

**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): October 23, 2019



GENOCEA BIOSCIENCES, INC.

(Exact name of registrant as specified in its charter)

Delaware
(State or other jurisdiction of
incorporation)

001-36289
(Commission File Number)

51-0596811
(IRS Employer
Identification No.)

**Cambridge Discovery Park
100 Acorn Park Drive, 5th Floor
Cambridge, MA 02140**
(Address of principal executive offices, including zip code)
(Registrant's telephone number, including area code): **(617) 876-8191**

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))

Title of each class	Trading symbol(s)	Name of each exchange on which registered
Common stock, \$0.001 par value per share	GNCA	NASDAQ Capital Market

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 a 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.

Agreements with Lincoln Park Capital Fund, LLC

On October 23, 2019, Genocea Biosciences, Inc. (“we” or the “Company”) entered into a purchase agreement (the “Purchase Agreement”) with Lincoln Park Capital Fund, LLC (“Lincoln Park”), pursuant to which we have the right to sell to Lincoln Park up to \$30,000,000 of shares of our common stock, including the initial purchase of \$2,500,000, at a purchase price of \$2.587 per share (the “Initial Purchase”), at our discretion over the next 30 months, subject to the conditions and limitations set forth in the Purchase Agreement and as described further below. As consideration for entering into the Purchase Agreement, we agreed to issue 289,966 shares of our common stock to Lincoln Park as a commitment fee (the “Commitment Shares”).

In addition to the Initial Purchase of \$2,500,000 of shares of our common stock, under the Purchase Agreement, from time to time on any trading day that we select, we have the right, in our sole discretion, subject to the conditions and limitations in the Purchase Agreement, to direct Lincoln Park to purchase up to 100,000 shares of our common stock (each such purchase, a “Regular Purchase”) over the 30-month term of the Purchase Agreement; provided, however, that such limit may be increased to up to 150,000 shares if the last closing sale price of our common stock is at least \$4.50 on the purchase date, and may be increased to up to 200,000 shares if the last closing sale price of our common stock is at least \$6.00 on the purchase date (each subject to adjustment for any reorganization, recapitalization, non-cash dividend, stock split, reverse stock split or other similar transaction as provided in the Purchase Agreement). The purchase price for shares of common stock to be purchased by Lincoln Park will be the equal to lesser of (i) the lowest sale price on the purchase date, as reported by Nasdaq, or (ii) the arithmetic average of the three lowest closing sale prices for our common stock during the ten trading days prior to the purchase date. Lincoln Park’s obligation under each Regular Purchase shall not exceed \$2,000,000; provided that we may agree with Lincoln Park to increase the share limit for any Regular Purchase.

We can also direct Lincoln Park to purchase additional amounts as accelerated purchases (an “Accelerated Purchase”), under certain circumstances and provided that the last closing sale price of our common stock is at least \$1.00 per share, in an amount up to the lesser of (i) three times the number of shares purchased pursuant to such Regular Purchase or (ii) 30% of the trading volume on such accelerated purchase date. The purchase price for the additional shares is the lower of:

- the closing sale price for the common stock on the date of sale; and
- ninety-seven percent (97%) of the volume weighted average price of the common stock on the Nasdaq Capital Market on the date of sale.

In the event we have directed Lincoln Park to purchase shares of our common stock in the full amount available for an Accelerated Purchase, on the date of such Accelerated Purchase (which is the business day following the corresponding Regular Purchase), we may also direct Lincoln Park to purchase an additional amount of our common stock under the same terms set forth above for an Accelerated Purchase.

There is no upper or lower limit on the price per share that Lincoln Park must pay for our common stock under the Purchase Agreement.

Other than as described above, there are no trading volume requirements or restrictions under the Purchase Agreement. We will control the timing and amount of any sales of our common stock to Lincoln Park. We may at any time, in our sole discretion terminate the Purchase Agreement without fee, penalty or cost, upon one trading day written notice.

The Purchase Agreement limits our sales of shares of common stock to Lincoln Park to 5,227,323 shares of common stock, representing 19.99% of the shares of common stock outstanding on the date of the Purchase Agreement (which number of shares shall be reduced, on a share-for-share basis, by the number of shares of common stock issued or issuable pursuant to any transaction or series of transactions that may be aggregated with the transactions contemplated by the Purchase Agreement under applicable Nasdaq rules (the “Exchange Cap”), unless (i) shareholder approval is obtained to issue more than such amount or (ii) the average price of all applicable sales of our common stock to Lincoln Park under the Purchase Agreement equals or exceeds the average of the closing price of our common stock on the Nasdaq Capital Market for the five business days immediately preceding the signing of the Purchase Agreement, such that issuances and sales of common stock to Lincoln Park under the Purchase Agreement would be exempt from the Exchange Cap limitation under applicable Nasdaq rules.

The Purchase Agreement also prohibits us from directing Lincoln Park to purchase any shares of common stock if those shares, when aggregated with all other shares of our common stock then beneficially owned by Lincoln Park and its affiliates, would result in Lincoln Park and its affiliates having beneficial ownership, at any single point in time, of more than 9.99% of the

then total outstanding shares of our common stock, as calculated pursuant to Section 13(d) of the Securities Exchange Act of 1934, as amended, or the Exchange Act, and Rule 13d-3 thereunder.

The Purchase Agreement does not limit our ability to raise capital from other sources at our sole discretion, provided, however, that we shall not enter into any “Variable Rate Transaction” as defined in the Purchase Agreement, including the issuance of any floating conversion rate or variable priced equity-like securities during the 30 months after the date of the Purchase Agreement.

