individually or in the aggregate, reasonably be expected to have a Material Adverse Effect, each "employee benefit plan" (within the meaning of Section 3(3) of the Employee Retirement Security Act of 1974, as amended ("**ERISA**")) for which the Company or any member of its "Controlled Group" (defined as any organization which is a member of a controlled group of corporations within the meaning of Section 414 of the Internal Revenue Code of 1986, as amended (the "**Code**")) would have any liability (each a "**Plan**") has been maintained in compliance with its terms and with the requirements of all applicable statutes, rules and regulations including ERISA and the Code; (ii) no prohibited transaction, within the meaning of Section 406 of ERISA or Section 4975 of the Code, has occurred with respect to any Plan excluding transactions effected pursuant to a statutory or administrative exemption; (iii) with respect to each Plan subject to Title IV of ERISA (A) no "reportable event" (within the meaning of Section 4043(c) of ERISA) has occurred or is reasonably expected to occur, (B) no "accumulated funding deficiency" (within the meaning of Section 302 of ERISA or Section 412 of the Code), whether or not waived, has occurred or is reasonably expected to occur, (C) the fair market value of the assets under each Plan exceeds the present value of all benefits accrued under such Plan (determined based on those assumptions used to fund such Plan), and (D) neither the Company or any member of its Controlled Group has incurred, or reasonably expects to incur, any liability under Title IV of ERISA (other than contributions to the Plan or premiums to the Pension Benefit Guaranty Corporation in the ordinary course and without default) in respect of a Plan (including a "multiemployer plan", within the meaning of Section 4001(c)(3) of ERISA); and (iv) each Plan that is intended to be qualified under Section 401(a) of the Code is so qualified and nothing has occurred, whether by action or by failure to act, which would cause the loss of such qualification.

(pp) There has been no storage, generation, transportation, handling, use, treatment, disposal, discharge, emission, contamination, release or other activity involving any kind of hazardous, toxic or other wastes, pollutants, contaminants, petroleum products or other hazardous or toxic substances, chemicals or materials ("**Hazardous Substances**") by, due to, on behalf of, or caused by the Company or any Subsidiary (or, to the Company's knowledge, any other entity for whose acts or omissions the Company is or may be liable) upon any property now or previously owned, operated, used or leased by the Company or any Subsidiary, or upon any other property, which would be a violation of or give rise to any liability under any applicable law, rule, regulation, order, judgment, decree or permit, common law provision or other legally binding standard relating to pollution or protection of human health and the environment ("**Environmental Law**"), except for violations and liabilities which, individually or in the aggregate, would not reasonably be expected to have a Material Adverse Effect. There has been no disposal, discharge, emission contamination or other release of any kind at, onto or from any such property or into the environment surrounding any such property of any Hazardous Substances with respect to which the Company or any Subsidiary has knowledge, except as would not, individually or in the aggregate, reasonably be expected to have a Material Adverse Effect. Neither the Company nor any Subsidiary has agreed to assume, undertake or provide indemnification for any liability of any other person under any Environmental Law, including any obligation for cleanup or remedial action, except as would not, individually or in the aggregate, reasonably be expected to have a Material Adverse Effect. There is no pending or, to the Company's knowledge, threatened administrative, regulatory or judicial action, claim or notice of noncompliance or violation, investigation or proceedings relating to any Environmental Law against the Company or any Subsidiary, except in each case which, individually or in the aggregate, would not reasonably be expected to have a Material Adverse Effect. No property of the Company or any Subsidiary is subject to any Lien under any Environmental Law. Neither the Company nor any Subsidiary is subject to any order, decree, agreement or other individualized legal requirement related to any Environmental Law.

(qq) The Company and the Subsidiaries (i) are in compliance with all statutes, rules and regulations applicable to the testing, development, manufacture, packaging, processing, use, distribution, marketing, labeling, promotion, sale, offer for sale, storage, import, export or disposal of any product under development, manufactured or distributed by the Company or the Subsidiaries ("**Applicable Laws**") except where such noncompliance would not reasonably be expected to have a Material Adverse Effect, (ii) have not received any Form 483 from the FDA, notice of adverse finding, warning letter, or other written correspondence or notice from the FDA, the European Medicines Agency (the "**EMA**"), or any other federal, state, local or foreign governmental or regulatory authority alleging or asserting material 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**"), that would, individually or in the aggregate, result in a Material Adverse Effect; (iii) possess all Authorizations and such Authorizations are valid and in full force and effect and neither the Company nor the Subsidiaries is in violation of any term of any such Authorizations except where such nonpossession, failure or noncompliance would not reasonably be expected to have a Material Adverse Effect; (iv) have not received written notice of any claim, action, suit, proceeding, hearing, enforcement, investigation, arbitration or other action from the FDA, the EMA, or any other federal, state, local or foreign governmental or regulatory authority or third party alleging that any Company product, operation or activity is in violation of any Applicable Laws or Authorizations except where such noncompliance would not reasonably be expected to have a Material Adverse Effect, and has no knowledge that the FDA, the EMA, or any other federal, state, local or foreign governmental or regulatory authority or third party is considering any such claim, litigation, arbitration, action, suit, investigation or proceeding against the Company; (v) have not received written notice that the FDA, EMA, or any other federal, state, local or foreign governmental or regulatory authority has taken, is taking or intends to take action to limit, suspend, modify or revoke any Authorizations that would reasonably be expected to have a Material Adverse Effect and has no knowledge that the FDA, EMA, or any other federal, state, local or foreign governmental or regulatory authority is considering such action; and (vi) have filed, obtained, maintained or submitted all reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments as required by any Applicable Laws or Authorizations, except whether the failure to file, obtain, maintain or submit such reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments would not result in a Material Adverse Effect, 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) except such incompletions and incorrections as would not reasonably be expected to result in a Material Adverse Effect.

(rr) The Company's and each of its Subsidiaries' business practices have been structured in a manner reasonably designed to comply with the state, federal and foreign Health Care Laws applicable to the Company and its Subsidiaries respective businesses, and the Company and its Subsidiaries are in compliance with Health Care Laws, except where the failure to do so would not reasonably be expected to have a Material Adverse Effect. The Company and its Subsidiaries have not engaged in activities which to its knowledge are cause for false claims liability, civil penalties, or mandatory or permissive exclusion from Medicare, Medicaid, or any other state health care program or federal health care program. For purposes of this Agreement, "**Health Care Laws**" means the: (i) the Federal Food, Drug, and Cosmetic Act (21 U.S.C. § 301 et seq.) and the regulations promulgated thereunder; (ii) all applicable federal, state, local and all applicable foreign health care related fraud and abuse laws, including, without limitation, the U.S. Anti-Kickback Statute (42 U.S.C. Section 1320a-7b(b)), the U.S. civil False Claims Act (31 U.S.C. Section 3729 et seq.), the federal criminal false claims law (42 U.S.C. § 1320a-7b(a)), the federal civil monetary penalties law (42 U.S.C. § 1320a-7a), the Stark Law (42 U.S.C. §1395nn), 18 U.S.C. Sections 286 and 287, the health care fraud criminal provisions under the U.S. Health Insurance Portability and Accountability Act of 1996 ("**HIPAA**") (42 U.S.C. Section 1320d et seq.), the exclusion laws (42 U.S.C. §1320a-7), the statutes and regulations government healthcare programs, including the European Union General Data Protection Regulation (EU 2016 679), Medicare, Title XVIII of the Social Security Act, and Medicaid, Title XIX of the Social Security Act, and the regulations promulgated pursuant to such statutes; (iii) the U.S. federal Prescription Drug Marketing Act of 1987, as amended, and the regulations promulgated thereunder; (iv) the U.S. Controlled Substances Act; (v) the Clinical Laboratory Improvement Act; and (vi) the Standards for Privacy of Individually Identifiable Health Information (the "**Privacy Rule**"), the Security Standards, and the Standards for Electronic Transactions and Code Sets promulgated under HIPAA, the Health Information Technology for Economic and Clinical Health Act (42 U.S.C. Section 17921 et seq.), and the regulations promulgated thereunder and any state or non-U.S. counterpart thereof or other law or regulation the purpose of which is to protect the privacy of individuals or prescribers. Neither the Company nor its Subsidiaries have received written notice of any claim, action, suit, proceeding, hearing, enforcement, investigation, arbitration or other material action from any court or arbitrator or governmental or regulatory authority or third party alleging that any product, operation or activity is in violation of any Health Care Laws nor, to the Company's knowledge, is any such claim, action, suit, proceeding, hearing, enforcement, investigation, arbitration or other action threatened. The Company and its Subsidiaries have filed, maintained or submitted all material reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments as required by any Health Care Laws, and all such reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments were complete and accurate on the date filed in all material respects (or were corrected or supplemented by a subsequent submission). Neither the Company nor its Subsidiaries are a party to any corporate integrity agreements, monitoring agreements, consent decrees, plans of correction, settlement orders, or similar agreements with or imposed by any governmental or regulatory authority. Additionally, neither the Company, its Subsidiaries nor any of their respective employees, officers or directors has been excluded, suspended or debarred from participation in any U.S. federal health care program or human clinical research or, to the knowledge of the Company, is subject to a governmental inquiry, investigation, proceeding, or other similar action that would reasonably be expected to result in debarment, suspension, or exclusion.

(ss) All animal and other preclinical studies and clinical trials currently being conducted by the Company or on behalf of the Company are, to the Company's knowledge, being conducted in all material respects in compliance with all Applicable Laws and in accordance with experimental protocols, procedures and controls generally used by qualified experts in the preclinical study and clinical trials of new drugs and biologics as applied to comparable products to those being developed by the Company, and, except as set forth in the Registration Statement and the Prospectus, the Company has no knowledge of any other clinical trials or preclinical studies, the results of which reasonably call into question the clinical trial or preclinical study results described or referred to in the Registration Statement and the Prospectus when viewed in the context in which such results are described, except such results as would not reasonably be expected to result in a Material Adverse Effect; and the Company has not received any written notices or correspondence from the FDA, the EMA, or any other domestic or foreign governmental agency requiring the termination or suspension of any preclinical studies or clinical trials conducted by or on behalf of the Company that are described in the Registration Statement and the Prospectus or the results of which are referred to in the Registration Statement and the Prospectus.

(tt) The Company has established and administers a compliance program applicable to the Company, to assist the Company and the directors, officers and employees of the Company in complying with applicable regulatory guidelines (including, without limitation, those administered by the FDA, the EMA, and any other foreign, federal, state or local governmental or regulatory authority performing functions similar to those performed by the FDA or EMA).

(uu) Neither the Company nor any of its Subsidiaries nor, to the Company's knowledge, any director, officer, agent, employee, affiliate or other person acting on behalf of the Company or any of its Subsidiaries, has (i) made any unlawful contribution, gift, entertainment or other unlawful expense relating to political activity; (ii) made any direct or indirect unlawful payment to any domestic governmental official, "foreign official" (as defined in the U.S. Foreign Corrupt Practices Act of 1977, as amended, and the rules and regulations thereunder (collectively, the "**FCPA**")) or employee; (iii) violated or is in violation of any provision of the FCPA, UK Bribery Act, or any applicable non-U.S. anti-bribery statute or regulation or any locally applicable corruption laws; (iv) made any bribe, rebate, payoff, influence payment, kickback or other unlawful payment; or (v) received notice of any investigation, proceeding or inquiry by any governmental agency, authority or body regarding any of the matters in clauses (i)-(iv) above; and the Company and its Subsidiaries and, to the Company's knowledge, the Company's affiliates have conducted their respective businesses in compliance with the FCPA and have instituted and maintain policies and procedures designed to ensure, and which are reasonably expected to continue to ensure, continued compliance therewith.

(vv) The operations of the Company and its Subsidiaries are and have been conducted at all times in compliance with applicable financial record-keeping and reporting requirements, including those of the Bank Secrecy Act, as amended by Title III of the Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act of 2001 (USA PATRIOT Act) (Title III of Pub. L. 107-56 (signed into law October 26, 2001)) (the "**USA Patriot Act**"), and those of the Currency and Foreign Transactions Reporting Act of 1970, as amended, and the money laundering statutes of all applicable jurisdictions, the rules and regulations thereunder and any related or similar rules, regulations or guidelines issued, administered or enforced by any governmental agency (collectively, the "**Money Laundering Laws**") and no action, suit or proceeding by or before any court or governmental agency, authority or body or any arbitrator involving the Company or any of its Subsidiaries with respect to the Money Laundering Laws is pending or, to the Company's knowledge, threatened.

(ww) None of the Company, any of its Subsidiaries, any officer or director of either the Company or its Subsidiaries nor, to the best knowledge of the Company, any agent, employee, affiliate or other person acting on behalf of the Company or any of its Subsidiaries is or, in the past five years, has been (A) engaged in any services (including financial services), transfers of goods, software, or technology, or any other business activity related to (i) Cuba, Iran, North Korea, Sudan, Syria or the Crimea region of Ukraine claimed by Russia ("**Sanctioned Countries**"), (ii) the government of any Sanctioned Country, (iii) any person, entity or organization located in, resident in, formed under the laws of, or owned or controlled by the government of, any Sanctioned Country, or (iv) any person, entity or organization made subject or target of any sanctions administered or enforced by the United States Government (including the US Department of Treasury, Office of Foreign Assets Control and the US Department of State), including, without limitation, the list of Specially Designated Nationals ("**SDN List**") of the Office of Foreign Assets Control of the U.S. Treasury Department ("**OFAC**"), or by the United Nations Security Council, the European Union, Her Majesty's Treasury, or other relevant sanctions authority (collectively, "**Sanctions**") and the Company will not directly or indirectly use the proceeds of this offering, or lend, contribute or otherwise make available such proceeds to any of its subsidiaries, or any joint venture partner or other person or entity, for the purpose of financing the activities of or business with any person, or in any country or territory, that currently is the subject to any U.S. sanctions administered by OFAC or in any other manner that will result in a violation by any person (including any person participating in the transaction whether as underwriter, advisor, investor or otherwise) of U.S. sanctions administered by OFAC; (B) engaged in any transfers of goods, technologies or services (including financial services) that may assist the governments of Sanctioned Countries or facilitate money laundering or other activities proscribed by United States laws, rules or regulations; (C) is a person, entity or organization currently the subject of any Sanctions; or (D) located, organized or resident in any Sanctioned Country.

(xx) The Company (i) has not alone engaged in any Testing-the-Waters Communication, and (ii) has not authorized anyone to engage in Testing-the-Waters Communications. The Company has not distributed any Written Testing-the-Waters Communications. "Testing-the-Waters Communication" means any oral or written communication with potential investors undertaken in reliance on Section 5(d) of the Securities Act. "Written Testing-the-Waters Communication" means any Testing-the-Waters Communication that is a written communication within the meaning of Rule 405 under the Securities Act.

(yy) Except as disclosed in the Registration Statement, the Pricing Disclosure Package and the Prospectus, the Company (i) does not have any material lending or other relationship with any bank or lending affiliate of any Underwriter and (ii) does not intend to use any of the proceeds from the sale of the Shares to repay any outstanding debt owed to any affiliate of any Underwriter.

Any certificate signed by or on behalf of the Company and delivered to the Representatives or to counsel for the Underwriters shall be deemed to be a representation and warranty by the Company to each Underwriter as to the matters covered thereby.

2. Purchase, Sale and Delivery of the Shares.

(a) On the basis of the representations, warranties, covenants and agreements herein contained, and subject to the terms and conditions herein set forth, the Company agrees to sell to each Underwriter and each Underwriter, severally and not jointly, agrees to purchase from the Company, at a purchase price per share of $103.40, the number of Firm Shares set forth opposite their respective names on Schedule I hereto together with any additional number of Shares which such Underwriter may become obligated to purchase pursuant to the provisions of Section 10 hereof, subject, however, to such adjustments to eliminate fractional shares as the Representatives in their sole discretion shall make.

(b) The closing of the issuance of the Firm Shares shall be held at the office of Goodwin Procter LLP ("**Underwriters' Counsel**"), or at such other place as shall be agreed upon by the Representatives and the Company, at 10:00 a.m. (New York City time), on December 10, 2020, or such other time and date as the Representatives and the Company may agree upon in writing (such time and date of payment and delivery being herein called the "**Closing Date**"). Payment of the purchase price for the Firm Shares shall be made by wire transfer in same day funds to the accounts specified by the Company upon delivery of the Firm Shares to the Representatives through the facilities of The Depository Trust Company ("**DTC**") for the respective accounts of the several Underwriters. The Firm Shares shall be registered in such name or names and shall be in such denominations as the Representatives may request in writing not later than the business day immediately prior to the Closing Date.