Events of default under the Purchase Agreement include the following:

- the effectiveness of the registration statement lapses for any reason (including, without limitation, the issuance of a stop order), or the prospectus supplement and accompanying prospectus are unavailable for sale by us or the resale by Lincoln Park of our common stock offered thereby, and such lapse or unavailability continues for a period of ten consecutive business days or for more than an aggregate of thirty business days in any 365-day period;
- the suspension of our common stock from trading or the failure of our common stock to be listed on Nasdaq for a period of one business day;
- the delisting of our common stock from Nasdaq; provided, however, that our common stock is not immediately thereafter trading on the New York Stock Exchange, the Nasdaq Global Market, the Nasdaq Global Select Market, the NYSE American, the NYSE Arca, the OTC Bulletin Board, or the OTCQX or OTCQB operated by the OTC Markets Group, Inc. (or nationally recognized successor to any of the foregoing);
- the failure for any reason by the transfer agent to issue shares to Lincoln Park within three business days after the applicable purchase date on which Lincoln Park is entitled to receive such securities;
- any breach of the representations and warranties or covenants contained in the Purchase Agreement or any related agreements with Lincoln Park if such breach would reasonably be expected to have a material adverse effect and such breach is not cured within five trading days;
- our insolvency or our participation or threatened participation in insolvency or bankruptcy proceedings by or against us, as more fully described in the Purchase Agreement;
- if at any time we are not eligible to transfer our common stock electronically via DWAC;
or
- if at any time after the commencement date, the Exchange Cap is reached, to the extent it is applicable.

Lincoln Park does not have the right to terminate the Purchase Agreement upon any of the events of default set forth above. During an event of default, all of which are outside the control of Lincoln Park, shares of our common stock cannot be sold by us or purchased by Lincoln Park under the terms of the Purchase Agreement.

We have the right to terminate the Purchase Agreement at any time, at no cost to us. In the event of bankruptcy proceedings by or against us, the Purchase Agreement will automatically terminate without action of any party.

The Purchase Agreement contains customary representations, warranties and agreements of the Company and Lincoln Park, limitations and conditions to completing future sale transactions, indemnification rights and other obligations of the parties. Actual sales of shares of common stock to Lincoln Park under the Purchase Agreement will depend on a variety of factors to be determined by the Company from time to time, including (among others) market conditions, the trading price of our common stock and determinations by the Company as to other available and appropriate sources of funding for the Company.

Concurrently with entering into the Purchase Agreement, we also entered into a registration rights agreement with Lincoln Park (the “Registration Rights Agreement”), pursuant to which we agreed to file a prospectus supplement pursuant to Rule 424(b) relating to the sale of the Company’s shares of common stock that have been and may be issued to Lincoln Park under the Purchase Agreement pursuant to the Company’s existing shelf registration statement or a new registration statement and to use our reasonable best efforts to keep such registration statement effective until the earlier of (i) the date on which Lincoln Park shall have sold all the shares under the Purchase Agreement and (ii) the earlier of (A) 180 days following the first day of the month immediately following the 30 month anniversary of the commencement date and (B) the nine months following the termination of the Purchase Agreement.

The offer and sale of the shares under the Purchase Agreement was and will be made pursuant to the Company’s registration statement on Form S-3 (SEC File No. 333-225086), which was declared effective by the SEC on June 5, 2018, and pursuant to the prospectus supplement filed on October 24, 2019.

The Company intends to use the net proceeds from this offering primarily to support the continued advancement of both GEN-009 and GEN-011 as well as for other research and general corporate purposes.

The foregoing description of the terms and conditions of the Purchase Agreement and the Registration Rights Agreement does not purport to be complete and is qualified in their entirety by the full text of the Purchase Agreement and the Registration Rights Agreement, which are attached hereto as Exhibit 99.1 and Exhibit 4.1, respectively, and incorporated herein by reference.

The Company is filing the opinion of its counsel, Ropes & Gray LLP, relating to the legality of the shares of common stock offered and sold pursuant to the Purchase Agreement, as Exhibit 5.1 hereto.

Item 2.02 Results of Operations and Financial Condition.

On October 24, 2019, the Company announced its financial results for the third quarter ended September 30, 2019. A full text of the press release issued in connection with the announcement is furnished as Exhibit 99.2 to this Current Report on Form 8-K.

The information contained in this Current Report on Form 8-K, including Exhibit 99.2 attached hereto, is being furnished and shall not be deemed “filed” for any purpose, and shall not be deemed incorporated by reference in any filing under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended, except as expressly set forth by specific reference in such filing.

Item 9.01 Financial Statements and Exhibits.

(d) Exhibits

- 4.1 [Registration Rights Agreement, dated as of October 23, 2019, by and between Genoclea Biosciences, Inc. and Lincoln Park Capital Fund, LLC.](#)
 - 5.1 [Opinion of Ropes & Gray LLP.](#)
 - 23.1 [Consent of Ropes & Gray LLP \(included in Exhibit 5.1\).](#)
 - 99.1 [Purchase Agreement, dated as of October 23, 2019, by and between Genoclea Biosciences, Inc. and Lincoln Park Capital Fund, LLC.](#)
 - 99.2 [Press Release issued by Genoclea Biosciences, Inc. on October 24, 2019](#)
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SIGNATURES

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

GENOCEA BIOSCIENCES, INC.

By: /s/ DIANTHA DUVALL

Diantha Duvall

Chief Financial Officer

(Principal Financial Officer)

Date: October 24, 2019

REGISTRATION RIGHTS AGREEMENT

THIS REGISTRATION RIGHTS AGREEMENT (this “Agreement”), dated as of October 23, 2019, is entered into by and between **GENOCEA BIOSCIENCES, INC.**, a Delaware corporation (the “Company”), and **LINCOLN PARK CAPITAL FUND, LLC**, an Illinois limited liability company (together with its permitted assigns, the “Investor”). Capitalized terms used herein and not otherwise defined herein shall have the respective meanings set forth in the Purchase Agreement by and between the parties hereto, dated as of the date hereof (as amended, restated, supplemented or otherwise modified from time to time, the “Purchase Agreement”).

WHEREAS:

A. Upon the terms and subject to the conditions of the Purchase Agreement, (i) the Company has agreed to issue to the Investor, and the Investor has agreed to purchase, up to Thirty Million Dollars (\$30,000,000.00) of the Company’s Common Stock, par value \$0.001 per share (the “Common Stock”), pursuant to Section 2 of the Purchase Agreement (such shares, the “Purchase Shares”), and (ii) the Company has agreed to issue to the Investor such number of shares of Common Stock as is required pursuant to Section 5(e) of the Purchase Agreement (the “Commitment Shares”); and

B. To induce the Investor to enter into the Purchase Agreement, the Company has agreed to provide certain registration rights under the Securities Act of 1933, as amended, and the rules and regulations thereunder, or any similar successor statute (collectively, the “Securities Act”), and applicable state securities laws.

NOW, THEREFORE, in consideration of the promises and the mutual covenants contained herein and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Company and the Investor hereby agree as follows:

1. DEFINITIONS.

For purposes of this Agreement, the following terms shall have the following meanings:

(a) “Register,” “Registered,” and “Registration” refer to a registration effected by preparing and filing one or more registration statements of the Company in compliance with the Securities Act and providing for offering securities on a continuous basis, and the declaration or ordering of effectiveness of such registration statement(s) by the SEC.

(b) “Registrable Securities” means the Purchase Shares that may from time to time be issued or issuable to the Investor upon purchases of the Available Amount under the Purchase Agreement (without regard to any limitation or restriction on purchases), the Commitment Shares issued or issuable to the Investor, and any Common Stock issued or issuable with respect to the Purchase Shares, the Commitment Shares or the Purchase Agreement as a result of any stock split, stock dividend, recapitalization, exchange or similar event, without regard to any limitation on purchases under the Purchase Agreement.

(c) “Registration Statement” means the Shelf Registration Statement and any other registration statement of the Company that Registers Registrable Securities, including a New Registration Statement (as defined below), as amended when each became effective, including all documents filed as part thereof or incorporated by reference therein, and including any information contained in a Prospectus subsequently filed with the SEC

(d) “Shelf Registration Statement” means the Company’s existing registration statement on Form S-3 (File No. 333-230577).

2. REGISTRATION.

(a) Mandatory Registration. The Company agrees that it shall, within the time required under Rule 424(b) under the Securities Act, file with the SEC the Initial Prospectus Supplement pursuant to Rule 424(b) under the Securities Act specifically relating to the transactions contemplated by, and describing the material terms and conditions of, the Transaction Documents, containing information previously omitted at the time of effectiveness of the Registration Statement in reliance on Rule 430B under the Securities Act, and disclosing all information relating to the transactions contemplated hereby required to be disclosed in the Registration Statement and the Prospectus as of the date of the Initial Prospectus Supplement, including, without limitation, information required to be disclosed in the section captioned “Plan of Distribution” in the Prospectus. The Investor acknowledges that it will be identified in the Initial Prospectus Supplement as an underwriter within the meaning of Section 2(a)(11) of the Securities Act. The Company shall permit the Investor to review and comment upon the Initial Prospectus Supplement at least two (2) Business Days prior to their filing with the SEC, the Company shall give due consideration to all such comments, and the Company shall not file the Initial Prospectus Supplement with the SEC in a form to which the Investor reasonably objects. The Investor shall use its reasonable best efforts to comment upon the Initial Prospectus Supplement within one (1) Business Day from the date the Investor receives the final pre-filing draft version thereof from the Company. The Investor shall furnish to the Company such information regarding itself, the Securities held by it and the intended method of distribution thereof, including any arrangement between the Investor and any other Person relating to the sale or distribution of the Securities, as shall be

reasonably requested by the Company in connection with the preparation and filing of the Initial Prospectus Supplement, and shall otherwise cooperate with the Company as reasonably requested by the Company in connection with the preparation and filing of the Initial Prospectus Supplement with the SEC.

(b) Effectiveness. The Company shall use its reasonable best efforts to keep the Registration Statement effective under the Securities Act (including through any necessary renewals), and to keep the Registration Statement and the Prospectus current and available (including through any necessary renewals) for issuances and sales of all possible Registrable Securities by the Company to the Investor, and for the resale of all of the Registrable Securities by the Investor, at all times until the earlier of (i) the date on which the Investor shall have sold all the Registrable Securities and no Available Amount remains and (ii) the earlier of (A) 180 days following the Maturity Date and (B) the nine months following the termination of the Purchase Agreement (the “Registration Period”). Without limiting the generality of the foregoing, during the Registration Period, the Company shall (a) take all action necessary to cause the Common Stock to continue to be Registered as a class of securities under Section 12(b) of the Exchange Act and shall not take any action or file any document (whether or not permitted by the Exchange Act) to terminate or suspend such registration and (b) file or furnish on or before their respective due dates all reports and other documents required to be filed or furnished by the Company pursuant to Sections 13(a), 13(c), 14, 15(d) or any other provision of or under the Exchange Act, and shall not take any action or file any document (whether or not permitted by the Exchange Act) to terminate or suspend its reporting and filing obligations under the Exchange Act. The Registration Statement (including any amendments or supplements thereto and prospectuses contained therein) shall not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements therein, in the light of the circumstances then existing, not misleading.

(c) Prospectus Amendments or Supplements. Except as provided in this Agreement and other than periodic and current reports required to be filed pursuant to the Exchange Act, the Company shall not file with the SEC any amendment to the Registration Statement or any supplement to the Base Prospectus that refers to the Investor, the Transaction Documents or the transactions contemplated thereby (including, without limitation, any Prospectus Supplement filed in connection with the transactions contemplated by the Transaction Documents), in each case with respect to which (a) the Investor shall not previously have been advised and afforded the opportunity to review and comment thereon at least two (2) Business Days prior to filing with the SEC, as the case may be, (b) the Company shall not have given due consideration to any comments thereon received from the Investor or its counsel, or (c) the Investor shall reasonably object, unless the Company reasonably has determined that it is necessary to amend the Registration Statement or make any supplement to the Prospectus to comply with the Securities Act or any other applicable law or regulation, in which case the Company shall promptly (but in no event later than 24 hours) so inform the Investor, the Investor shall be provided with a reasonable opportunity to review and comment upon any disclosure referring to the Investor, the Transaction Documents or the transactions contemplated thereby, as applicable, and the Company shall expeditiously furnish to the Investor a copy thereof. In addition, for so long as, in the reasonable opinion of counsel for the Investor, the Prospectus is required to be delivered in connection with any acquisition or sale of Securities by the Investor, the Company shall not file any Prospectus Supplement with respect to the Securities without furnishing to the Investor as many copies of such Prospectus Supplement, together with the Prospectus, as the Investor may reasonably request.