(c) In addition, the Company hereby grants to the Underwriters the option to purchase up to 204,750 Additional Shares at the same purchase price per share to be paid by the Underwriters for the Firm Shares as set forth in Section 2(a) above. This option may be exercised at any time and from time to time, in whole or in part on one or more occasions, on or before the thirtieth day following the date of the Prospectus, by written notice from the Representatives to the Company. Such notice shall set forth the aggregate number of Additional Shares as to which the option is being exercised and the date and time, as reasonably determined by the Representatives, when the Additional Shares are to be delivered (any such date and time being herein sometimes referred to as an "**Additional Closing Date**"); *provided*, *however*, that no Additional Closing Date shall occur earlier than the Closing Date or earlier than the second full business day after the date on which the option shall have been exercised nor later than the eighth full business day after the date on which the option shall have been exercised. On the basis of the representations, warranties, covenants and agreements herein contained, but subject to the terms and conditions herein set forth, upon any exercise of the option as to all or any portion of the Additional Shares, each Underwriter, acting severally and not jointly, agrees to purchase from the Company the number of Additional Shares that bears the same proportion of the total number of Additional Shares then being purchased as the number of Firm Shares set forth opposite the name of such Underwriter in Schedule I hereto (or such number increased as set forth in Section 10 hereof) bears to the total number of Firm Shares that the Underwriters have agreed to purchase hereunder, subject, however, to such adjustments to eliminate fractional shares as the Representatives in their sole discretion shall make. In the event that the Underwriters exercise less than their full option to purchase Additional Shares, the number of Additional Shares to be sold by the Company shall be, as nearly as practicable, in the same proportion as the maximum number of Additional Shares to be sold by the Company and the number of Additional Shares to be sold.

(d) The closing of the issuance of the Additional Shares shall be held at the office of Underwriters' Counsel, or at such other place as shall be agreed upon by the Representatives and the Company, at 10:00 a.m. (New York City time), on any Additional Closing Date, or such other time as shall be agreed upon by the Representatives and the Company. Payment of the purchase price for the Additional Shares shall be made by wire transfer in same day funds to the account specified by the Company upon delivery of the Additional Shares to the Representatives through the facilities of DTC for the respective accounts of the several Underwriters. The Additional Shares shall be registered in such name or names and shall be in such denominations as the Representatives may request in writing not later than the business day immediately prior to the Closing Date.

3. Offering. Upon authorization of the release of the Firm Shares by the Representatives, the Underwriters propose to offer the Shares for sale to the public upon the terms and conditions set forth in the Prospectus.

4. Covenants of the Company. In addition to the other covenants and agreements of the Company contained herein, the Company further covenants and agrees with each of the Underwriters that:

(a) The Company shall prepare the Prospectus in a form approved by the Representatives and file such Prospectus pursuant to, and within the time period specified in, Rule 424(b) and Rule 430B under the Securities Act; prior to the last date on which an Additional Closing Date, if any, may occur, the Company shall file no further amendment to the Registration Statement or amendment or supplement to the Prospectus to which the Representatives shall object in writing after being furnished in advance a copy thereof and given a reasonable opportunity to review and comment thereon; the Company shall notify the Representatives promptly (and, if requested by any of the Representatives, confirm such notice in writing) (i) when the Registration Statement and any amendments thereto become effective, (ii) of any request by the Commission for any amendment of or supplement to the Registration Statement or the Prospectus, including any document incorporated by reference therein or for any additional information, (iii) of the Company's intention to file, or prepare any supplement or amendment to, the Registration Statement, any Preliminary Prospectus, the Prospectus or any Issuer Free Writing Prospectus, (iv) of the mailing or the delivery to the Commission for filing of any amendment of or supplement to the Registration Statement or the Prospectus, including but not limited to Rule 462(b) under the Securities Act, (v) of any notice with respect to any suspension of the qualification of the Shares for offer and sale in any jurisdiction or the initiation or threatening of any proceeding for such purpose or any post-effective amendment thereto, or suspending the use of any Preliminary Prospectus, the Prospectus or any Issuer Free Writing Prospectus or, in each case, of the initiation or threatening of any proceedings therefore, (vi) of the receipt of any comments from the Commission, and (vii) of the receipt by the Company of any notification with respect to the suspension of the qualification of the Shares for sale in any jurisdiction or the initiation or threatening of any proceeding for that purpose. If the Commission shall propose or enter a stop order at any time, the Company will make every reasonable effort to prevent the issuance of any such stop order and, if issued, to obtain the lifting of such order as soon as possible. The Company will pay the registration fee for this offering within the time period required by Rule 456(b)(1) under the Securities Act (without giving effect to the proviso therein) and in any event prior to the Closing Date.

(b) If at any time when a prospectus relating to the Shares (or, in lieu thereof, the notice referred to in Rule 173(a) under the Securities Act) is required to be delivered under the Securities Act, any event shall have occurred as a result of which the Pricing Disclosure Package (prior to the availability of the Prospectus) or the Prospectus as then amended or supplemented would, in the judgment of the Underwriters or the Company, include an untrue 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 at the time of delivery of such Pricing Disclosure Package or Prospectus (or, in lieu thereof, the notice referred to in Rule 173(a) under the Securities Act) to the purchaser, not misleading, or if to comply with the Securities Act, the Exchange Act or the Rules and Regulations it shall be necessary at any time to amend or supplement the Pricing Disclosure Package, the Prospectus or the Registration Statement, or to file any document incorporated by reference in the Registration Statement or the Prospectus or in any amendment thereof or supplement thereto, the Company will notify the Representatives promptly and prepare and file with the Commission an appropriate amendment, supplement or document (in form and substance satisfactory to the Representatives) that will correct such statement or omission or effect such compliance, and will use its best efforts to have any amendment to the Registration Statement declared effective as soon as possible.

(c) The Company will not, without the prior consent of the Representatives, (i) make any offer relating to the Shares that would constitute a "free writing prospectus" as defined in Rule 405 under the Securities Act, except for any Issuer Free Writing Prospectus set forth in Schedule II hereto and any electronic road show previously approved by the Representatives, or (ii) file, refer to, approve, use or authorize the use of any "free writing prospectus" as defined in Rule 405 under the Securities Act with respect to the Offering or the Shares. If at any time any event shall have occurred as a result of which any Issuer Free Writing Prospectus as then amended or supplemented would, in the judgment of the Underwriters or the Company, conflict with the information in the Registration Statement, the Pricing Disclosure Package or the Prospectus as then amended or supplemented or would, in the judgment of the Underwriters or the Company, include an untrue statement of a material fact or omit to state any material necessary in order to make the statements therein, in the light of the circumstances existing at the time of delivery to the purchaser, not misleading, or if to comply with the Securities Act or the Rules and Regulations it shall be necessary at any time to amend or supplement any Issuer Free Writing Prospectus, the Company will notify the Representatives promptly and, if requested by any of the Representatives, prepare and furnish without charge to each Underwriter an appropriate amendment or supplement (in form and substance satisfactory to the Representatives) that will correct such statement, omission or conflict or effect such compliance.

(d) The Company will comply with the requirements of Rule 433 with respect to each Issuer Free Writing Prospectus including, without limitation, all prospectus delivery, filing, record retention and legending requirements applicable to each such Issuer Free Writing Prospectus.

(e) At the request of any of the Representatives, the Company will promptly deliver to each of the Representatives and Underwriters' Counsel a signed copy of the Registration Statement, as initially filed and all amendments thereto, including all consents and exhibits filed therewith. At the request of any of the Representatives, the Company will promptly deliver to each of the Underwriters such number of copies of any Preliminary Prospectus, the Prospectus, the Registration Statement, all amendments of and supplements to such documents, if any, and all documents incorporated by reference in the Registration Statement and Prospectus or any amendment thereof or supplement thereto, as any of the Representatives may reasonably request. Prior to 3:00 p.m. (New York City time), on the business day next succeeding the date of this Agreement and from time to time thereafter, at the request of any of the Representatives, the Company will furnish the Underwriters with copies of the Prospectus in New York City in such quantities as the Representatives may reasonably request.

(f) The Company will use its reasonable best efforts, in cooperation with the Representatives, to qualify the Shares for offering and sale under the securities laws relating to the offering or sale of the Shares of such jurisdictions, domestic or foreign, as any of the Representative may reasonably request, and to maintain such qualification in effect for so long as required for the distribution thereof; except that in no event shall the Company be obligated in connection therewith (i) to qualify as a foreign corporation, (ii) to execute a general consent to service of process or (iii) subject itself to taxation in any jurisdiction where it is not otherwise so subject.

(g) The Company will make generally available to its security holders and to the Representatives as soon as practicable an earnings statement of the Company and the Subsidiaries (which need not be audited) covering a period of at least twelve months beginning with the first fiscal quarter of the Company commencing after the date of this Agreement that will satisfy the provisions of Section 11(a) of the Securities Act and the Rules and Regulations (including, at the option of the Company, Rule 158).

(h) During the period of 60 days from the date of the Prospectus (the "**Lock-Up Period**"), without the prior written consent of Piper Sandler and Guggenheim, the Company (i) will not, directly or indirectly, issue, offer, sell, agree to issue, 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 any shares of Common Stock or any securities convertible into or exercisable or exchangeable for Common Stock, or make any public announcement of any of the foregoing, (ii) will not 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 and the rules and regulations thereunder) with respect to any shares of Common Stock or any securities convertible into or exercisable or exchangeable for Common Stock, and (iii) will not 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 any shares of Common Stock or any securities convertible into or exercisable or exchangeable for Common Stock, whether or not such transaction is to be settled by delivery of any shares of Common Stock, securities convertible into or exercisable or exchangeable for Common Stock, other securities, cash or other consideration, other than (A) the Shares to be sold hereunder, (B) upon the exercise of an option or warrant, the vesting of restricted stock units, performance stock units or deferred stock units or the conversion or exchange of a security outstanding on the date hereof as referred to in the Registration Statement, the Pricing Disclosure Package and the Prospectus, (C) pursuant to the stock-based compensation plans of the Company and the Subsidiaries as referred to in the Registration Statement (including the Company's 2020 Employee Stock Purchase Plan), the Pricing Disclosure Package and the Prospectus, (D) pursuant to an inducement award permitted to be issued without shareholder approval by Nasdaq rules, and (E) shares of Common Stock or other securities issued to a third party in connection with a bona fide commercial relationship (including joint ventures, marketing or distribution arrangements, collaboration agreements or intellectual property license agreements) or any bona fide acquisition of assets of not less than a majority or controlling portion of the equity of another entity, provided that (x) any such issuance is not primarily for the purpose of raising capital; (y) the aggregate number of shares of Common Stock that the Company may sell or issue or agree to sell or issue shall not exceed 5% of the total number of shares of Common Stock issued and outstanding as of the date of this Agreement and (z) each recipient of shares of Common Stock or securities convertible into or exercisable for Common Stock shall execute a lock-up agreement substantially in the form of Exhibit C hereto. The Company has obtained an undertaking in substantially the form of Exhibit C hereto (a "**Lock-Up Agreement**") of each of its executive officers, directors and stockholders listed on Schedule IV attached hereto, not to engage in any of the aforementioned transactions on their own behalf. The Company will not file a registration statement under the Securities Act in connection with any transaction by the Company or any person that is prohibited pursuant to the foregoing, except for registration statements on Form S-8 or any successor form thereto relating to stock based compensation and employee benefit plans. Notwithstanding the foregoing, during the Lockup Period the Company may enter into an at-the-market ("**ATM**") equity distribution or similar agreement with one or more sales agents and file a prospectus supplement for the ATM facility, provided that no sales can be made under such ATM facility during the Lockup Period.

(i) During the period of two years from the latest Effective Date of the Registration Statement, the Company will furnish to the Representatives copies of all reports or other communications (financial or other) furnished to security holders or from time to time published or publicly disseminated by the Company, and will deliver to the Representatives as soon as they are available, copies of any reports, financial statements and proxy or information statements furnished to or filed with the Commission or any national securities exchange on which any class of securities of the Company is listed; provided, that the Company will be deemed to have furnished such reports, other communications, financial statements and proxy or information statements to the Representatives to the extent they are filed on EDGAR.

(j) The Company will use its best efforts to list the Shares on the Nasdaq Global Market and to maintain the listing of the Common Stock (including the Shares) on the Nasdaq Global Market (or another Nasdaq market) following the issuance of the Shares pursuant to this Agreement provided; however that this covenant shall not prevent a sale, merger or similar transaction involving the Company.

(k) The Company will apply the net proceeds from the sale of the Shares as set forth under the caption "Use of Proceeds" in the Pricing Disclosure Package and the Prospectus.

(l) The Company, during the period when a prospectus (or, in lieu thereof, the notice referred to in Rule 173(a) under the Securities Act) is required to be delivered under the Securities Act in connection with the offer or sale of the Shares, will file all reports and other documents required to be filed by the Company with the Commission pursuant to Section 13(a), 13(c), 14 or 15(d) of the Exchange Act and the Rules and Regulations within the time periods required thereby.

(m) If the Company elects to rely upon Rule 462(b) under the Securities Act, the Company shall file a Rule 462(b) Registration Statement with the Commission in compliance with Rule 462(b) by 10:00 p.m. (New York City time), on the date of this Agreement, and the Company shall at the time of filing either pay to the Commission the filing fee for the Rule 462(b) Registration Statement or give irrevocable instructions for the payment of such fee pursuant to Rule 111(b) under the Securities Act.

(n) The Company will not take, and will cause its affiliates (within the meaning of Rule 144 under the Securities Act) not to take, directly or indirectly, any action which constitutes or is designed to cause or result in, or which would reasonably be expected to constitute, cause or result in, the stabilization or manipulation of the price of any security to facilitate the sale or resale of the Shares or to result in a violation of Regulation M under the Exchange Act.

(o) The Company will do and perform all things required or necessary to be done and performed under this Agreement by it prior to each Closing Date, and to satisfy all conditions precedent to the Underwriters' obligations hereunder to purchase the Shares.

5. Covenant of the Underwriters. Each Underwriter, severally and not jointly, covenants and agrees with the Company that such Underwriter will not use or refer to any "free writing prospectus" (as defined in Rule 405 under the Securities Act) without the prior written consent of the Company if such Underwriter's use of or reference to such "free writing prospectus" would require the Company to file with the Commission any "issuer information" (as defined in Rule 433 under the Securities Act).

6. Payment of Expenses. Whether or not the transactions contemplated by this Agreement, the Registration Statement and the Prospectus are consummated or this Agreement is terminated, (provided, however, the Company shall have no obligation to reimburse any defaulting Underwriter pursuant to Section 10 herewith), the Company hereby agrees to pay all costs and expenses incident to the performance of its obligations hereunder, including the following: (i) all expenses in connection with the preparation, printing and filing of the Registration Statement, any Preliminary Prospectus, any Issuer Free Writing Prospectus, the Prospectus and any and all amendments and supplements thereto and the mailing and delivering of copies thereof to the Underwriters and dealers; (ii) the fees, disbursements and expenses of the Company's counsel and accountants in connection with the registration of the Shares under the Securities Act and the Offering; (iii) the cost of producing this Agreement and any agreement among Underwriters, blue sky survey, closing documents and other instruments, agreements or documents (including any compilations thereof) in connection with the Offering; (iv) all expenses in connection with the qualification of the Shares for offering and sale under state or foreign securities or blue sky laws as provided in Section 4(f) hereof, including the fees and disbursements of counsel for the Underwriters in connection with such qualification or offering and in connection with any blue sky survey; (v) all fees and expenses in connection with listing the Shares on the Nasdaq Global Market; (vi) the costs and expenses of the Company relating to investor presentations on any Road Show undertaken in connection with the marketing of the Shares, including without limitation, expenses associated with the production and distribution (including electronic) of Road Show slides and graphics, fees and expenses of any consultants engaged in connection with the Road Show presentations, travel and lodging expenses of the representatives and officers of the Company in connection with the Road Show; (vii) any stock transfer taxes incurred in connection with this Agreement or the Offering and (viii) the fees and expenses incident to the performance of the obligations of the Representatives (including reasonable and documented fees and expenses of Underwriters' Counsel); in an amount not to exceed $75,000 in the aggregate. The Company also will pay or cause to be paid: (x) the cost of preparing stock certificates representing the Shares; (y) the cost and charges of any transfer agent or registrar for the Shares; and (z) all other costs and expenses incident to the performance of its obligations hereunder which are not otherwise specifically provided for in this Section 6.

7. Conditions of Underwriters' Obligations. The several obligations of the Underwriters to purchase and pay for the Firm Shares and the Additional Shares, as provided herein, shall be subject to the accuracy of the representations and warranties of the Company herein contained, as of the date hereof and as of the applicable Closing Date (for purposes of this Section 7, "**Closing Date**" shall refer to the Closing Date for the Firm Shares and any Additional Closing Date, if different, for the Additional Shares), to the performance by the Company of all of its obligations hereunder, and to each of the following additional conditions:

(a) The Prospectus shall have been filed with the Commission in a timely fashion in accordance with Section 4(a) hereof; no stop order suspending the effectiveness of the Registration Statement or any post-effective amendment thereto, and no stop order suspending or preventing the use of any Preliminary Prospectus, any Issuer Free Writing Prospectus or the Prospectus, shall have been issued by the Commission and no proceedings therefor, pursuant to Rule 401(g)(2) or pursuant to Section 8A under the Securities Act, shall have been initiated or threatened by the Commission; all requests for additional information on the part of the Commission shall have been complied with to the Representatives' reasonable satisfaction; if the Company has elected to rely on Rule 462(b) under the Securities Act, the Rule 462(b) Registration Statement shall have become effective by 10:00 p.m. (New York City time) on the date of this Agreement; and all necessary regulatory or stock exchange approvals shall have been received.