(d) Sufficient Number of Shares Registered. In the event the number of shares available under the Shelf Registration Statement is insufficient to cover the Registrable Securities, the Company shall, to the extent necessary and permissible, amend the Shelf Registration Statement or file a new registration statement (together with any prospectuses or prospectus supplements thereunder, a “New Registration Statement”), so as to cover all of such Registrable Securities as soon as reasonably practicable, but in any event not later than ten (10) Business Days after the necessity therefor arises. The Company shall use its reasonable best efforts to have such amendment and/or New Registration Statement become effective as soon as reasonably practicable following the filing thereof.

(e) Offering. If the SEC seeks to characterize any offering pursuant to a Registration Statement filed pursuant to this Agreement as constituting an offering of securities that does not permit such Registration Statement to become effective and be used by the Investor under Rule 415 at then-prevailing market prices (and not fixed prices), or if after the filing of the Initial Prospectus Supplement with the SEC pursuant to Section 2(a), the Company is otherwise required by the Staff or the SEC to reduce the number of Registrable Securities included in such initial Registration Statement, then the Company shall reduce the number of Registrable Securities to be included in such initial Registration Statement (with the prior consent, which shall not be unreasonably withheld, of the Investor and its legal counsel as to the specific Registrable Securities to be removed therefrom) until such time as the SEC shall so permit such Registration Statement to become effective and be used as aforesaid. In the event of any reduction in Registrable Securities pursuant to this paragraph, the Company shall file one or more New Registration Statements in accordance with Section 2(d) until such time as all Registrable Securities have been included in Registration Statements that have been declared effective and the prospectuses contained therein is available for use by the Investor. Notwithstanding any provision herein or in the Purchase Agreement to the contrary, the Company’s obligation to register Registrable Securities (and any related conditions to the Investor’s obligations) shall be qualified as necessary to comport with any requirement of the SEC as addressed in this Section 2(e).

3. RELATED OBLIGATIONS.

With respect to the Registration Statement and whenever any Registrable Securities are to be Registered pursuant to Section 2, including on the Shelf Registration Statement or on any New Registration Statement, the Company shall use its reasonable best efforts to effect the registration of the Registrable Securities in accordance with the intended method of disposition thereof and, pursuant thereto, the Company shall have the following obligations:

(a) Notifications. The Company will notify the Investor promptly of the time when any subsequent amendment to the Shelf Registration Statement or any New Registration Statement, other than documents incorporated by reference, has been filed with the SEC and/or has become effective or where a receipt has been issued therefor or any subsequent supplement to a Prospectus has been filed and of any request by the SEC for any amendment or supplement to the Registration Statement, any New Registration Statement or any Prospectus or for additional information.

(b) Amendments. The Company will prepare and file with the SEC, promptly upon the Investor's request, any amendments or supplements to the Shelf Registration Statement, any New Registration Statement or any Prospectus, as applicable, that, in the reasonable opinion of the Investor and the Company, may be necessary or advisable in connection with any acquisition or sale of Registrable Securities by the Investor (provided, however, that the failure of the Investor to make such request shall not relieve the Company of any obligation or liability hereunder).

(c) Investor Review. The Company will not file any amendment or supplement to the Registration Statement, any New Registration Statement or any Prospectus, other than documents incorporated by reference, relating to the Investor, the Registrable Securities or the transactions contemplated hereby unless (A) the Investor shall have been advised and afforded the opportunity to review and comment thereon at least two (2) Business Days prior to filing with the SEC (B) the Company shall have given due consideration to any comments thereon received from the Investor or its counsel, and (C) the Investor has not reasonably objected thereto (provided, however, that the failure of the Investor to make such objection shall not relieve the Company of any obligation or liability hereunder), and the Company will furnish to the Investor at the time of filing thereof a copy of any document that upon filing is deemed to be incorporated by reference into the Registration Statement or any Prospectus, except for those documents available via EDGAR.

(d) Form S-3. The Company will cause each amendment or supplement to the Prospectus, other than documents incorporated by reference, to be filed with the SEC as required pursuant to the rules of Form S-3.

(e) Copies Available. The Company will furnish to the Investor and its counsel (at the expense of the Company) copies of the Registration Statement, the Prospectus (including all documents incorporated by reference therein), any Prospectus Supplement, any New Registration Statement and all amendments and supplements to the Registration Statement, the Prospectus or any New Registration Statement that are filed with the SEC during the Registration Period (including all documents filed with or furnished to the SEC during such period that are deemed to be incorporated by reference therein), in each case as soon as reasonably practicable upon the Investor's request and in such quantities as the Investor may from time to time reasonably request and, at the Investor's request, will also furnish copies of the Prospectus to each exchange or market on which sales of the Registrable Securities may be made; provided, however, that the Company shall not be required to furnish any document (other than the Prospectus) to the Investor to the extent such document is available on EDGAR.

(f) Qualification. The Company shall take all such action, if any, as is reasonably necessary in order to obtain an exemption for or to qualify (i) the issuance of the Commitment Shares and the sale of the Purchase Shares to the Investor under this Agreement and (ii) any subsequent resale of all Commitment Shares and all Purchase Shares by the Investor, in each case, under applicable securities or "Blue Sky" laws of the states of the United States in such states as is reasonably requested by the Investor during the Registration Period, and shall provide evidence of any such action so taken to the Investor. During the Registration Period, the Company shall promptly notify the Investor of the receipt by the Company of any notification with respect to the suspension of the registration or qualification of any of the Registrable Securities for sale under the securities or "blue sky" laws of any jurisdiction in the United States or its receipt of actual notice of the initiation or threat of any proceeding for such purpose.