(b) At the Closing Date, the Representatives shall have received (i) the written opinion and negative assurance statement of Dentons US LLP, counsel for the Company, dated the Closing Date and addressed to the Underwriters, in form and substance satisfactory to the Representatives, to the effect set forth in Exhibit B-1 hereto; and (ii) the written opinion of Peter Knudsen, intellectual property counsel for the Company, dated the Closing Date and addressed to the Underwriters, in form and substance satisfactory to the Representatives, to the effect set forth in Exhibit B-2.

(c) At the Closing Date, the Representatives shall have received the written opinion and negative assurance statement of Underwriters' Counsel, dated the Closing Date and addressed to the Underwriters, in form and substance satisfactory to the Representatives with respect to the issuance and sale of the Shares, the Registration Statement, the Pricing Disclosure Package, the Prospectus and such other matters as the Representatives may require, and the Company shall have furnished to Underwriters' Counsel such documents as they may reasonably request for the purpose of enabling them to pass upon such matters.

(d) At the Closing Date, the Representatives shall have received a certificate of the Chief Executive Officer and Chief Financial Officer of the Company, dated the Closing Date, in form and substance satisfactory to the Representatives, as to the accuracy of the representations and warranties of the Company set forth in Section 1 hereof as of the date hereof and as of the Closing Date, as to the performance by the Company of all of its obligations hereunder to be performed at or prior to the Closing Date, as to the matters set forth in subsections (a), (f), (g) and (h) of this Section 7, and as to such other matters as the Representatives may reasonably request.

(e) At the time this Agreement is executed and at the Closing Date, the Representatives shall have received a comfort letter, from Ernst & Young LLP, independent registered public accountants for the Company, dated, respectively, as of the date of this Agreement and as of the Closing Date, addressed to the Underwriters and in form and substance satisfactory to the Underwriters and Underwriters' Counsel, containing statements and information of the type ordinarily included in accountants' "comfort letters" to underwriters with respect to the financial statements and certain financial information contained in the Registration Statement, the Pricing Disclosure Package and the Prospectus.

(f) (i) Neither the Company nor any Subsidiary shall have sustained, since the date of the latest audited financial statements included or incorporated by reference in the Registration Statement, the Pricing Disclosure Package and the Prospectus, any material loss or interference with its business or properties from fire, explosion, flood, earthquake, hurricane, accident or other calamity, whether or not covered by insurance, or from any labor dispute or any legal or governmental proceeding, other than as set forth in the Registration Statement, the Pricing Disclosure Package and the Prospectus (exclusive of any supplement thereto); and (ii) subsequent to the dates as of which information is given in the Registration Statement (exclusive of any amendment thereto subsequent to the date hereof) and the Pricing Disclosure Package and the Prospectus (exclusive of any supplement thereto), there shall not have been any change in the capital stock or long-term or short-term debt of the Company or any Subsidiary or any change or any development involving a change, whether or not arising from transactions in the ordinary course of business, in the business, general affairs, management, condition (financial or otherwise), results of operations, stockholders' equity, properties or prospects of the Company and the Subsidiaries, individually or taken as a whole, the effect of which, in any such case described above, is, in the judgment of the Representatives, so material and adverse as to make it impracticable or inadvisable to proceed with the Offering on the terms and in the manner contemplated in the Registration Statement, the Pricing Disclosure Package and the Prospectus (exclusive of any such supplement).

(g) On or after the Applicable Time, (i) no downgrading shall have occurred in the rating accorded the Company's or any Subsidiaries' debt securities or preferred stock or the Company's or any Subsidiaries' financial strength or claims paying ability by any "nationally recognized statistical rating organization", as such term is defined in Section 3(a)(62) of the Exchange Act, and (ii) no such organization shall have publicly announced that it has under surveillance or review, with possible negative implications, its rating of any of the Company's or any Subsidiaries' debt securities or preferred stock or the Company's or any Subsidiaries' financial strength or claims paying ability.

(h) No Underwriter shall have discovered and disclosed to the Company on or prior to such Closing Date that any of the Registration Statement, the Pricing Disclosure Package or the Prospectus, or any amendment or supplement thereto, contains an untrue statement of a fact which, in the opinion of Underwriters' Counsel, is material or omits to state a fact which, in the opinion of such counsel, is material and is required to be stated therein or is necessary to make the statements therein not misleading.

(i) As of the date of this Agreement, the Representatives shall have received a duly executed Lock-Up Agreement from each person who is a director or executive officer of the Company and each shareholder and other person or entity listed on Schedule IV hereto, in each case substantially in the form attached hereto as Exhibit C.

(j) At the Closing Date, the Shares shall have been approved for quotation on the Nasdaq Global Market, subject only to official notice of issuance.

(k) The Chief Financial Officer of the Company shall have furnished to the Representatives a certificate, dated as of the date of this Agreement and on each Closing Date, in the form attached hereto as Exhibit D.

(l) If a filing has been made with FINRA, FINRA shall have confirmed that it has not raised any objection with respect to the fairness and reasonableness of the underwriting terms and arrangements relating to the Offering of the Shares.

(m) The Company shall have furnished the Underwriters and Underwriters' Counsel with such other certificates, opinions or other documents as they may have reasonably requested.

If any of the conditions specified in this Section 7 shall not have been fulfilled when and as required by this Agreement, or if any of the certificates, opinions, written statements or letters furnished to the Representatives or to Underwriters' Counsel pursuant to this Section 7 shall not be satisfactory in form and substance to the Representatives and to Underwriters' Counsel, all obligations of the Underwriters hereunder may be cancelled by the Representatives at, or at any time prior to, the Closing Date and the obligations of the Underwriters to purchase the Additional Shares may be cancelled by the Representatives at, or at any time prior to, any Additional Closing Date. Notice of such cancellation shall be given to the Company in writing or by telephone. Any such telephone notice shall be confirmed promptly thereafter in writing.

8. Indemnification.

(a) The Company shall indemnify and hold harmless each Underwriter, its affiliates, directors, officers, employees and each person, if any, who controls any Underwriter within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act, against any and all losses, liabilities, claims, damages and expenses whatsoever as incurred (including but not limited to attorneys' fees and any and all expenses whatsoever incurred in investigating, preparing or defending against any litigation, commenced or threatened, or any claim whatsoever, and any and all amounts paid in settlement of any claim or litigation), joint or several, to which they or any of them may become subject under the Securities Act, the Exchange Act or otherwise, insofar as such losses, liabilities, claims, damages or expenses (or actions in respect thereof) arise out of or are based upon (i) any untrue statement or alleged untrue statement of a material fact contained in the Registration Statement, or any amendment thereto, or the omission or alleged omission to state therein a material fact required to be stated therein or necessary to make the statements therein not misleading; or (ii) any untrue statement or alleged untrue statement of a material fact included (A) in any Preliminary Prospectus or the Prospectus, or in any supplement thereto or amendment thereof, or in any Issuer Free Writing Prospectus, or in any "issuer information" (as defined in Rule 433(h)(2) under the Securities Act) filed or required to be filed pursuant to Rule 433(d) under the Securities Act, or (B) in any other materials or information provided to investors by, or with the approval of, the Company in connection with the Offering, including in any Road Show for the Offering ("**Marketing Materials**"), or the omission or alleged omission to state in any Preliminary Prospectus or the Prospectus, or in any supplement thereto or amendment thereof, or in any Issuer Free Writing Prospectus, or in any "issuer information" (as defined in Rule 433(h)(2) under the Securities Act) filed or required to be filed pursuant to Rule 433(d) under the Securities Act, or in any Marketing Materials, 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 the Company will not be liable in any such case to the extent but only to the extent that any such loss, liability, claim, damage or expense arises out of or is based upon any such untrue statement or alleged untrue statement or omission or alleged omission made therein in reliance upon and in conformity with written information furnished to the Company by or on behalf of any Underwriter through the Representatives expressly for use therein. The parties agree that such information provided by or on behalf of any Underwriter through the Representatives consists solely of the material referred to in Section 19 hereof. This indemnity agreement will be in addition to any liability which the Company may otherwise have, including but not limited to other liability under this Agreement.

(b) Each Underwriter, severally and not jointly, shall indemnify and hold harmless the Company, each of the directors of the Company, each of the officers of the Company who shall have signed the Registration Statement, and each other person, if any, who controls the Company within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act, against any losses, liabilities, claims, damages and expenses whatsoever as incurred (including but not limited to attorneys' fees and any and all expenses whatsoever incurred in investigating, preparing or defending against any litigation, commenced or threatened, or any claim whatsoever, and any and all amounts paid in settlement of any claim or litigation), joint or several, to which they or any of them may become subject under the Securities Act, the Exchange Act or otherwise, insofar as such losses, liabilities, claims, damages or expenses (or actions in respect thereof) arise out of or are based upon (i) any untrue statement or alleged untrue statement of a material fact contained in the Registration Statement, or any amendment thereto, or the omission or alleged omission to state therein a material fact required to be stated therein or necessary to make the statements therein not misleading or (ii) any untrue statement or alleged untrue statement of a material fact contained in any related Preliminary Prospectus or the Prospectus, or in any amendment thereof or supplement thereto, or arise out of or are based upon the omission or alleged omission 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, in each case to the extent, but only to the extent, that any such loss, liability, claim, damage or expense arises out of or is based upon any such untrue statement or alleged untrue statement or omission or alleged omission made therein in reliance upon and in conformity with information furnished in writing to the Company by or on behalf of any Underwriter through the Representatives specifically for use therein; provided, however, that in no case shall any Underwriter be liable or responsible for any amount in excess of the underwriting discount applicable to the Shares to be purchased by such Underwriter hereunder. The parties agree that such information provided by or on behalf of any Underwriter through the Representatives consists solely of the material referred to in Section 19 hereof.

(c) Promptly after receipt by an indemnified party under subsection (a) or (b) above of notice of any claims or the commencement of any action, such indemnified party shall, if a claim in respect thereof is to be made against the indemnifying party under such subsection, notify each party against whom indemnification is to be sought in writing of the claim or the commencement thereof (but the failure so to notify an indemnifying party shall not relieve the indemnifying party from any liability which it may have under this Section 8 to the extent that it is not materially prejudiced as a result thereof or otherwise has notice of any such action, and in any event shall not relieve it from any liability that such indemnifying party may have otherwise than on account of the indemnity agreement hereunder). In case any such claim or action is brought against any indemnified party, and it notifies an indemnifying party of the commencement thereof, the indemnifying party will be entitled to participate, at its own expense in the defense of such action, and to the extent it may elect by written notice delivered to the indemnified party promptly after receiving the aforesaid notice from such indemnified party, to assume the defense thereof with counsel satisfactory to such indemnified party; provided however, that counsel to the indemnifying party shall not (except with the written consent of the indemnified party) also be counsel to the indemnified party. Notwithstanding the foregoing, the indemnified party or parties 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 such indemnified party or parties unless (i) the employment of such counsel shall have been authorized in writing by one of the indemnifying parties in connection with the defense of such action, (ii) the indemnifying parties shall not have employed counsel to have charge of the defense of such action within a reasonable time after notice of commencement of the action, (iii) the indemnifying party does not diligently defend the action after assumption of the defense, or (iv) such indemnified party or parties shall have reasonably concluded that there may be defenses available to it or them which are different from or additional to those available to one or all of the indemnifying parties (in which case the indemnifying parties shall not have the right to direct the defense of such action on behalf of the indemnified party or parties), in any of which events such fees and expenses shall be borne by the indemnifying parties hereof, then, in addition to the fees and expenses of such counsel for the indemnified parties, the indemnifying party shall be liable for the reasonable fees and expenses of not more than one counsel (in addition to any local counsel) separate from its own counsel. No indemnifying party shall, without the prior written consent of the indemnified parties, effect any settlement or compromise of, or consent to the entry of judgment with respect to, any pending or threatened claim, investigation, action or proceeding in respect of which indemnity or contribution may be or could have been sought by an indemnified party under this Section 8 or Section 9 hereof (whether or not the indemnified party is an actual or potential party thereto), unless such settlement, compromise or judgment (i) includes an unconditional release of the indemnified party from all liability arising out of such claim, investigation, action or proceeding and (ii) does not include a statement as to or an admission of fault, culpability or any failure to act, by or on behalf of the indemnified party.

9. Contribution. In order to provide for contribution in circumstances in which the indemnification provided for in Section 8 hereof is for any reason held to be unavailable from any indemnifying party or is insufficient to hold harmless a party indemnified thereunder, the Company and the Underwriters severally shall contribute to the aggregate losses, claims, damages, liabilities and expenses of the nature contemplated by such indemnification provision (including any investigation, legal and other expenses incurred in connection with, and any amount paid in settlement of, any action, suit or proceeding or any claims asserted, but after deducting in the case of losses, claims, damages, liabilities and expenses suffered by the Company, any contribution received by the Company from persons, other than the Underwriters, who may also be liable for contribution, including persons who control the Company within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act, officers of the Company who signed the Registration Statement and directors of the Company) as incurred to which the Company and one or more of the Underwriters may be subject, in such proportions as is appropriate to reflect the relative benefits received by the Company and by the Underwriters from the Offering or, if such allocation is not permitted by applicable law, in such proportions as are appropriate to reflect not only the relative benefits referred to above but also the relative fault of the Company and the Underwriters in connection with the statements or omissions which resulted in such losses, claims, damages, liabilities or expenses, as well as any other relevant equitable considerations. The relative benefits received by the Company and the Underwriters shall be deemed to be in the same proportion as the total proceeds from the Offering (net of underwriting discounts and commissions but before deducting expenses) received by the Company and the underwriting discount and commissions received by the Underwriters, in each case as set forth in the table on the cover page of the Prospectus, bear to the aggregate initial public offering price of the Shares as set in the table on the cover page of the Prospectus. The relative fault of each of the Company and of the Underwriters shall be determined by reference to, among other things, whether the untrue or alleged untrue statement of a material fact or the omission or alleged omission to state a material fact relates to information supplied by the Company or the Underwriters and the parties' relative intent, 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 contribution pursuant to this Section 9 were determined by pro rata allocation (even if the Underwriters were treated as one entity for such purpose) or by any other method of allocation which does not take account of the equitable considerations referred to above in this Section 9. The aggregate amount of losses, liabilities, claims, damages and expenses incurred by an indemnified party and referred to above in this Section 9 shall be deemed to include any legal or other expenses reasonably incurred by such indemnified party in investigating, preparing or defending against any litigation, or any investigation or proceeding by any judicial, regulatory or other legal or governmental agency or body, commenced or threatened, or any claim whatsoever based upon any such untrue or alleged untrue statement or omission or alleged omission. Notwithstanding the provisions of this Section 9, (i) no Underwriter shall be required to contribute any amount in excess of the amount by which the discounts and commissions applicable to the Shares underwritten by it and distributed to the public exceeds the amount of any damages which such Underwriter has otherwise been required to pay by reason of such untrue or alleged untrue statement or omission or alleged omission and (ii) 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. For purposes of this Section 9, each of the Underwriter's affiliates, directors, officers, employees and each person, if any, who controls any Underwriter within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act shall have the same rights to contribution as such Underwriter, and each person, if any, who controls the Company within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act, each officer of the Company who shall have signed the Registration Statement and each director of the Company shall have the same rights to contribution as the Company, subject in each case to clauses (i) and (ii) of the immediately preceding sentence. Any party entitled to contribution will, promptly after receipt of notice of commencement of any action, suit or proceeding against such party in respect of which a claim for contribution may be made against another party or parties, notify each party or parties from whom contribution may be sought, but the omission to so notify such party or parties shall not relieve the party or parties from whom contribution may be sought from any obligation it or they may have under this Section 9 or otherwise. The obligations of the Underwriters to contribute pursuant to this Section 9 are several in proportion to the respective number of Shares to be purchased by each of the Underwriters hereunder and not joint.

10. Underwriter Default.

(a) If any Underwriter or Underwriters shall default in its or their obligation to purchase Firm Shares or Additional Shares hereunder, and if the Firm Shares or Additional Shares with respect to which such default relates (the "**Default Shares**") do not (after giving effect to arrangements, if any, made by the Representatives pursuant to subsection (b) below) exceed in the aggregate 10% of the number of Firm Shares or Additional Shares, each non-defaulting Underwriter, acting severally and not jointly, agrees to purchase from the Company that number of Default Shares that bears the same proportion of the total number of Default Shares then being purchased as the number of Firm Shares set forth opposite the name of such Underwriter in Schedule I hereto bears to the aggregate number of Firm Shares set forth opposite the names of the non-defaulting Underwriters, subject, however, to such adjustments to eliminate fractional shares as the Representatives in their sole discretion shall make.