(g) Notification of Stop Orders; Material Changes. The Company shall advise the Investor promptly (but in no event later than 24 hours) and shall confirm such advice in writing, in each case: (i) of the Company's receipt of notice of any request by the SEC or any other federal or state governmental authority for amendment of or a supplement to the Registration Statement or any Prospectus or for any additional information; (ii) of the Company's receipt of notice of the issuance by the SEC or any other federal or state governmental authority of any stop order suspending the effectiveness of the Registration Statement or prohibiting or suspending the use of the Prospectus or Prospectus Supplement, or any New Registration Statement, or of the Company's receipt of any notification of the suspension of qualification of the Registrable Securities for offering or sale in any jurisdiction or the initiation or contemplated initiation of any proceeding for such purpose; and (iii) of the Company becoming aware of the happening of any event, which makes any statement of a material fact made in the Registration Statement or any Prospectus untrue or which requires the making of any additions to or changes to the statements then made in the Registration Statement or any Prospectus in order to state a material fact required by the Securities Act to be stated therein or necessary in order to make the statements then made therein (in the case of any Prospectus, in light of the circumstances under which they were made) not misleading, or of the necessity to amend the Registration Statement or any Prospectus to comply with the Securities Act or any other law. The Company shall not be required to disclose to the Investor the substance or specific reasons of any of the events set forth in clauses (i) through (iii) of the immediately preceding sentence, but rather, shall only be required to disclose that the event has occurred. If at any time the SEC, or any other federal or state governmental authority shall issue any stop order suspending the effectiveness of the Registration Statement or prohibiting or suspending the use of the Prospectus or Prospectus Supplement, the Company shall use its reasonable best efforts to obtain the withdrawal of such order at the earliest possible time. The Company shall furnish to the Investor, without charge, a copy of any correspondence from the SEC or the staff of the SEC, or any other federal or state governmental authority to the Company or its representatives relating to the Shelf Registration Statement, any New Registration Statement or any Prospectus, or Prospectus Supplement as the case may be. The Company shall not deliver to the Investor any Regular Purchase Notice, Accelerated Purchase Notice or Additional Accelerated Purchase Notice, and the Investor shall not be obligated to purchase any shares of Common Stock under this Agreement, during

the continuation or pendency of any of the foregoing events. If at any time the SEC shall issue any stop order suspending the effectiveness of the Registration Statement or prohibiting or suspending the use of the Prospectus or any Prospectus Supplement, the Company shall use its reasonable best efforts to obtain the withdrawal of such order at the earliest possible time. The Company shall furnish to the Investor, without charge, a copy of any correspondence from the SEC or the staff of the SEC to the Company or its representatives relating to the Registration Statement or the Prospectus, as the case may be.

(h) Listing on the Principal Market. The Company shall promptly secure the listing, or conditional listing as applicable, of all of the Purchase Shares and Commitment Shares to be issued to the Investor hereunder on the Principal Market (subject to standard listing conditions, if any, for transactions of this nature, official notice of issuance and the Exchange Cap) and upon each other national securities exchange or automated quotation system, if any, upon which the Common Stock are then listed, and shall maintain, so long as any Common Stock shall be so listed, such listing of all such Registrable Securities from time to time issuable hereunder. The Company shall use commercially reasonable efforts to maintain the listing of the Common Stock on the Principal Market and shall comply in all respects with the Company's reporting, filing and other obligations under the bylaws or rules and regulations of the Principal Market. Neither the Company nor any of its Subsidiaries shall take any action that would reasonably be expected to result in the delisting or suspension of the Common Stock on the Principal Market. The Company shall promptly, and in no event later than the following Business Day, provide to the Investor copies of any notices it receives from the Principal Market regarding the continued eligibility of the Common Stock for listing on the Principal Market; provided, however, that the Company shall not provide the Investor copies of any such notice that the Company reasonably believes constitutes material non-public information and that the Company would not be required to publicly disclose in any report or statement filed with the SEC under Exchange Act (including on Form 8-K) or the Securities Act. The Company shall pay all fees and expenses in connection with satisfying its obligations under this Section 3(h).

(i) Delivery of Shares. The Company shall cooperate with the Investor to facilitate the timely preparation and delivery of DWAC Shares (not bearing any restrictive legend) representing the Registrable Securities to be offered pursuant to the Shelf Registration Statement or any New Registration Statement and enable such DWAC Shares to be in such denominations or amounts as the Investor may reasonably request and registered in such names as the Investor may request.

(j) Transfer Agent. The Company shall at all times maintain the services of the Transfer Agent with respect to its Common Stock.

(k) Approvals. The Company shall use commercially reasonable efforts to cause the Registrable Securities covered by any Registration Statement to be Registered with or approved by such other governmental agencies or authorities in the United States as may be necessary to consummate the disposition of such Registrable Securities.

(l) Confirmation of Effectiveness. If reasonably requested by the Investor at any time, the Company shall deliver to the Investor a written confirmation from Company's counsel of whether or not the effectiveness of such Registration Statement has lapsed at any time for any reason (including, without limitation, the issuance of a stop order) and whether or not the Registration Statement is currently effective and available to the Company for sale of all of the Registrable Securities.

(m) Further Assurances. The Company agrees to take all other reasonable actions as necessary and reasonably requested by the Investor to expedite and facilitate disposition by the Investor of Registrable Securities pursuant to any Registration Statement.

(n) Suspension of Sales. The Investor agrees that, upon receipt of any notice from the Company of the existence of any suspension or stop order as set forth in Section 3(f) or 3(g), the Investor will immediately discontinue disposition of Registrable Securities pursuant to any Registration Statement covering such Registrable Securities until the Investor's receipt of the copies of a notice regarding the resolution or withdrawal of the suspension or stop order as contemplated by Section 3(f) or 3(g). Notwithstanding anything to the contrary, the Company shall cause its transfer agent to promptly deliver to the Investor DWAC Shares without any restrictive legend in accordance with the terms of the Purchase Agreement in connection with any sale of Registrable Securities with respect to which the Investor has entered into a contract for sale prior to the Investor's receipt of a notice from the Company of the happening of any event of the kind described in Section 3(f) or 3(g) and for which the Investor has not yet settled.

4. OBLIGATIONS OF THE INVESTOR.

(a) Investor Information. The Investor has furnished to the Company in Exhibit A hereto such information regarding itself, the Registrable Securities held by it, the Registrable Securities held by it and the intended method of disposition thereof, including any arrangement between the Investor and any other Person relating to the sale or distribution of the Securities, as required to effect the registration of such Registrable Securities and shall execute such documents in connection with such registration as the Company may reasonably request. The Company shall notify the Investor in writing of any other information the Company reasonably requires from the Investor in connection with any Registration Statement hereunder. The Investor will as promptly as practicable notify the Company of any material change in the information set forth in Exhibit A, other than changes in its ownership of Common Stock.