(b) In the event that the aggregate number of Default Shares exceeds 10% of the number of Firm Shares or Additional Shares, as the case may be, any of the Representatives may in its discretion arrange for itself or for another party or parties (including any non-defaulting Underwriter or Underwriters who so agree) to purchase the Default Shares on the terms contained herein. In the event that within five calendar days after such a default the Representatives do not arrange for the purchase of the Default Shares as provided in this Section 10, this Agreement or, in the case of a default with respect to the Additional Shares, the obligations of the Underwriters to purchase and of the Company to sell the Additional Shares shall thereupon terminate, without liability on the part of the Company with respect thereto (except in each case as provided in Sections 6, 8, 9, 11 and 12(d)) or the Underwriters, but nothing in this Agreement shall relieve a defaulting Underwriter or Underwriters of its or their liability, if any, to the other Underwriters and the Company for damages occasioned by its or their default hereunder.

(c) In the event that any Default Shares are to be purchased by the non-defaulting Underwriters, or are to be purchased by another party or parties as aforesaid, the Representatives or the Company shall have the right to postpone the Closing Date or Additional Closing Date, as the case may be for a period, not exceeding five business days, in order to effect whatever changes may thereby be made necessary in the Registration Statement or the Prospectus or in any other documents and arrangements, and the Company agrees to file promptly any amendment or supplement to the Registration Statement or the Prospectus which, in the opinion of Underwriters' Counsel, may thereby be made necessary or advisable. The term "**Underwriter**" as used in this Agreement shall include any party substituted under this Section 10 with like effect as if it had originally been a party to this Agreement with respect to such Firm Shares and Additional Shares.

11. Survival of Representations and Agreements. All representations and warranties, covenants and agreements of the Underwriters and the Company contained in this Agreement or in certificates of officers of the Company or any Subsidiary submitted pursuant hereto, including the agreements contained in Section 6, the indemnity agreements contained in Section 8 and the contribution agreements contained in Section 9, shall remain operative and in full force and effect regardless of any investigation made by or on behalf of any Underwriter or any controlling person thereof or by or on behalf of the Company, any of its officers and directors or any controlling person thereof, and shall survive delivery of and payment for the Shares to and by the Underwriters. The representations contained in Section 1 and the agreements contained in Sections 6, 8, 9, 11, 12, 17 and 18 hereof shall survive any termination of this Agreement, including termination pursuant to Section 10 or 12 hereof.

12. Effective Date of Agreement; Termination.

(a) This Agreement shall become effective when the parties hereto have executed and delivered this Agreement.

(b) The Representatives shall have the right to terminate this Agreement at any time prior to the Closing Date or to terminate the obligations of the Underwriters to purchase the Additional Shares at any time prior to any Additional Closing Date, as the case may be, if, at or after the Applicable Time, (i) any domestic or international event or act or occurrence has materially disrupted, or in the opinion of the Representatives will in the immediate future materially disrupt, the market for the Company's or any Subsidiaries' securities or securities in general; or (ii) trading on the New York Stock Exchange, the NYSE American LLC or Nasdaq shall have been suspended or been made subject to material limitations, or minimum or maximum prices for trading shall have been fixed, or maximum ranges for prices for securities shall have been required, on the New York Stock Exchange, the NYSE American LLC or Nasdaq or by order of the Commission or any other governmental authority having jurisdiction; or (iii) a banking moratorium has been declared by any state or federal authority or any material disruption in commercial banking or securities settlement or clearance services shall have occurred; or (iv) (A) there shall have occurred any outbreak or escalation of hostilities or acts of terrorism involving the United States or there is a declaration of a national emergency or war by the United States or (B) there shall have been any other calamity or crisis or any change in political, financial or economic conditions if the effect of any such event in (A) or (B), in the judgment of the Representatives, makes it impracticable or inadvisable to proceed with the offering, sale and delivery of the Firm Shares or the Additional Shares, as the case may be, on the terms and in the manner contemplated by the Prospectus; or (v) any of the events described in Sections 7(f) or 7(g) shall have occurred or the Underwriters shall decline to purchase the Shares for any reason permitted under this Agreement.

(c) Any notice of termination pursuant to this Section 12 shall be in writing.

(d) If this Agreement shall be terminated pursuant to any of the provisions hereof, or if the sale of the Shares provided for herein is not consummated because any condition to the obligations of the Underwriters set forth herein is not satisfied or because of any refusal, inability or failure on the part of the Company to perform any agreement herein or comply with any provision hereof, the Company will, subject to demand by any of the Representatives, reimburse the Underwriters for all out-of-pocket expenses (including the fees and expenses of their counsel) incurred by the Underwriters in connection herewith; provided, however, that in the event of a termination pursuant to Section 10 hereof, only the non-defaulting Underwriters shall be entitled to receive such reimbursement.

13. Research Analyst Independence. The Company acknowledges that the Underwriters' research analysts and research departments are required to be independent from their respective investment banking divisions and are subject to certain regulations and internal policies, and that such Underwriters' research analysts may hold views and make statements or investment recommendations and/or publish research reports with respect to the Company and/or the Offering that differ from the views of personnel in their respective investment banking divisions. The Company hereby waives and releases, to the fullest extent permitted by law, any claims that the Company may have against the Underwriters with respect to any conflict of interest that may arise from the fact that the views expressed by their independent research analysts and research departments may be different from or inconsistent with the views or advice communicated to the Company by personnel in such Underwriters' investment banking divisions. The Company acknowledges that each of the Underwriters is a full service securities firm and as such from time to time, subject to applicable securities laws, may effect transactions for its own account or the account of its customers and hold long or short positions in debt or equity securities of the companies that may be the subject of the transactions contemplated by this Agreement.

14. No Advisory or Fiduciary Relationship. The Company acknowledges and agrees that (a) the purchase and sale of the Shares pursuant to this Agreement, including the determination of the public offering price of the Shares and any related discounts and commissions, is an arm's-length commercial transaction between the Company, on the one hand, and the several Underwriters, on the other hand, and does not constitute a recommendation, investment advice, or solicitation of any action by the Underwriters, (b) in connection with the Offering and the process leading thereto, each Underwriter is and has been acting solely as a principal and is not the agent or fiduciary of the Company, any of its Subsidiaries or their respective stockholders, creditors, employees or any other party, (c) no Underwriter has assumed or will assume an advisory or fiduciary responsibility in favor of the Company with respect to the Offering or the process leading thereto (irrespective of whether such Underwriter has advised or is currently advising the Company or any of its Subsidiaries on other matters) and no Underwriter has any obligation to the Company with respect to the Offering except the obligations expressly set forth in this Agreement, (d) the Underwriters and their respective affiliates may be engaged in a broad range of transactions that involve interests that differ from those of the Company, (e) any duties and obligations that the Underwriters may have to the Company shall be limited to those duties and obligations specifically stated herein, (f) the Underwriters have not provided any legal, accounting, regulatory, investment or tax advice with respect to the Offering and the Company has consulted its own respective legal, accounting, regulatory and tax advisors to the extent it deemed appropriate, and (g) none of the activities of the Underwriters in connection with the transactions contemplated herein constitutes a recommendation, investment advice or solicitation of any action by the Underwriters with respect to any entity or natural person.

15. Notices. All communications hereunder, except as may be otherwise specifically provided herein, shall be in writing, and:

(a) if sent to any Underwriter, shall be mailed, delivered, or faxed and confirmed in writing, if to the Underwriters, shall be sufficient in all respects if delivered or sent to Piper Sandler at Piper Sandler & Co., U.S. Bancorp Center, 800 Nicollet Mall, Minneapolis, Minnesota 55402, Attention: Equity Capital Markets, with a copy to Piper Sandler General Counsel at 800 Nicollet Mall, Minneapolis, MN 55402 and LegalCapMarkets@pjc.com, to Guggenheim at Guggenheim Securities, LLC, 330 Madison Avenue, New York, New York 10017, Attention: Head of Equity Capital Markets, Fax: (212) 658-9689, and to Wells Fargo at Wells Fargo Securities, LLC, 500 West 33rd Street, New York, New York 10001, Attention: Equity Syndicate Department, Fax: (212) 214-5918, with a copy to Underwriters' Counsel at Goodwin Procter LLP, The New York Times Building, 620 Eighth Avenue, New York, New York 10018, Attention: Thomas S. Levato, Esq., Fax: (212) 355-3333;

(b) if sent to the Company, shall be mailed, delivered, or faxed and confirmed in writing to the Company at Arcturus Therapeutics Holdings Inc., 10628 Science Center Drive, Suite 200, San Diego, California 92121, Attention: Chief Executive Officer, with a copy to its counsel at Dentons US LLP, 1221 Avenue of the Americas, New York, New York 10020, Fax (212) 768 6800, Attention: Jeffrey A. Baumel, Esq.;

provided, however, that any notice to an Underwriter pursuant to Section 8 shall be delivered or sent by mail or facsimile transmission to such Underwriter at its address set forth in its acceptance facsimile to the Representatives, which address will be supplied to any other party hereto by any of the Representatives upon request. Any such notices and other communications shall take effect at the time of receipt thereof.

16. Recognition of the U.S. Special Resolution Regimes.

(a) In the event that any Underwriter is a Covered Entity and becomes subject to a proceeding under a U.S. Special Resolution Regime, the transfer from such Underwriter of this Agreement, and any interest and obligation in or under this Agreement, will be effective to the same extent as the transfer would be effective under the U.S. Special Resolution Regime if this Agreement, and any such interest and obligation, were governed by the laws of the United States or a state of the United States.

(b) In the event that any Underwriter is a Covered Entity or a BHC Act Affiliate of such Underwriter and becomes subject to a proceeding under a U.S. Special Resolution Regime, Default Rights under this Agreement that may be exercised against such Underwriter are permitted to be exercised to no greater extent than such Default Rights could be exercised under the U.S. Special Resolution Regime if this Agreement were governed by the laws of the United States or a state of the United States.

For purposes of this Section 16:

"**BHC Act Affiliate**" has the meaning assigned to the term "affiliate" in, and shall be interpreted in accordance with, 12 U.S.C. § 1841(k).

"**Covered Entity**" means any of the following: (i) a "covered entity" as that term is defined in, and interpreted in accordance with, 12 C.F.R. § 252.82(b); (ii) a "covered bank" as that term is defined in, and interpreted in accordance with, 12 C.F.R. §47.3(b); or (iii) a "covered FSI" as that term is defined in, and interpreted in accordance with, 12 C.F.R. §382.2(b).

"**Default Right**" has the meaning assigned to that term in, and shall be interpreted in accordance with, 12 C.F.R. §§ 252.81, 47.2 or 382.1, as applicable.

"**U.S. Special Resolution Regime**" means each of (i) the Federal Deposit Insurance Act and the regulations promulgated thereunder and (ii) Title II of the Dodd-Frank Wall Street Reform and Consumer Protection Act and the regulations promulgated thereunder.

17. Parties. This Agreement shall insure solely to the benefit of, and shall be binding upon, the Underwriters and the Company and the controlling persons, affiliates, directors, officers, employees and agents referred to in Section 8 and Section 9 hereof, and their respective successors 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 provision herein contained. This Agreement and all conditions and provisions hereof are intended to be for the sole and exclusive benefit of the parties hereto and said controlling persons and their respective successors, officers, directors, heirs and legal representatives, and it is not for the benefit of any other person, firm or corporation. The term "**successors and assigns**" shall not include a purchaser, in its capacity as such, of Shares from any of the Underwriters.

18. Governing Law and Jurisdiction; Waiver of Jury Trial. **This Agreement shall be governed by and construed in accordance with the laws of the State of New York.** The Company irrevocably (a) submits to the jurisdiction of any court of the State of New York located in the City and County of New York, Borough of Manhattan or any federal courts of the United States of America located in the City and County of New York, Borough of Manhattan for the purpose of any suit, action, or other proceeding arising out of this Agreement, or any of the agreements or transactions contemplated by this Agreement, the Registration Statement and the Prospectus (each, a "**Proceeding**"), (b) agrees that all claims in respect of any Proceeding may be heard and determined in any such court, (c) waives, to the fullest extent permitted by law, any immunity from jurisdiction of any such court or from any legal process therein, (d) agrees not to commence any Proceeding other than in such courts, and (e) waives, to the fullest extent permitted by law, any claim that such Proceeding is brought in an inconvenient forum. THE COMPANY (ON BEHALF OF ITSELF AND, TO THE FULLEST EXTENT PERMITTED BY LAW, ON BEHALF OF ITS RESPECTIVE EQUITY HOLDERS AND CREDITORS) HEREBY WAIVES ANY RIGHT IT MAY HAVE TO A TRIAL BY JURY IN RESPECT OF ANY CLAIM BASED UPON, ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT AND THE TRANSACTIONS CONTEMPLATED BY THIS AGREEMENT, THE REGISTRATION STATEMENT AND THE PROSPECTUS.

19. Underwriters' Information. The parties acknowledge and agree that, for purposes of Sections 1(c), 1(d), 1(e) and 8 hereof, the information provided by or on behalf of any Underwriter consists solely of the material included in the ninth paragraph under the caption "Underwriting—Commissions and Discounts; Expenses" (concerning price stabilization and short positions) in the Prospectus.

20. Counterparts. This Agreement may be executed in any number of counterparts, each of which shall be deemed to be an original, but all such counterparts shall together constitute one and the same instrument. Delivery of a signed counterpart of this Agreement by facsimile or other electronic transmission shall constitute valid and sufficient delivery thereof.

21. Headings. The headings herein are inserted for convenience of reference only and are not intended to be part of, or to affect the meaning or interpretation of, this Agreement.

22. Time is of the Essence. Time shall be of the essence of this Agreement. As used herein, the term "**business day**" shall mean any day when the Commission's office in Washington, D.C. is open for business.

If the foregoing correctly sets forth your understanding, please so indicate in the space provided below for that purpose, whereupon this Agreement shall constitute a binding agreement among us.

Very truly yours,

ARCTURUS THERAPEUTICS HOLDINGS INC.

By: /s/ Joseph Payne
Name: Joseph Payne
Title: Chief Executive Officer

Accepted as of the date first above written:

PIPER SANDLER & CO.

By: /s/ Chad E. Huber
Name: Chad E. Huber
Title: Managing Director

GUGGENHEIM SECURITIES, LLC

By: /s/ Jordan Bliss
Name: Jordan Bliss
Title: Senior Managing Director

WELLS FARGO SECURITIES, LLC

By: /s/ Geoffrey Goodman
Name: Geoffrey Goodman
Title: Managing Director

On behalf of itself and the other
Underwriters named in Schedule I hereto.

SCHEDULE I

Underwriters

Underwriter	Number of Firm Shares to be Purchased	Number of Additional Shares to be Purchased if Option is Fully Exercised
Piper Sandler & Co.	546,000	81,900
Guggenheim Securities, LLC	546,000	81,900
Wells Fargo Securities, LLC	204,750	30,713
Robert W. Baird & Co. Incorporated	68,250	10,237
Total:	1,365,000	204,750

SCHEDULE II

Issuer Free Writing Prospectuses Included in the Pricing Disclosure Package

None.

SCHEDULE III

Pricing Information

1. The Company is selling 1,365,000 shares of Common Stock.

2. The Company has granted an option to the Underwriters to purchase up to an additional 204,750 shares of Common Stock.

3. The public offering price per share of Common Stock shall be $110.00.

SCHEDULE IV

Persons Executing Lock-Up Agreements

Joseph E. Payne
Padmanabh Chivukula
Andrew Sassine
Steve Hughes
Peter Farrell
Karah Parschauer
James Barlow
Magda Marquet
Edward Holmes

EXHIBIT A

List of Subsidiaries

Arcturus Therapeutics, Inc.
Arcturus Therapeutics Ltd.
Arcturus Therapeutics Asia Pte. Ltd.
Arcturus Therapeutics Europe B.V.
Alcobra, Inc.

EXHIBIT B-1

Form of Opinion and Negative Assurance of Company Counsel

EXHIBIT B-2

Form of Opinion of IP Counsel to the Company

EXHIBIT C

Form of Lock-Up Agreement

December __, 2020

Piper Sandler & Co.
Guggenheim Securities, LLC
Wells Fargo Securities, LLC
As Representatives of the several Underwriters

c/o Piper Sandler & Co.
800 Nicollet Mall, Suite 800
Minneapolis, Minnesota 55402

c/o Guggenheim Securities, LLC
330 Madison Avenue
New York, New York 10017

c/o Wells Fargo Securities, LLC
500 West 33rd Street, 14th Floor
New York, New York 10001

Arcturus Therapeutics Holdings Inc. Lock-Up Agreement

Ladies and Gentlemen:

This letter agreement (this "Agreement") relates to the proposed public offering (the "Offering") by Arcturus Therapeutics Holdings Inc., a Delaware corporation (the "Company"), of its common stock, $0.001 par value (the "Stock").