(b) Investor Cooperation. The Investor agrees to cooperate with the Company as reasonably requested by the Company in connection with the preparation and filing of any amendments and supplements to any Registration Statement or New Registration Statement hereunder.

5. EXPENSES OF REGISTRATION.

All reasonable expenses of the Company, other than sales or brokerage commissions and fees and disbursements of counsel for, and other expenses of, the Investor, incurred in connection with registrations, filings or qualifications pursuant to Sections 2 and 3, including, without limitation, all registration, listing and qualifications fees, printers and accounting fees, and fees and disbursements of counsel for the Company, shall be paid by the Company.

6. INDEMNIFICATION.

(a) To the fullest extent permitted by law, the Company will, and hereby does, indemnify, hold harmless and defend the Investor, each Person, if any, who controls the Investor, the members, the directors, officers, partners, employees, members, managers, agents, representatives of the Investor and each Person, if any, who controls the Investor within the meaning of the Securities Act or the Exchange Act (each, an “Indemnified Person”), against any losses, claims, damages, liabilities, judgments, fines, penalties, charges, costs, reasonable attorneys’ fees, amounts paid in settlement (with the consent of the Company, such consent not to be unreasonably withheld) or reasonable expenses, (collectively, “Claims”) reasonably incurred in investigating, preparing or defending any action, claim, suit, inquiry, proceeding, investigation or appeal taken from the foregoing by or before any court or governmental, administrative or other regulatory agency or body or the SEC, whether pending or threatened, whether or not an indemnified party is or may be a party thereto (“Indemnified Damages”), to which any of them may become subject insofar as such Claims (or actions or proceedings, whether commenced or threatened, in respect thereof) arise out of or are based upon: (i) any untrue statement or alleged untrue statement of a material fact in the Shelf Registration Statement, any New Registration Statement or any post-effective amendment thereto or in any filing made in connection with the qualification of the offering under the securities or other “blue sky” laws of any jurisdiction in which Registrable Securities are offered (“Blue Sky Filing”), or the omission or alleged omission to state a material fact required to be stated therein or necessary to make the statements therein not misleading, (ii) any untrue statement or alleged untrue statement of a material fact contained in the final Prospectus or the omission or alleged omission to state therein any material fact necessary to make the statements made therein, in light of the circumstances under which the statements therein were made, not misleading, (iii) any violation by the Company of the Securities Act, the Exchange Act, any other law, including, without limitation, any state securities law, or any rule or regulation thereunder relating to the offer or sale of the Registrable Securities pursuant to the Shelf Registration Statement or any New Registration Statement or (iv) any material violation by the Company of this Agreement (the matters in the foregoing clauses (i) through (iv) being, collectively, “Violations”). The Company shall reimburse each Indemnified Person promptly as such expenses are incurred and are due and payable, for any reasonable out-of-pocket legal fees or other reasonable expenses incurred by them in connection with investigating or defending any such Claim. Notwithstanding anything to the contrary contained herein, the indemnification agreement contained in this Section 6(a): (A) shall not apply to a Claim by an Indemnified Person arising out of or based upon a Violation which occurs in reliance upon and in conformity with information furnished in writing to the Company by the Investor or such Indemnified Person expressly for use in connection with the preparation of the Registration Statement, any New Registration Statement, the Prospectus or any such amendment thereof or supplement thereto, in each case if the foregoing was timely made available by the Company pursuant to Section 3(c) or Section 3(e); (B) with respect to any superseded prospectus, shall not inure to the benefit of any such Person from whom the Person asserting any such Claim purchased the Registrable Securities that are the subject thereof (or to the benefit of any other Indemnified Person) if the untrue statement or omission of material fact contained in the superseded prospectus was corrected in the revised prospectus, as then amended or supplemented, if such revised prospectus was timely made available by the Company pursuant to Section 3(c) or Section 3(e), and the Indemnified Person was promptly advised in writing not to use the incorrect prospectus prior to the use giving rise to a violation; (C) shall not be available to the extent such Claim is based on a failure of the Investor to deliver, or to cause to be delivered, the prospectus made available by the Company, if such prospectus was timely made available by the Company pursuant to Section 3(c) or Section 3(e); and (D) shall not apply to amounts paid in settlement of any Claim if such settlement is effected without the prior written consent of the Company, which consent shall not be unreasonably withheld. Such indemnity shall remain in full force and effect regardless of any investigation made by or on behalf of the Indemnified Person and shall survive the transfer of the Registrable Securities by the Investor pursuant to Section 8.

(b) In connection with the Shelf Registration Statement any New Registration Statement or Prospectus, the Investor agrees to indemnify, hold harmless and defend, to the same extent and in the same manner as is set forth in Section 6(a), the Company, each of its directors, each of its officers who signed the Shelf Registration Statement or signs any New Registration Statement, each Person, if any, who controls the Company within the meaning of the Securities Act or the Exchange Act (collectively and together with an Indemnified Person, an “Indemnified Party”), against any Claim or Indemnified Damages to which any of them may become subject, under the Securities Act, the Exchange Act or otherwise, insofar as such Claim or Indemnified Damages arise out of or are based upon any Violation, in each case to the extent, and only to the extent, that such Violation occurs in reliance upon and in conformity with written information about the Investor set forth on Exhibit A attached hereto or updated from time to time in writing by the Investor and furnished to the Company by the Investor expressly for inclusion in the Shelf Registration Statement or Prospectus or any New Registration Statement or from the failure of the Investor to deliver or to cause to be delivered the prospectus made available by the Company, if such prospectus was timely made available by the Company pursuant to Section 3(c) or Section 3(e); and, subject to Section 6(d), the Investor will reimburse any reasonable out-of-pocket legal or other expenses reasonably incurred by them in connection with investigating or defending any such Claim; provided, however, that the indemnity agreement contained in this Section 6(b) and the agreement with respect to contribution contained in Section 7 shall not apply to amounts paid in settlement of any Claim if such settlement is effected without the prior written consent of the Investor, which consent shall not be unreasonably withheld; provided, further, however, that the Investor shall be liable under this Section 6(b) for only that amount of a Claim or Indemnified Damages as does not exceed the net proceeds to the Investor as a result of the sale of Registrable

Securities pursuant to such Registration Statement. Such indemnity shall remain in full force and effect regardless of any investigation made by or on behalf of such Indemnified Party and shall survive the transfer of the Registrable Securities by the Investor pursuant to Section 8.