In order to induce you and the other underwriters (the "Underwriters"), for which you act as representatives, to underwrite the Offering, the undersigned hereby agrees that, without the prior written consent of Piper Sandler & Co. and Guggenheim Securities, LLC, during the period from the date hereof until 90 days from the date of the final prospectus supplement for the Offering (the "Lock-Up Period"), the undersigned (a) will not, directly or indirectly, offer, sell, agree to offer or sell, solicit offers to purchase, grant any call option or purchase any put option with respect to, pledge, borrow or otherwise dispose of, any Relevant Security (as defined below), and (b) will not establish or increase any "put equivalent position" or liquidate or decrease any "call equivalent position" with respect to any Relevant Security (in each case within the meaning of Section 16 of the Securities Exchange Act of 1934, as amended (the "Exchange Act") and the rules and regulations promulgated thereunder), or 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 Relevant Security, whether or not such transaction is to be settled by delivery of Relevant Securities, other securities, cash or other consideration. As used herein "Relevant Security" means the Stock, any other equity security of the Company and any security convertible into, or exercisable or exchangeable for, any Stock or other such equity security.

The restrictions in this Agreement shall not apply to:

(a) the transfer of Relevant Securities (i) as a bona fide gift or gifts, (ii) by will, other testamentary document or intestate succession, (iii) to a Family Member (as defined below), (iv) to a trust for the direct or indirect benefit of the undersigned and/or one or more Family Members, (v) pursuant to a domestic order, divorce settlement, divorce decree, separation agreement or pursuant to an order of a court of competent jurisdiction enforcing such agreement, (vi) to a charitable trust, or (vii) to a corporation, limited liability company or partnership wholly owned by the undersigned and/or one or more Family Members; or

(b) the transfer of Relevant Securities pursuant to a bona fide third-party tender offer for all outstanding shares of the Company, merger, consolidation or other similar transaction made to all holders of the Company's securities involving a change of control of the Company (including, without limitation, the entering into of any lock-up, voting or similar agreement pursuant to which the undersigned may agree to transfer, sell, tender or otherwise dispose of Relevant Securities in connection with such transaction, or vote any Relevant Securities in favor of any transaction), provided that in the event that such tender offer, merger, consolidation or other such transaction is not completed, such securities held by the undersigned shall remain subject to the provisions of this letter agreement.

It shall be a further condition to any transfer or distribution pursuant to the preceding clause (a): (i) that no public disclosure or filing by any party (donor, donee, transferor or transferee) under the Exchange Act, or other public announcement shall be required in connection with such transfer or distribution (other than a filing on Form 5 made after the expiration of the Lock-Up Period), and (ii) that (x) any such transfer shall not involve a disposition for value and (y) each resulting transferee or donee of Relevant Securities agrees in writing to be bound by the terms of this Agreement for the remainder of the Lock-Up Period.

For purposes of this Agreement, the term "Family Member" shall mean any relationship by blood, domestic partnership, marriage or adoption not more remote than first cousin.

In addition, this Agreement shall not: (i) restrict the sale or other disposition of Relevant Securities that are acquired by the undersigned in the open market after the Offering is priced, provided that any such sale or other disposition fully complies with, and is not required to be disclosed or reported under, applicable law (including but not limited to Section 16 under the Exchange Act, and the rules and regulations promulgated thereunder) or (ii) apply to the establishment of a trading plan pursuant to Rule 10b5-1 under the Exchange Act, provided that no transfers occur under such plan during the Lock-Up Period and no public announcement or filing shall be required or voluntarily made by any person in connection therewith other than general disclosure in Company periodic reports to the effect that Company directors and officers may enter into such trading plans from time to time.

The undersigned hereby authorizes the Company during the Lock-Up Period to cause any transfer agent for the Relevant Securities to decline to transfer, and to note stop transfer restrictions on the stock register and other records relating to, Relevant Securities for which the undersigned is the record holder and, in the case of Relevant Securities for which the undersigned is the beneficial but not the record holder, agrees during the Lock-Up Period to cause the record holder to cause the relevant transfer agent to decline to transfer, and to note stop transfer restrictions on the stock register and other records relating to, such Relevant Securities. The undersigned hereby further agrees that, without the prior written consent of Piper Sandler & Co. and Guggenheim Securities, LLC, during the Lock-Up Period the undersigned (x) will not file or participate in the filing with the Securities and Exchange Commission of any registration statement, or circulate or participate in the circulation of any preliminary or final prospectus or prospectus supplement or other disclosure document with respect to any proposed offering or sale of a Relevant Security and (y) will not exercise any rights the undersigned may have to require registration with the Securities and Exchange Commission of any proposed offering or sale of a Relevant Security.

It is understood that, (i) if the Company notifies the Underwriters that it does not intend to proceed with the Offering, (ii) if the Underwriting Agreement does not become effective by January 20, 2021 or (iii) 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 Stock, the undersigned and any of its permitted transferees pursuant to the provisions of this Agreement will be released from its or their obligations under this Agreement.

The undersigned understands that the Company and the Underwriters will proceed with the Offering in reliance on this Agreement. The undersigned further acknowledges and agrees that, although the Underwriters may provide certain Regulation Best Interest and Form CRS disclosures or other related documentation to you in connection with the Offering, the Underwriters are not making a recommendation to you to participate in the Offering or sell any Stock at the price determined in the Offering, and nothing set forth in such disclosures or documentation is intended to suggest that any Underwriter is making such a recommendation.

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

The undersigned hereby represents and warrants that the undersigned has full power and authority to enter into this Agreement and that this Agreement constitutes the legal, valid and binding obligation of the undersigned, enforceable in accordance with its terms. Upon request, the undersigned will execute any additional documents necessary in connection with enforcement hereof. Any obligations of the undersigned shall be binding upon the successors and assigns of the undersigned from the date first above written.

This Agreement shall be governed by and construed in accordance with the laws of the State of New York. Delivery of a signed copy of this Agreement by facsimile transmission shall be effective as delivery of the original hereof.

Very truly yours,

By: _____

Print Name: _____

EXHIBIT D

Form of CFO Certificate

Reference is hereby made to the underwriting agreement, dated as of December 7, 2020 (the "Agreement"), by and among Arcturus Therapeutics Holdings Inc., a Delaware corporation (the "Company"), and Piper Sandler & Co., Guggenheim Securities, LLC, and Wells Fargo Securities, LLC, acting as representatives of the several Underwriters in connection with the Offering (the "Underwriters"). Capitalized terms used herein and not otherwise defined shall have the meanings ascribed to them in the Agreement.

To assist the Underwriters in conducting and documenting their investigation of the affairs of the Company, I, Andrew Sassine, solely in my capacity as Chief Financial Officer of the Company, do hereby certify that after reasonable inquiry and investigation by myself or members of my staff who are responsible for the Company's financial and accounting matters:

1. As the principal financial officer of the Company, I am responsible for, among other things: (i) preparing financial statements and related disclosures for the Company in conformity with generally accepted accounting principles and (ii) maintaining internal control over financial reporting and the Company's management information systems.

2. I am familiar with the accounting, operations, records systems and internal controls of the Company.

3. I, or members of my staff who are responsible for the Company's financial and accounting matters, have reviewed the financial and operating data circled on the pages of the Prospectus and certain of the documents incorporated therein by reference attached hereto as Exhibit A.

4. With regard to these amounts, I, or members of my staff who are responsible for the Company's financial and accounting matters, compared such amounts to the corresponding amounts included in or derived from the Company's internal accounting records or schedules prepared by management from such accounting records for the applicable periods and found them to be in agreement. These amounts are accurate in all material respects, and nothing has come to my attention that would cause me to believe that these amounts have been materially misstated or are materially misleading.

DENTONS

Dentons US LLP
1221 Avenue of the Americas
New York, NY 10020-1089 USA

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Salans FMC SNR Denton
dentons.com

December 8, 2020

Arcturus Therapeutics Holdings Inc.
10628 Science Center Drive, Suite 250
San Diego, California 92121

Re: Arcturus Therapeutics Holdings Inc.--Registration Statement on Form S-3

Ladies and Gentlemen:

In our capacity as counsel to Arcturus Therapeutics Holdings Inc., a corporation organized under the laws of the State of Delaware (the "Company"), we have been asked to render this opinion in connection with a registration statement on Form S-3 (File No. 333-251175) (the "Registration Statement"), which Registration Statement the Company initially filed with the Securities and Exchange Commission (the "Commission") on December 7, 2020 and which Registration Statement became automatically effective upon filing, as supplemented by the prospectus supplement filed pursuant to Rule 424(b)(5) of the Securities Act of 1933, as amended (the "Securities Act"), dated December 7, 2020 (the "Prospectus Supplement"), under which up to 1,365,000 shares (the "Firm Shares") of Company common stock, par value $0.001 per share ("Common Stock"), are being sold by the Company pursuant to the Underwriting Agreement, dated December 7, 2020, between the Company and the underwriters named therein. The Company has also granted an option to the underwriters to purchase up to an additional 204,750 shares of Common Stock (the "Option Shares," together with the Firm Shares, the "Shares").

We are delivering this opinion to you at your request in accordance with the requirements of Item 16 of Form S-3 and Item 601(b)(5) of Regulation S-K under the Act.

In connection with rendering this opinion, we have examined originals, certified copies or copies otherwise identified as being true copies of the following: (i) the Company's articles of incorporation, as amended, (ii) the Company's by-laws, as amended, (iii) the Registration Statement, including the prospectus contained therein (the "Base Prospectus"), (iv) the Prospectus Supplement (the Base Prospectus and the Prospectus Supplement are collectively referred to herein as the "Prospectus"), (v) corporate proceedings of the Company relating to the Shares and (vi) such other instruments and documents as we have deemed relevant under the circumstances.

In making the aforesaid examinations, we have assumed the genuineness and authenticity of all documents examined by us and all signatures thereon, and the conformity to originals of all copies of all documents examined by us.

Based on the foregoing, and in reliance thereon, and subject to the qualifications, limitations and exceptions stated herein, we are of the opinion that the Shares have been duly authorized and, when issued and delivered by the Company against due payment therefor in accordance with the terms set forth in the Registration Statement and the Prospectus, will be validly issued, fully paid and non-assessable.

The foregoing opinion is limited to the laws of the State of Delaware (excluding local laws) and the federal law of the United States of America.

We hereby consent to the use of our opinion as Exhibit 5.1 to the Registration Statement and to the reference to this firm and this opinion under the heading "Legal Matters" in the Prospectus comprising a part of the Registration Statement and any amendment thereto. In giving such consent, we do not hereby admit that we come within the category of persons whose consent is required under Section 7 of the Act, or the rules and regulations of the Commission thereunder.

Very truly yours,

/s/ Dentons US LLP

Arcturus Therapeutics Announces Pricing of $150 Million Public Offering of Common Stock

SAN DIEGO, December 7, 2020 (GLOBE NEWSWIRE) -- Arcturus Therapeutics Holdings Inc. (the "Company", NASDAQ: ARCT), a leading clinical-stage messenger RNA medicines company focused on the development of infectious disease vaccines and significant opportunities within liver and respiratory rare diseases, today announced the pricing of an underwritten public offering of 1,365,000 shares of its common stock at a public offering price of $110.00 per share. The gross proceeds of the offering to the Company are expected to be approximately $150 million, before deducting the underwriting discounts and commissions and other estimated offering expenses. In addition, the Company granted the underwriters a thirty-day option to purchase up to an additional 204,750 shares of common stock at the public offering price, less underwriting discounts and commissions.

The closing of the offering is expected to occur on or about December 10, 2020, subject to the satisfaction of customary closing conditions.

Piper Sandler & Co., Guggenheim Securities and Wells Fargo Securities are acting as joint book-running managers for the offering. Baird is acting as lead manager for the offering.

The Company intends to use the net proceeds of the offering to conduct clinical trials and to commence manufacturing its LUNAR-COV19 vaccine candidate for stockpiling purposes.

The securities described above are being offered by the Company pursuant to an effective shelf registration statement on Form S-3 (File No. 333-251175) previously filed with the Securities and Exchange Commission ("SEC") on December 7, 2020, which registration statement became automatically effective upon filing.

A preliminary prospectus supplement relating to the offering was filed with the SEC on December 7, 2020 and is available on the SEC's website at http://www.sec.gov. The final prospectus supplement relating to and describing the terms of the offering will be filed with the SEC and also will be available on the SEC's website. Before investing in the offering, you should read each of the prospectus supplement and the accompanying prospectus relating to the offering in their entirety as well as the other documents that the Company has filed with the SEC that are incorporated by reference in the prospectus supplement and the accompanying prospectus relating to the offering, which provide more information about the Company and the offering. Copies of the final prospectus supplement and accompanying prospectus relating to the offering may be obtained, when available, from Piper Sandler & Co., Attention: Prospectus Department, 800 Nicollet Mall, J12S03, Minneapolis, MN 55402, by telephone at 1-800-747-3924, or by email at prospectus@psc.com; Guggenheim Securities, LLC, Attention: Equity Syndicate Department, 330 Madison Avenue, New York, NY 10017, by telephone at (212) 518-5548, or by email at GSEquityProspectusDelivery@guggenheimpartners.com; or Wells Fargo Securities, LLC, Attention: Equity Syndicate Department, 500 West 33rd Street, New York, New York, 10001, at (800) 326-5897 or by email at cmclientsupport@wellsfargo.com.

This press release shall not constitute an offer to sell or the solicitation of an offer to buy any of the securities described herein, nor shall there be any sale of these securities in any state or jurisdiction in which such offer, solicitation or sale would be unlawful prior to registration or qualification under the securities laws of any such state or jurisdiction.

About Arcturus Therapeutics

Founded in 2013 and based in San Diego, California, Arcturus Therapeutics Holdings Inc. (Nasdaq: ARCT) is a clinical-stage mRNA medicines and vaccines company with enabling technologies: (i) LUNAR® lipid-mediated delivery, (ii) STARR™ mRNA Technology and (iii) mRNA drug substance along with drug product manufacturing expertise. Arcturus' diverse pipeline of RNA therapeutic and vaccine candidates includes self-replicating mRNA vaccine programs for SARS-CoV-2 (COVID-19) and Influenza, and other programs to potentially treat Ornithine Transcarbamylase (OTC) Deficiency, Cystic Fibrosis, and Cardiovascular Disease along with partnered programs including Glycogen Storage Disease Type 3, Hepatitis B Virus, and non-alcoholic steatohepatitis (NASH). Arcturus' versatile RNA therapeutics platforms can be applied toward multiple types of nucleic acid medicines including messenger RNA, small interfering RNA, replicon RNA, antisense RNA, microRNA, DNA, and gene editing therapeutics. Arcturus' technologies are covered by its extensive patent portfolio (200 patents and patent applications, issued in the U.S., Europe, Japan, China and other countries). Arcturus' commitment to the development of novel RNA therapeutics has led to collaborations with Janssen Pharmaceuticals, Inc., part of the Janssen Pharmaceutical Companies of Johnson & Johnson, Ultragenyx Pharmaceutical, Inc., Takeda Pharmaceutical Company Limited, CureVac AG, Synthetic Genomics Inc., Duke-NUS Medical School, and the Cystic Fibrosis Foundation. For more information visit www.ArcturusRx.com. In addition, please connect with us on Twitter and LinkedIn.

Forward Looking Statements

This press release contains forward-looking statements that involve substantial risks and uncertainties for purposes of the safe harbor provided by the Private Securities Litigation Reform Act of 1995. Any statements, other than statements of historical fact included in this press release, including those regarding the Company's expected performance, development of any specific novel mRNA therapeutics, satisfaction of the customary closing conditions to the offering, delays in obtaining required stock exchange or other regulatory approvals, stock price volatility, the impact of general business and economic conditions, the expected gross proceeds from the offering and the intended use of proceeds of the offering, are forward-looking statements. Arcturus may not actually achieve the plans, carry out the intentions or meet the expectations or projections disclosed in any forward-looking statements such as the foregoing and you should not place undue reliance on such forward-looking statements. Such statements are based on management's current expectations and involve risks and uncertainties, including those discussed under the heading "Risk Factors" in Arcturus' Annual Report on Form 10-K for the fiscal year ended December 31, 2019, filed with the SEC on March 16, 2020 and in subsequent filings with, or submissions to, the SEC. Except as otherwise required by law, Arcturus disclaims any intention or obligation to update or revise any forward-looking statements, which speak only as of the date they were made, whether as a result of new information, future events or circumstances or otherwise.