(c) Promptly after receipt by an Indemnified Person or Indemnified Party under this Section 6 of notice of the commencement of any action or proceeding (including any governmental action or proceeding) involving a Claim, such Indemnified Person or Indemnified Party shall, if a Claim in respect thereof is to be made against any indemnifying party under this Section 6, deliver to the indemnifying party a written notice of the commencement thereof, and the indemnifying party shall have the right to participate in, and, to the extent the indemnifying party so desires, jointly with any other indemnifying party similarly noticed, to assume control of the defense thereof with counsel mutually satisfactory to the indemnifying party and the Indemnified Person or the Indemnified Party, as the case may be; provided, however, that an Indemnified Person or Indemnified Party shall have the right to retain its own counsel with the fees and expenses to be paid by the indemnifying party, if, in the reasonable opinion of counsel retained by the indemnifying party, the representation by such counsel of the Indemnified Person or Indemnified Party and the indemnifying party would be inappropriate due to actual or potential differing interests between such Indemnified Person or Indemnified Party and any other party represented by such counsel in such proceeding. The Indemnified Party or Indemnified Person shall cooperate with the indemnifying party in connection with any negotiation or defense of any such action or claim by the indemnifying party and shall furnish to the indemnifying party all information reasonably available to the Indemnified Party or Indemnified Person which relates to such action or claim. The indemnifying party shall keep the Indemnified Party or Indemnified Person fully apprised as to the status of the defense or any settlement negotiations with respect thereto. No indemnifying party shall be liable for any settlement of any action, claim or proceeding effected without its written consent, provided, however, that the indemnifying party shall not unreasonably withhold, delay or condition its consent. No indemnifying party shall, without the consent of the Indemnified Party or Indemnified Person, consent to entry of any judgment or enter into any settlement or other compromise which does not include as an unconditional term thereof the giving by the claimant or plaintiff to such Indemnified Party or Indemnified Person of a release from all liability in respect to such claim or litigation. Following indemnification as provided for hereunder, the indemnifying party shall be subrogated to all rights of the Indemnified Party or Indemnified Person with respect to all third parties, firms or corporations relating to the matter for which indemnification has been made. The failure to deliver written notice to the indemnifying party within a reasonable time of the commencement of any such action shall not relieve such indemnifying party of any liability to the Indemnified Person or Indemnified Party under this Section 6, except to the extent that the indemnifying party is prejudiced in its ability to defend such action.

d. The indemnification required by this Section 6 shall be made by periodic payments of the amount thereof during the course of the investigation or defense, as and when bills are received or Indemnified Damages are incurred. Any Person receiving a payment pursuant to this Section 6 which person is later determined to not be entitled to such payment shall return such payment to the person making it.

e. The indemnity agreements contained herein shall be in addition to (i) any cause of action or similar right of the Indemnified Party or Indemnified Person against the indemnifying party or others, and (ii) any liabilities the indemnifying party may be subject to pursuant to the law.

7. CONTRIBUTION.

To the extent any indemnification by an indemnifying party is prohibited or limited by law, the indemnifying party agrees to make the maximum contribution with respect to any amounts for which it would otherwise be liable under Section 6 to the fullest extent permitted by law; provided, however, that: (i) no seller of Registrable Securities guilty of fraudulent misrepresentation (within the meaning of Section 11(f) of the Securities Act) shall be entitled to contribution from any seller of Registrable Securities who was not guilty of fraudulent misrepresentation; and (ii) contribution by any seller of Registrable Securities shall be limited in amount to the net amount of proceeds received by such seller from the sale of such Registrable Securities.

8. ASSIGNMENT OF REGISTRATION RIGHTS.

The Company shall not assign this Agreement or any rights or obligations hereunder without the prior written consent of the Investor; provided, however, that any transaction, whether by merger, reorganization, restructuring, consolidation, financing or otherwise, whereby the Company remains the surviving entity immediately after such transaction shall not be deemed an assignment. The Investor may not assign its rights under this Agreement without the prior written consent of the Company, other than to an affiliate of the Investor controlled by Jonathan Cope or Josh Scheinfeld, in which case the assignee must agree in writing to be bound by the terms and conditions of this Agreement.

9. AMENDMENT OF REGISTRATION RIGHTS.

No provision of this Agreement may be amended or waived by the parties from and after the date that is one Business Day immediately preceding the initial filing of the Initial Prospectus Supplement with the SEC. Subject to the immediately preceding sentence, no provision of this Agreement may be (i) amended other than by a written instrument signed by both parties hereto or (ii) waived other than in a written instrument signed by the party against whom enforcement of such waiver is sought. Failure of any party to exercise any right or remedy under this Agreement or otherwise, or delay by a party in exercising such right or remedy, shall not operate as a waiver thereof.

10. MISCELLANEOUS.

(a) Notices. Any notices, consents or other communications required or permitted to be given under the terms of this Agreement must be in writing and will be deemed to have been delivered: (i) upon receipt, when delivered personally; (ii) upon receipt, when sent by facsimile (provided confirmation of transmission is mechanically or electronically generated and kept on file by the sending party); (iii) upon receipt, when sent by electronic message (provided the recipient responds to the message and confirmation of both electronic messages are kept on file by the sending party); or (iv) one (1) Business Day after timely deposit with a nationally recognized overnight delivery service, in each case properly addressed to the party to receive the same. The addresses for such communications shall be:

If to the Company:

Genocea Biosciences, Inc.
100 Acorn Park Drive, 5th Floor
Cambridge, MA 02140
Telephone: 617.876.8191
E-mail: diantha.duvall@genocea.com
Attention: Diantha Duvall, Chief Financial Officer

With a copy to (which shall not constitute notice or service of process):

Ropes & Gray LLP
Prudential Tower
800 Boylston Street
Boston, MA 02199
Telephone: 617-951-7000
Facsimile: 617-951-7050
Email: Marc.Rubenstein@ropesgray.com
Attention: Marc Rubenstein, Esq.