IR and Media Contacts

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ctanzi@kendallir.com

ARCTURUS THERAPEUTICS

Building the Next Generation of RNA Medicines

December 2020

FORWARD LOOKING STATEMENTS

This presentation contains forward-looking statements. These statements relate to future events and involve known and unknown risks, uncertainties and other factors which may cause our actual results, performance or achievements to be materially different from any future performances or achievements expressed or implied by the forward-looking statements. Each of these statements is based only on current information, assumptions and expectations that are inherently subject to change and involve a number of risks and uncertainties. Forward-looking statements include, but are not limited to, statements about: expectations regarding our capitalization and resources; the adequacy of our capital to support our future operations and our ability to successfully initiate and complete clinical trials; our strategy and focus; our efforts to develop a vaccine against COVID-19, the safety, efficacy or reliability of our COVID-19 vaccine candidate; the development and commercial potential of any of our product candidates; the timing and success of our development efforts; the success of any of our trials and our ability to achieve regulatory approval for any product candidate; the entry into or modification or termination of collaborative agreements and the expected milestones and royalties from such collaborative agreements; the potential market or clinical or commercial success of the clinical development programs of Arcturus; and any statements other than statements of historical fact, including those related to Arcturus' future cash, market or financial position.

In some cases, you can identify forward-looking statements by terms such as "may," "will," "should," "could," "would," "expects," "plans," "anticipates," "believes," "estimates," "projects," "predicts," "potential" and similar expressions (including the negative thereof) intended to identify forward looking statements. Arcturus may not actually achieve the plans, carry out the intentions or meet the expectations or projections disclosed in any forward-looking statements such as the foregoing, and you should not place undue reliance on such forward-looking statements. The forward-looking statements contained or implied in this presentation are subject to other risks and uncertainties, including those discussed under the heading "Risk Factors" in Arcturus' Annual Report on Form 10-K for the fiscal year ended December 31, 2019, filed with the SEC on March 16, 2020 and in subsequent filings with, or submissions to, the SEC. Except as otherwise required by law, we disclaim any intention or obligation to update or revise any forward-looking statements, which speak only as of the date they were made, whether as a result of new information, future events or circumstances or otherwise.

Company Highlights

BUILDING INNOVATIVE RNA MEDICINES

Arcturus is a Clinical-Stage mRNA Vaccines and Medicines Company

Publicly Traded (Nasdaq: ARCT)

- Headquarters: San Diego, CA
- Number of Employees: 113
- Founded: 2013

Promising Therapeutic Candidates

- LUNAR-COV19 (COVID-19 Vaccine)
- LUNAR-OTC (Ornithine Transcarbamylase Deficiency)
- LUNAR-CF (Cystic Fibrosis)
- Additional Earlier Stage Programs

Arcturus Technologies Validated by Multiple Strategic Partners

Johnson & Johnson · Takeda · ultragenyx pharmaceutical · Cystic Fibrosis Foundation · DukeNUS Medical School · Catalent · Recipharm

Proprietary mRNA Technologies Driving Promising Therapeutic Programs

BUILDING INNOVATIVE RNA MEDICINES

Broad and Strong Intellectual Property Portfolio

- mRNA & STARR™ mRNA
  - mRNA Chemistry
  - mRNA Design & Modifications
  - mRNA Manufacturing Process
- LUNAR® Delivery
  - Lipid Chemistry
  - Formulation Design
  - LUNAR® Drug Product Manufacturing
- 200 Patents & Patent Applications

Program	Indication
LUNAR-COV19	COVID-19 Vaccine
LUNAR-FLU	Flu Vaccine
LUNAR-OTC	Ornithine Transcarbamylase (OTC) Deficiency
LUNAR-CF	Cystic Fibrosis
LUNAR-CV	Cardiovascular Disease
ADDITIONAL EARLIER STAGE PROGRAMS	

Arcturus Pipeline of mRNA Medicines

	Product Name	Indication	Route of Administration	Cell Target	Prevalence Worldwide	Anticipated 2021 Milestones
VACCINES	**LUNAR-COV19** (ARCT-021)	COVID-19	Intramuscular	Myocytes & Dendritic Cells	Global	Phase 2 Initiation Q1 Phase 3 Initiation Q2 EUA H2
	LUNAR-FLU	Influenza	Intramuscular	Myocytes & Dendritic Cells	Global	CTA 2021
HEPATIC	**LUNAR-OTC** (ARCT-810)	Ornithine Transcarbamylase Deficiency	Intravenous	Periportal Hepatocytes	> 10,000	Phase 2 Multiple Dose Study Initiation Mid 2021
RESPIRATORY	**LUNAR-CF**	Cystic Fibrosis	Inhaled	Bronchial Epithelial Cells	> 70,000	DC Selection Q4 2020 CTA H2 2021
TARGETED	**LUNAR-CV**	Cardiovascular Disease	Intravenous	Hepatocytes	~4,000 (HoFH) 3.5 Mill (HeFH)	CTA 2021

EUA = Emergency Use Authorization; DC = Development Candidate; CTA = Clinical Trial Application

Multiple mRNA Therapeutic Programs in Clinical Development with Milestones in 2020 and 2021

Partnerships Maximize Platform

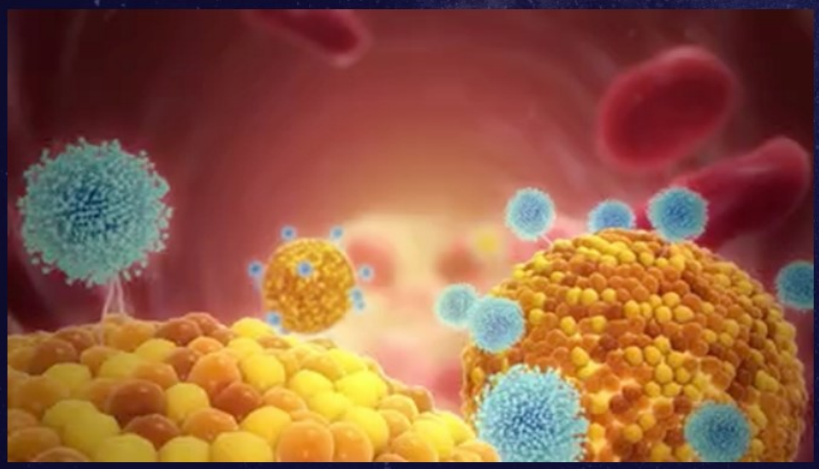
Program	Partner	Indication
LUNAR-HBV	Johnson & Johnson	Hepatitis B Virus (HBV)
LUNAR-NASH	Takeda	Nonalcoholic Steatohepatitis (NASH)
LUNAR-GSD3	ultragenyx pharmaceutical	Glycogen Storage Disease Type III
LUNAR-RARE	ultragenyx pharmaceutical	Undisclosed Rare Disease
LUNAR-RPL	Undisclosed Large Pharma	Vaccines
LUNAR-AH	Undisclosed Animal Health Pharma	Vaccines

Greater than $1 Billion in Potential Milestones & Royalties

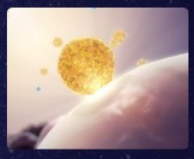
LUNAR® Delivery Technology

Biodegradable, highly optimized for each cell type

BUILDING INNOVATIVE RNA MEDICINES

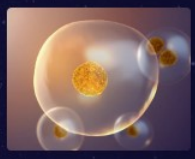


LUNAR Associates with Cell Membrane



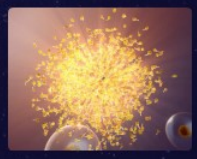
Enters Cell Via Endocytosis

Lipid Particle in Endosome



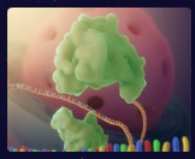
Increased Acidity as Endosome Ages

pH-Mediated Disruption



Rapid Biodegradation of Vehicle

RNA in Cytosol



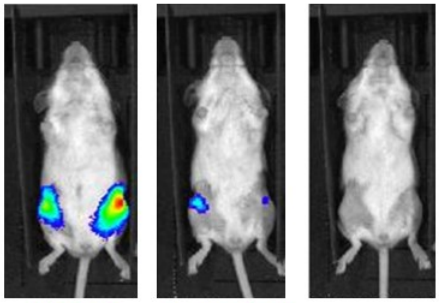
RNA Processing and Translation

BUILDING INNOVATIVE RNA MEDICINES

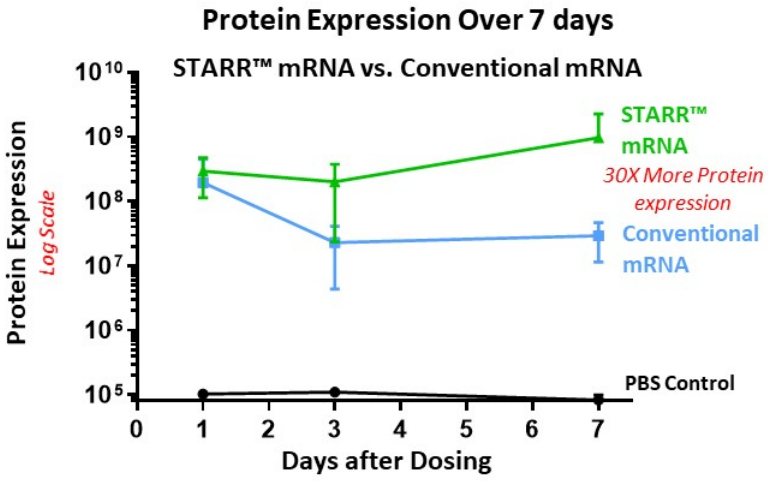
STARR™ mRNA Superior to Conventional mRNA

Self-Transcribing and Replicating mRNA (STARR) delivered with LUNAR® provides higher protein expression and potentially longer-lasting duration of protein expression in mouse

STARR™ Technology
30-Fold Higher Protein Expression



STARR™ Technology | Conventional mRNA | PBS Control

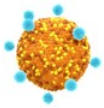


STARR™ mRNA technology together with LUNAR® delivery may enable single vaccine administration at very low dose

LUNAR-COV19 (ARCT-021)
COVID-19 Vaccine Candidate

Arcturus COVID-19 Vaccine Candidate has Significant Advantages

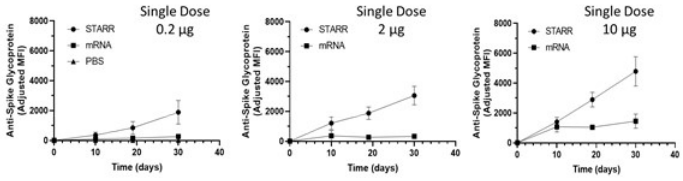
BUILDING INNOVATIVE RNA MEDICINES

- Duke-NUS Partnership DukeNUS Medical School
- mRNA Vaccine: Simple, No Adjuvants, No Viruses
- STARR™ mRNA: Produces 30X More Protein than Conventional mRNA
- LUNAR® Technology: Non-viral Delivery System 
- Promising Preliminary Clinical Data: Immunogenicity and Tolerability Data in both Younger and Older Adults
- Potential Single-Shot: Simpler Logistics for Vaccinating Large Populations
- Very Low Dose: Enables Rapid Global Scale-up
- Readily Manufactured: Arcturus Processes + Strategic Partnerships Catalent Recipharm
- Lyophilized Formulation: No need to be stored at ultra-cold temps, improved supply chain & distribution benefits

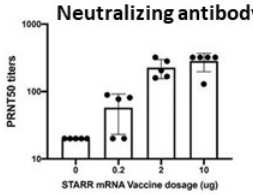
Preclinical Data: Robust Immune Response

Humoral Immunity

STARR™ induces more robust titers compared to conventional mRNA



Neutralizing antibody titers and high seroconversion at low doses

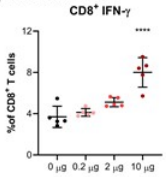


Single Dose (µg)	Seroconversion	Neutralizing Antibody Titers (Geometric Mean)
0.2	80 %	58
2	100 %	218
10	100 %	≥ 320

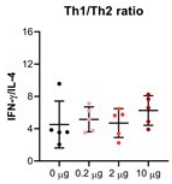
Cellular Immunity

7 Days Post Single Dose

Adaptive Cellular Response (CD8+ cells)



Balanced Th1/Th2 Immune Response (CD4+ cells)



- Single administration with a very low dose of Arcturus COVID vaccine results in potent immune reaction
- STARR™ mRNA generates neutralizing antibodies (anti-SARS-CoV-2 Spike Glycoprotein IgG) and a cellular T-cell mediated immune response at a much lower dose level compared to conventional mRNA

Publication BioRxiv Preprint

Promising pre-clinical results involving Arcturus' self-transcribing and replicating mRNA (STARR™) based vaccine ARCT-021 (LUNAR-COV19)

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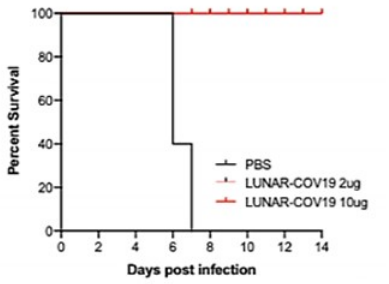
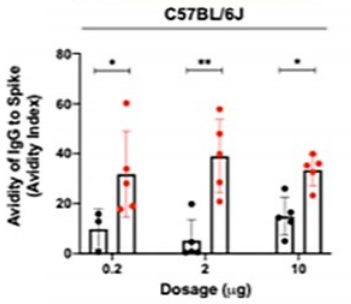
Challenge Study



IgG Avidity



- In a virus challenge study in the human ACE2 transgenic mouse model, a single dose provided complete protection from SARS-CoV-2 infection and death, compared to control mice which experienced 100% mortality
- The vaccination led to robust antibody responses, with neutralizing antibody titers increasing up to day 60
- Activation of cell mediated immunity produced a strong viral antigen specific CD8+ T lymphocyte response

ARCT-021 (LUNAR-COV19) Update

Phase 1/2 Clinical Trial

- Completed dosing all subjects (n=106), including older adults
- For both single and prime-boost regimens, at the interim analysis, observed high seroconversion rates for IgG binding antibodies, and Th1 dominant CD4+ immune responses – support advancement to Phase 2 trial
- Geometric Mean Titer (GMT) levels in the range of titers observed in convalescent plasma
- Favorable safety and tolerability observations; no subjects have withdrawn for any reason

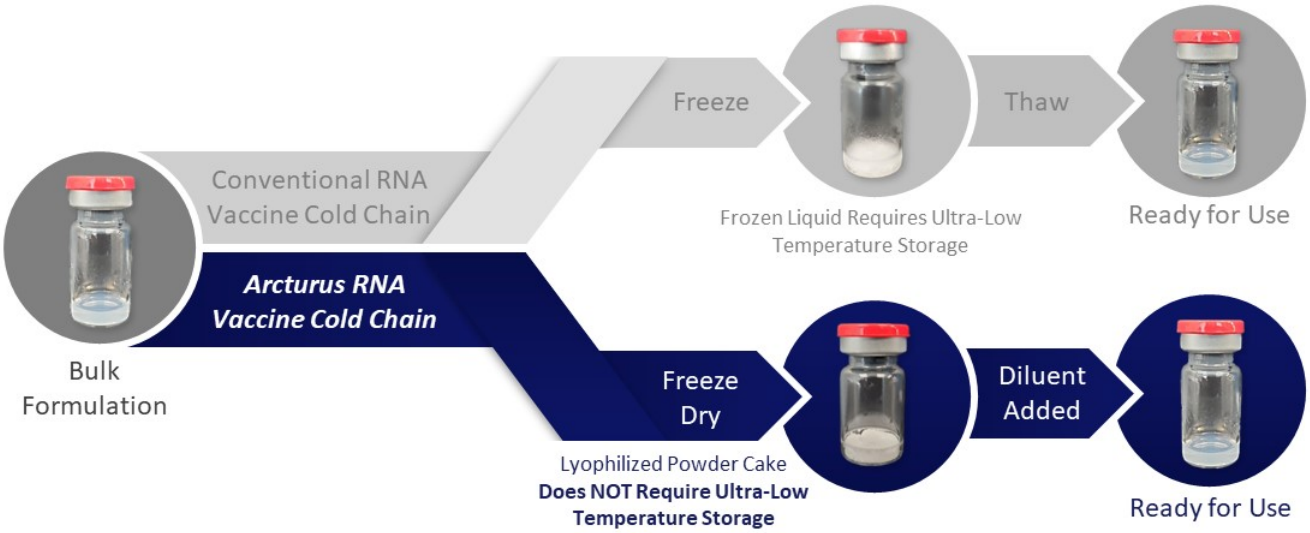
Later Stage Clinical Trials

- Investigational New Drug (IND) Application and Clinical Trial Application (CTA) have been submitted; presently awaiting allowance to proceed from the U.S. FDA and Singapore's Health Sciences Authority (HSA)
- Expect to commence Phase 2 trial Q1 2021; regimens include single dose 7.5 µg, and prime-boost regimens
- Expect to commence Phase 3 trial Q2 2021, targeting Emergency Use Authorization in H2 2021

Manufacturing

- With our global manufacturing partners, we are positioned to manufacture finished doses of LUNAR-COV19 in Q1 2021 for stockpiling purposes, and have laid the foundation to produce hundreds of millions of doses of ARCT-021 over the next 18 months
- Lyophilized version of ARCT-021 vaccine product on track to be evaluated in Phase 3 clinical trial

Lyophilization Process Advantage Over Conventional Frozen Liquid



Lyophilized version of ARCT-021 maintains key quality attributes of the frozen liquid equivalent
Improved stability; collecting stability data at -20°C, +4-8°C, and Room Temperature
Simpler handling: No dry ice at point of care, lower risk of degradation from uncontrolled temperature fluctuation

LUNAR-OTC (ARCT-810)
Ornithine Transcarbamylase (OTC) Deficiency

OTC Deficiency Market Opportunity

Ornithine Transcarbamylase (OTC) Deficiency: The most common urea cycle disorder

- The urea cycle converts neurotoxic ammonia to water-soluble urea that can be excreted in urine
- Deficiency in OTC causes elevated blood ammonia, which can lead to neurological damage, coma, and death
- 10,000 worldwide prevalence

Unmet Medical Need

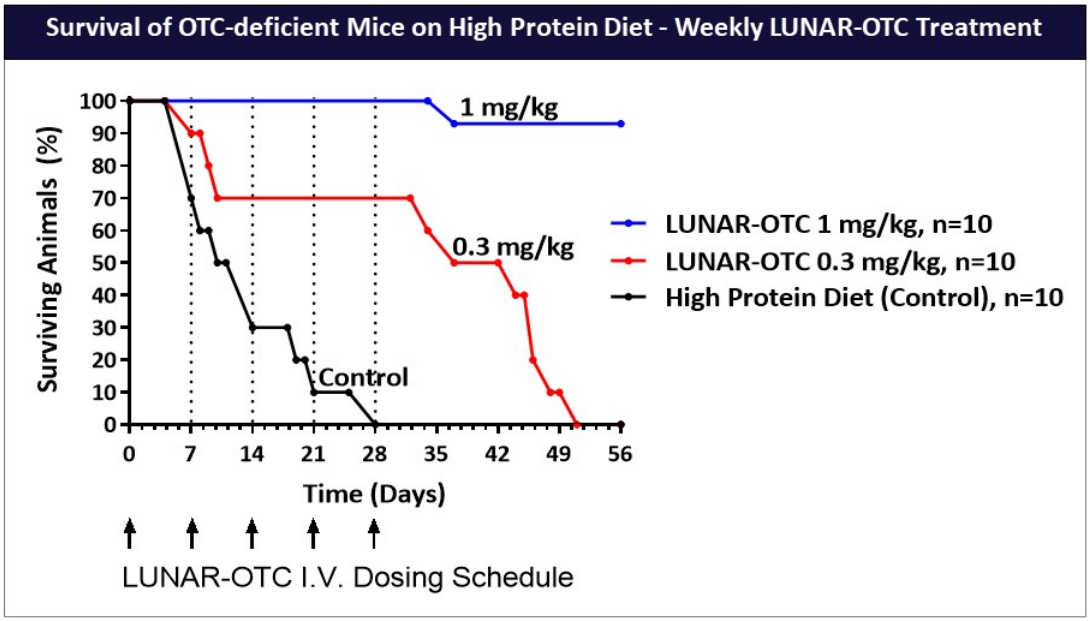
- Present standard of care involves a strict diet (low protein, high fluid intake) plus ammonia scavengers (sodium phenylbutyrate)
- Present standard of care does not effectively prevent life-threatening spikes of ammonia
- Severe OTC Deficiency patients are typically referred for liver transplant, currently the only cure

LUNAR-OTC Aims to Restore Enzyme Function

- Expression of OTC enzyme in liver has potential to restore normal urea cycle activity to detoxify ammonia, preventing neurological damage and removing need for liver transplantation

LUNAR-OTC

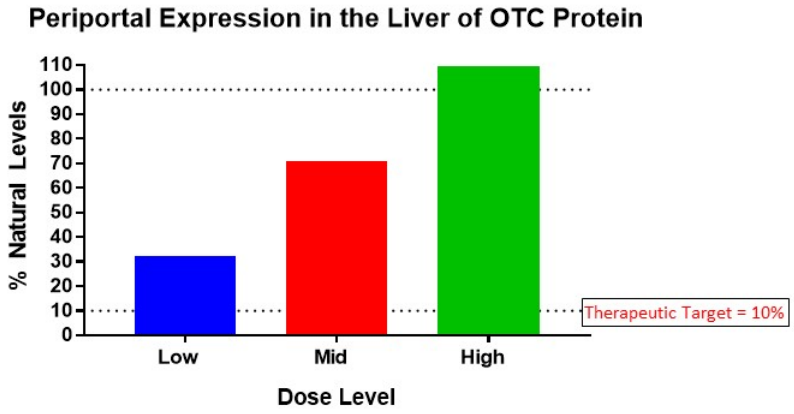
Disease Normalization Following Single and Repeat Dosing in OTC Mouse Model



LUNAR-OTC

Exceeds Therapeutic Target of 10% Enzyme Replacement at all Doses in OTC-Deficient Mouse Model

- OTCD impacts ureagenesis (ammonia detoxification)
- The main site of ureagenesis is the periportal region of the liver*
- Establishing 10% of natural enzyme levels is expected to be therapeutically significant



*Li, L. et al. PGC-1α Promotes Ureagenesis in Mouse Periportal Hepatocytes through SIRT3 and SIRT5 in Response to Glucagon. Scientific Reports. 6:24156 | DOI: 10.1038/srep24156, April 2016
*Lamers, W.H., Hakvoort, T.B.M., and Köhler, E.S. 'Molecular Pathology of Liver Diseases' in Monga S.P.S. (ed.), *MOLECULAR PATHOLOGY LIBRARY SERIES*, Springer Publishing, New York, pp. 125-132 | DOI: 10.1007/978-1-4419-7107-4

LUNAR-OTC treatment increases OTC expression in mouse periportal hepatocytes (main site of ureagenesis)

ARCT-810 Clinical Update

Phase 1 Clinical Trial Completed

- Double blind, randomized 2:1 active to placebo, dose-escalation trial in healthy adult volunteers
- All Adverse Events (AEs) mild or moderate
- Favorable PK profile: No LUNAR® lipids detectable after 48 hours following drug administration
- No steroid premedication
- Completed dose escalation of all cohorts (0.1, 0.2, 0.3, and 0.4 mg/kg)

Phase 1b Clinical Trial in OTC-Deficient Patients Initiated

- Commenced patient enrollment
- First subject has been dosed; well-tolerated
- Up to 12 patients; up to 3 dose levels
- All doses within anticipated range for therapeutic biological effect

Primary Goal: Identify safest doses to take forward into multiple dose clinical trials
Primary Endpoints: Safety and tolerability
Secondary Endpoints: Pharmacokinetics
Exploratory Endpoints: Biomarkers include ureagenesis, plasma ammonia levels and plasma OTC enzyme activity, and urine orotic acid levels

Next Milestone: Initiate Phase 2 Multiple Dose Study Mid-2021

LUNAR-CF
Cystic Fibrosis

Cystic Fibrosis Market Opportunity

Cystic Fibrosis: The most common rare disease in the United States

- Caused by genetic mutations in the CFTR gene, resulting in aberrant flux of ions in and out of cells, causing thick mucus buildup in lung airways
- Chronic airway obstruction leads to infection and inflammation, which causes permanent tissue scarring and respiratory failure
- 70,000 worldwide prevalence

Unmet Medical Need

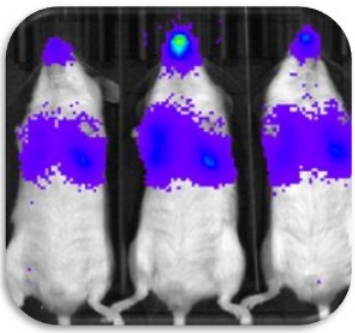
- No CFTR functional corrector is approved for treatment of all patients
- Present standard of care does not effectively prevent long-term effects of mucus accumulation. CF patients with late-stage loss of respiratory function require lung transplant

LUNAR-CF Aims to Restore CFTR Function

- An mRNA replacement therapy has the potential to deliver a new copy of CFTR into the lungs of CF patients, independent of any genotype
- A functional CFTR protein can restore chloride channel efflux in the airways, reducing mucus accumulation, tissue scarring and minimizing the progressive respiratory dysfunction observed in CF patients

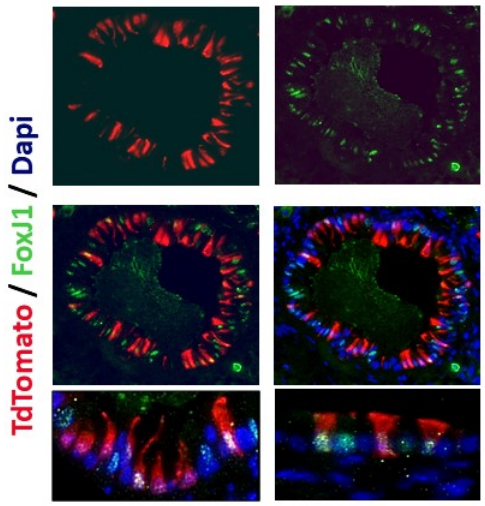
Delivery of LUNAR®-mRNA to Rodent Airways

Nebulization: Upper/Lower Airways



LUNAR® + Luciferase mRNA

LUNAR® Targets Mice Epithelial Airways (TdTomato), Including Ciliated Cells (TdTomato/FoxJ1)



Efficient delivery of LUNAR®-mRNA formulations in rodent airways

LUNAR®, an aerosolized delivery platform for lung

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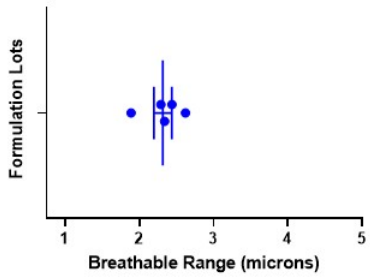
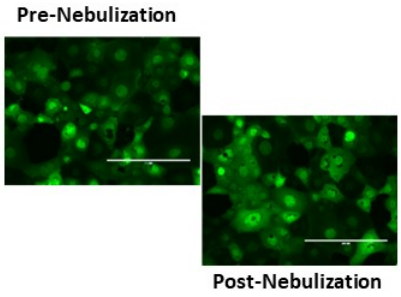
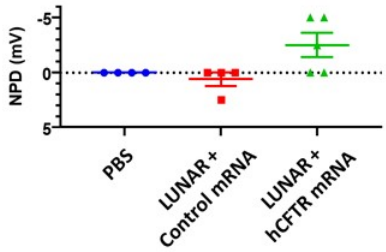
Aerosolized LUNAR® Particles are Breathable



Aerosolized LUNAR® -mRNA (EGFP) maintains activity



LUNAR®-mRNA (hCFTR) is biologically active *in vivo* (NPD, Mouse)



Aerosolized LUNAR® droplets are in the optimal breathable range (1-5 microns)
Aerosolized LUNAR® maintains activity as measured by EGFP protein expression & Nasal Potential Difference (NPD)

Delivery of LUNAR®-mRNA into Epithelial Airways in Ferret

EGFP conversion in tracheal epithelial airways observed in the ROSA26TG Ferret model

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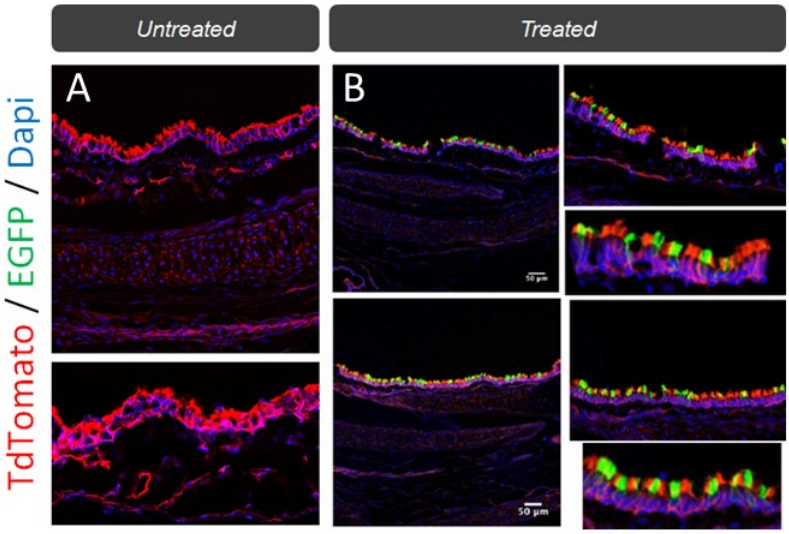
- Ferrets are an excellent species for modeling certain human lung diseases*
- Novel LUNAR® formulations of CRE mRNA were tested in a transgenic ROSA26TG ferret model
- Activation of EGFP expression indicates that LUNAR® targets epithelial airways
- Anticipated next steps: Development Candidate Selection 2020 & IND Filing 2021



In collaboration with John Engelhardt

LUNAR® effectively delivered mRNA to the tracheal epithelial airways in a Ferret model

*Yu, M., Sun, X., Tyler, S.R. *et al.* Highly Efficient Transgenesis in Ferrets. *Sci Rep* **9**, 1971 (2019)

LUNAR-CV

Targeted Messenger RNA Therapeutic
Cardiovascular Disease; LDL-Cholesterol Reduction

HoFH Market Opportunity

Homozygous Familial Hypercholesterolemia (HoFH):

- Severely elevated LDL Cholesterol (LDL-C) levels increases risk for cardiovascular disease
- In ~90% of HoFH patients, the LDL receptor (LDL-R) is deficient or absent that leads to low or no LDL-C uptake and subsequent degradation in the liver
- ~4000 HoFH patients and 3.5 million heterozygous FH (HeFH) patients in G7

Unmet Medical Need

- Current cholesterol-lowering medications do not sufficiently lower LDL levels in HoFH
- Most individuals with HoFH experience severe coronary artery disease by their mid-20s and apheresis is recommended by 5 years-old
- High rate of coronary bypass surgery or death by the teenage years in HoFH

LUNAR-CV Aims to lower LDL-Cholesterol to Normal Levels

- Restoration of LDL-Receptor function with mRNA therapy in the liver has potential to lower plasma LDL-Cholesterol levels, preventing cardiovascular disease, removing need for apheresis
- Potential to treat HeFH patients who do not respond effectively to existing therapies

LUNAR-CV, Targeted mRNA Therapeutic

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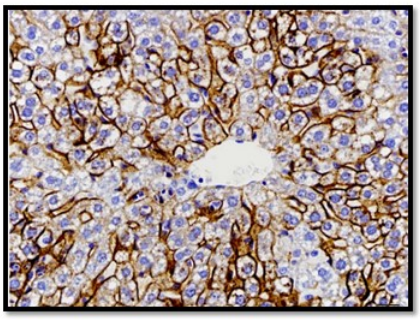
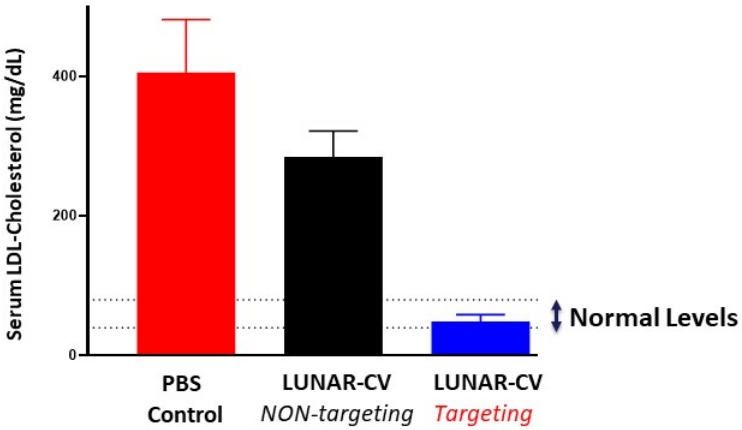
Targets Hepatocytes in LDL Receptor Knock-out Mouse Model
Result: LDL-Cholesterol is bound and cleared from the plasma



***in vivo* Proof-of-Concept:**
Hepatocytes Expressing LDL Receptors in LDL-R KO Mouse Model



- **LUNAR-CV Utilizes Arcturus Targeting LUNAR® Delivery Technology**
- **LUNAR-CV Treatment Results in LDL-Cholesterol Levels Being Restored to Normal**

Moving Forward

Anticipated Near-Term Milestones and Cash Position

LUNAR-COV19 (ARCT-021)	
Phase 2 Initiation	**Q1 2021**
Phase 3 Initiation	**Q2 2021**
Emergency Use Authorization (EUA)	**H2 2021**

LUNAR-OTC (ARCT-810)	
Phase 2 Multiple Dose Study Initiation	**Mid-2021**

LUNAR-CF	
Development Candidate (DC) Selection	**Q4 2020**
Clinical Trial Application (CTA) Filing	**H2 2021**

Cash Position
$307.1 million as of September 30, 2020

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Management Team

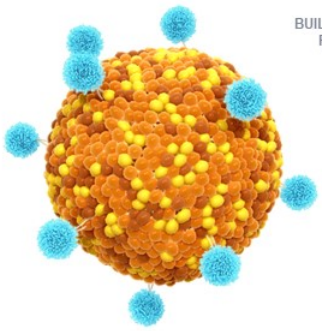
Joseph E. Payne, MSc
President & CEO

Pad Chivukula, Ph.D.
CSO & COO

Andrew Sassine, MBA
CFO

Steve Hughes, M.D.
Chief Development Officer

Lance Kurata, J.D.
Chief Legal Officer



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Director of the Board

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Director of the Board

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Director of the Board

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CEO of Virtus Consultants, former Governor of Kansas. Appointments at Georgetown, Kansas School of Medicine, Uniformed Services University for Health Sciences, International Medical Corps

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Professor and Deputy Director of the Emerging Infectious Diseases Programme at the Duke-NUS Medical School

DukeNUS Medical School

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Professor Emeritus of Clinical Virology and Medicine at Virginia University School of Medicine

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Biologics Consulting

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UC San Diego

Jonathan Smith, Ph.D.

Chief Scientific Officer at VLP Therapeutics

VLP Therapeutics

Michael Hodges, M.D., BSc.

Chief Medical Officer (CMO) at Amplyx Pharmaceuticals

amplyx

Drew Weissman, M.D., Ph.D.

Professor of Medicine at the Perelman School of Medicine

Perelman School of Medicine University of Pennsylvania

Appendix

LUNAR-COV19 Preclinical Seroconversion Data

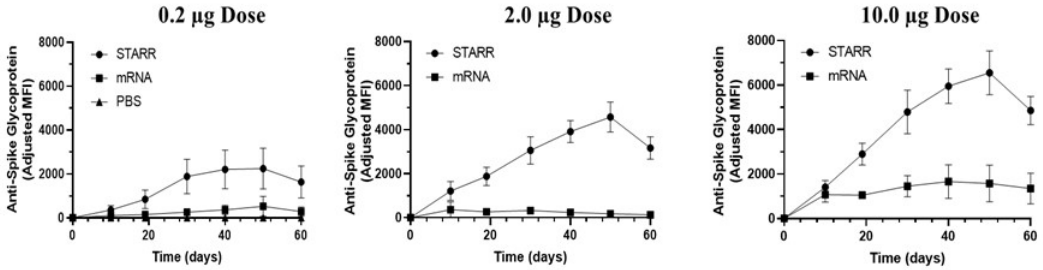
Seroconversion Rate (% of Animals) – STARR™ mRNA vs. Conventional mRNA

Single Dose (µg)	LUNAR® Delivery			
	STARR™ mRNA (%)		Conventional mRNA (%)	
	Day 10	Day 19	Day 10	Day 19
0.2	40	60	20	20
2	80	**100**	20	0
10	100	100	40	80

100% of mouse seroconverted by day 19 at a single low dose (2 µg)

Preclinical Data: Anti-Spike Protein Levels Continue to Increase Up to 50 Days

Single Administration of LUNAR-COV19



- **Higher titers** (anti-SARS-CoV-2 Spike Glycoprotein IgG) elicited by STARR™ mRNA
- **Titers continue to increase up to 50 days** with STARR™ mRNA; plateau reached with conventional mRNA
- Dose dependent increase in IgG titers; Luminex bead assay, 1/2000 serum dilution

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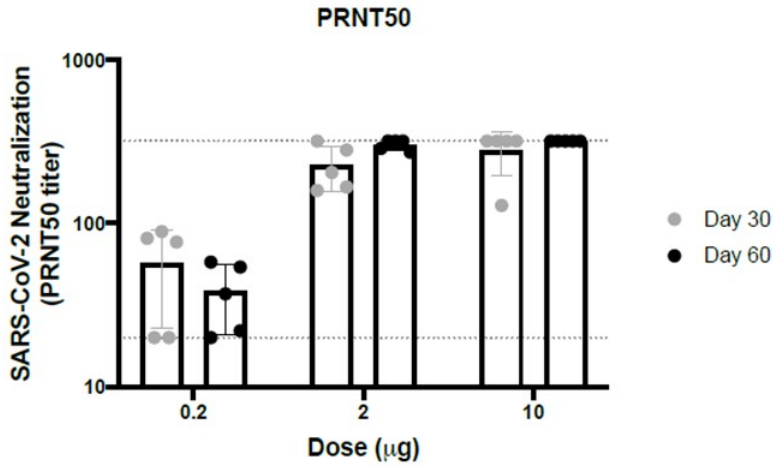
Preclinical Data: Neutralizing Antibodies Continue to Increase for 60 Days

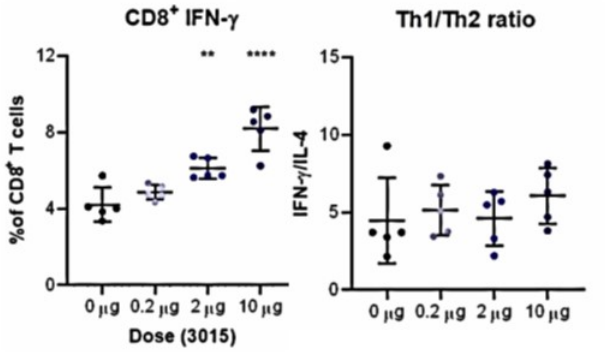
Single Administration (small dose, 2ug) of LUNAR-COV19



Virus neutralization assay: Serum dilutions are incubated with SARS-CoV-2 virus, then added to cells. The cells die forming plaques, which are counted. The serum dilution that reduces the number of plaques by 50% is recorded (PRNT50). Maximum serum dilution tested was 1/320

After single dose (2 μg) of LUNAR-COV19, neutralizing antibodies continue to increase for 60 days (>300 titer)

Preclinical Data: Arcturus Vaccine elicits a Balanced Cell Mediated Immune Response



RNA Dose (μg)	% IFN-γ+ CD8+ T Cells	CD4+ Th1/Th2 (IFN-γ/IL4)
0	4.0	4.6
0.2	4.5	5.3
2.0	6.0	5.0
10.0	8.0	6.0

Results Summary

- RNA dose dependent increase in IFN-γ positive CD8+ T-cells
- Th1 biased CD4+ response and stable Th1/Th2 ratio with increased RNA dose indicate balanced cell mediated immune response

Arcturus Safety Profile

External Validation

- Multiple strategic partnerships over many years confirms the positive potential safety profile of Arcturus LUNAR® and mRNA

Arcturus is committed to developing safe mRNA products

- 15 studies over several years with strategic partners

Top Safety Concern for RNA Medicines is Delivery

Arcturus LUNAR® Delivery Technology is well tolerated in non-human primates (NHPs)

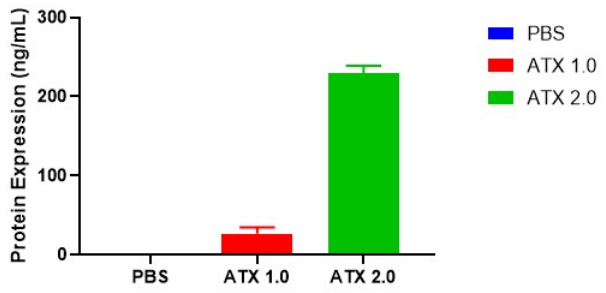
- ✓ **@ 15 mg/kg single dose of non-coding siRNA**
- ✓ **@ 3 mg/kg x eight (8) weekly doses of non-coding siRNA (total of 24 mg/kg over 2 months)**

Arcturus mRNA chemistry shows promising efficacy and tolerability data

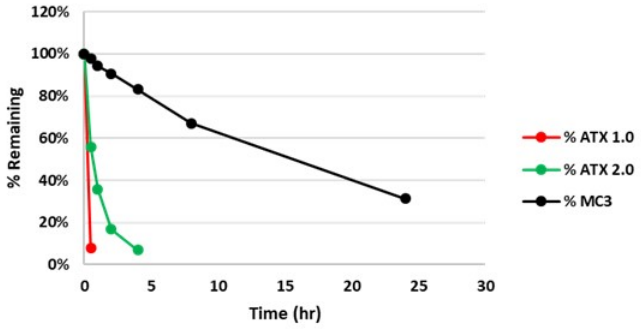
- Efficacy of OTC mRNA in mouse model @ 0.1 – 1 mg/kg

ATX Lipids are Effective and Biodegradable

Protein Expression (*in vivo*)



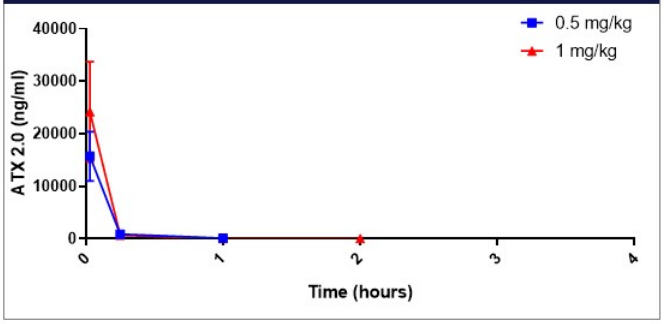
Esterase Catalyzed Degradation (*in vitro*)



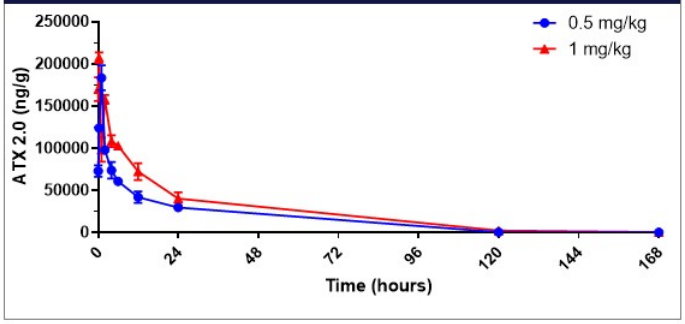
Next Generation ATX Lipids Retain Degradability & Improve Delivery Efficiency

ATX 2.0 Lipid is Biodegradable and Clears *in vivo*

Plasma



Liver



- **ATX Lipid (the major component in LUNAR® technology) is degraded *in vivo***
- **ATX 2.0 Lipid Half-Life in the Liver is Approximately 20 hours**

Key Existing Country Relationships

Singapore

Research Partnership with Duke-NUS Medical School

Financial Support from the Economic Development Board of Singapore

- $10 M Grant for Research and Preclinical Work
- $6.7 M Grant for Phase 1/2 Clinical Trial
- Executed Manufacturing Support Agreement for $45 Million Non-Recourse Loan
- Up to $175 Million in vaccine purchases

Israel

Supply Agreement with Israel Ministry of Health

- Announced August 18, 2020
- Up to $225 Million in vaccine purchases (with MOH election for 500,000 Initial Reserve Doses)
- $12.5 M Initial Reserve Payment was paid in Oct 2020

Drug Substance: mRNA Design

Arcturus' proprietary mRNA optimization platform

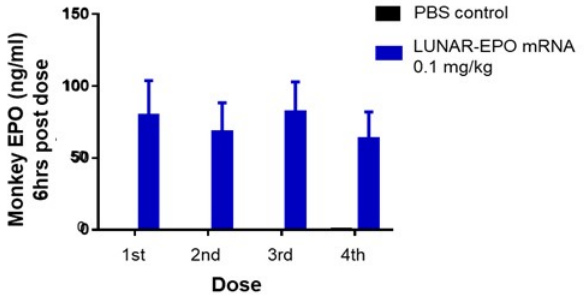
Optimize
mRNA sequence
Chemistry
Process

⇨

Improve
Protein Expression
Duration
Functional Activity

Sustained hEPO activity in NHPs upon repeat dosing

Weekly Dosing in Non-Human Primates (NHPs)



Proprietary mRNA Optimization Platform Demonstrates Sustained Activity Upon Repeat Dosing in NHPs

Drug Substance (mRNA) Manufacturing

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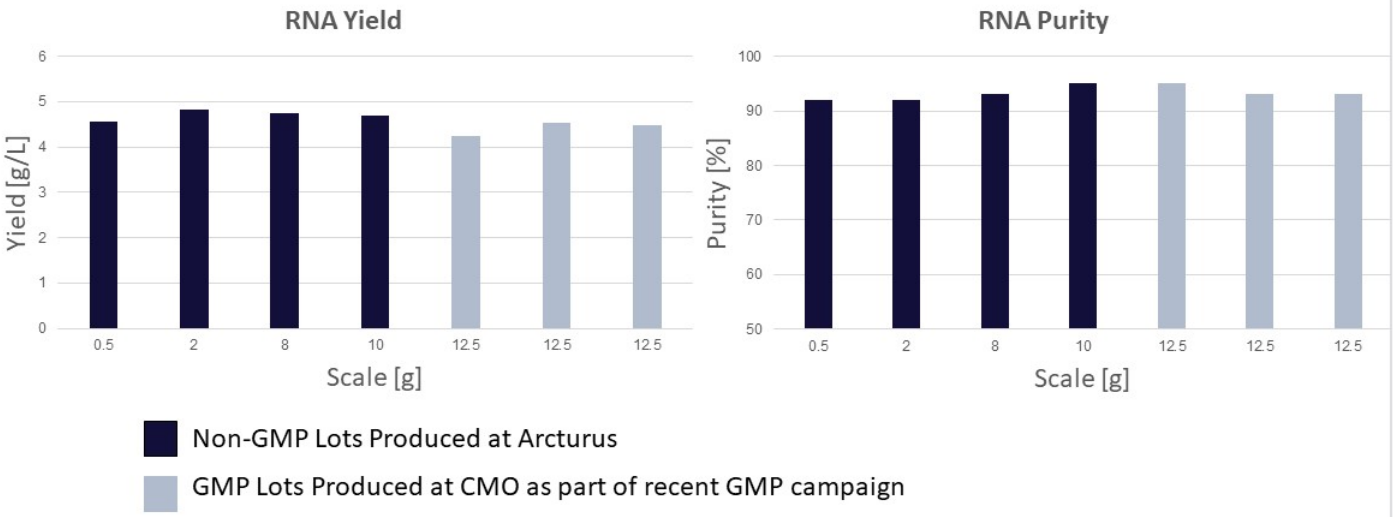
DNA Template Production → IVT and Capping Reaction → Purification Process → Buffer Exchange & Concentration

Features	Benefits
Optimized IVT Method	Reduced Cost; Higher Purity
Improved Capping Reaction	Reduced Cost of Goods
Proprietary Purification Process	Higher Purity in a Shorter Time
Efficient	Entire Process Less Than One Week
Scalable to > 1Kg	Access Large Patient Populations
Adaptable	Can Utilize a Variety of Modifications

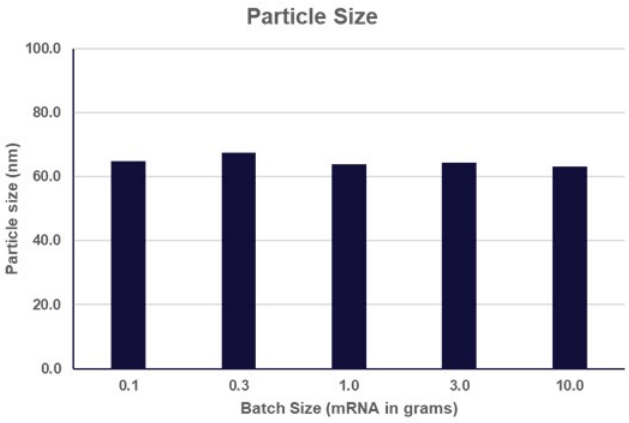
Arcturus Internal non-GMP mRNA Production Capabilities: Up to 30 g in Less Than One Week

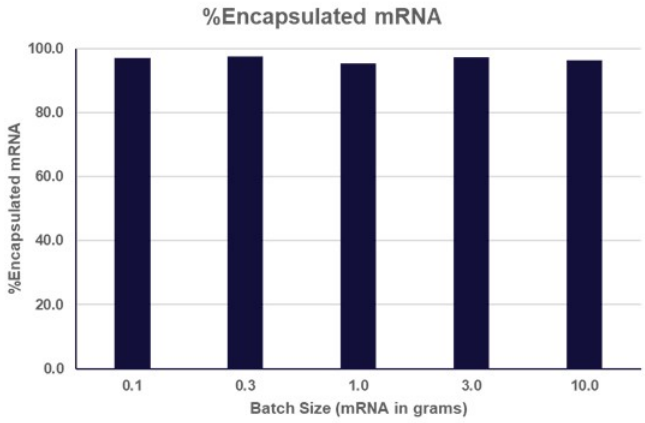
Drug Substance (mRNA) Manufacturing



Three 12.5 g lots produced in recent GMP campaign are of equivalent quality and yield

Drug Product (LUNAR® + mRNA) Manufacturing





- **Manufacturing of Drug Product Demonstrated up to Multigram Scale with Yields ≥ 85%**
- **GMP Batch of LUNAR®-OTC (ARCT-810) Drug Product Manufactured and Released**