If to the Investor:

Lincoln Park Capital Fund, LLC
440 North Wells, Suite 410
Chicago, IL 60654
Telephone: 312.822.9300
Facsimile: 312.822.9301
E-mail: jscheinfeld@lpcfunds.com/jcope@lpcfunds.com
Attention: Josh Scheinfeld/Jonathan Cope

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

K&L Gates, LLP
200 South Biscayne Boulevard
Suite 3900
Miami, Florida 33131
Telephone: 305.539.3300
Facsimile: 305.358.7095
E-mail: clayton.parker@klgates.com/matthew.ogurick@klgates.com
Attention: Clayton E. Parker, Esq./Matthew Ogurick, Esq.

or at such other address, e-mail address and/or facsimile number and/or to the attention of such other person as the recipient party has specified by written notice given to each other party at least one (1) Business Day prior to the effectiveness of such change. Written confirmation of receipt (A) given by the recipient of such notice, consent or other communication, (B) mechanically or electronically generated by the sender's facsimile machine containing the time, date, and recipient facsimile number, (C) electronically generated by the sender's electronic mail containing the time, date and recipient email address or (D) provided by a nationally recognized overnight delivery service, shall be rebuttable evidence of receipt in accordance with clause (i), (ii), (iii) or (iv) above, respectively. Any party to this Agreement may give any notice or other communication hereunder using any other means (including messenger service, ordinary mail or electronic mail), but no such notice or other communication shall be deemed to have been duly given unless it actually is received by the party for whom it is intended.

(b) No Waiver No failure or delay in the exercise of any power, right or privilege hereunder shall operate as a waiver thereof, nor shall any single or partial exercise of any such power, right or privilege preclude other or further exercise thereof or of any other

right, power or privilege.

(c) Governing Law. All questions concerning the construction, validity, enforcement and interpretation of this Agreement shall be governed by the internal laws of the State of New York, without giving effect to any choice of law or conflict of law provision or rule (whether of the State of New York or any other jurisdictions) that would cause the application of the laws of any jurisdictions other than the State of New York. Each party hereby irrevocably submits to the exclusive jurisdiction of the state and federal courts sitting in the Borough of Manhattan, in the State of New York for the adjudication of any dispute hereunder or in connection herewith or with any transaction contemplated hereby or discussed herein, and hereby irrevocably waives, and agrees not to assert in any suit, action or proceeding, any claim that it is not personally subject to the jurisdiction of any such court, that such suit, action or proceeding is brought in an inconvenient forum or that the venue of such suit, action or proceeding is improper. Each party hereby irrevocably waives personal service of process and consents to process being served in any such suit, action or proceeding by mailing a copy thereof to such party at the address for such notices to it under this Agreement and agrees that such service shall constitute good and sufficient service of process and notice thereof. Nothing contained herein shall be deemed to limit in any way any right to serve process in any manner permitted by law. If any provision of this Agreement shall be invalid or unenforceable in any jurisdiction, such invalidity or unenforceability shall not affect the validity or enforceability of the remainder of this Agreement in that jurisdiction or the validity or enforceability of any provision of this Agreement in any other jurisdiction. **EACH PARTY HEREBY IRREVOCABLY WAIVES ANY RIGHT IT MAY HAVE, AND AGREES NOT TO REQUEST, A JURY TRIAL FOR THE ADJUDICATION OF ANY DISPUTE HEREUNDER OR IN CONNECTION HEREWITH OR ARISING OUT OF THIS AGREEMENT OR ANY TRANSACTION CONTEMPLATED HEREBY.**

(d) Integration. This Agreement, the Purchase Agreement and the other Transaction Documents constitute the entire understanding among the parties hereto with respect to the subject matter hereof and thereof. There are no restrictions, promises, warranties or undertakings, other than those set forth or referred to herein and therein. This Agreement, the Purchase Agreement and the other Transaction Documents supersede all other prior oral or written agreements between the Investor, the Company, their affiliates and persons acting on their behalf with respect to the subject matter hereof and thereof.

(e) No Third Party Benefits. Subject to the requirements of Section 8, this Agreement shall inure to the benefit of and be binding upon the permitted successors and assigns of each of the parties hereto.

(f) Headings. The headings in this Agreement are for convenience of reference and shall not form part of, or affect the interpretation of, this Agreement.

(g) Counterparts. This Agreement may be executed in two or more identical counterparts, all of which shall be considered one and the same agreement and shall become effective when counterparts have been signed by each party and delivered to the other party; provided that a facsimile or pdf (or other electronic reproduction of a) signature shall be considered due execution and shall be binding upon the signatory thereto with the same force and effect as if the signature were an original, not a facsimile or pdf (or other electronic reproduction of a) signature.

(h) Each party shall do and perform, or cause to be done and performed, all such further acts and things, and shall execute and deliver all such other agreements, certificates, instruments and documents as the other party may reasonably request in order to carry out the intent and accomplish the purposes of this Agreement and the consummation of the transactions contemplated hereby.

(i) The language used in this Agreement will be deemed to be the language chosen by the parties to express their mutual intent and no rules of strict construction will be applied against any party.

(j) This Agreement is intended for the benefit of the parties hereto and their respective permitted successors and assigns, and is not for the benefit of, nor may any provision hereof be enforced by, any other Person.

* * * * *

IN WITNESS WHEREOF, the parties have caused this Registration Rights Agreement to be duly executed as of day and year first above written.

THE COMPANY:

GENOCEA BIOSCIENCES, INC.

By: /s/ Diantha Duvall

Name: Diantha Duvall

Title: Chief Financial Officer

INVESTOR:

LINCOLN PARK CAPITAL FUND, LLC
BY: LINCOLN PARK CAPITAL, LLC
BY:

By: /s/ Joshua Scheinfeld
Name: Joshua Scheinfeld
Title: President

EXHIBIT A

**Information About The Investor Furnished To The Company By The Investor
Expressly For Use In Connection With Each Registration Statement and Prospectus**

Information With Respect to Lincoln Park Capital

Immediately prior to the date of the Purchase Agreement, Lincoln Park Capital Fund, LLC, beneficially owned 125,482 shares of Common Stock and warrants to purchase 62,500 shares of Common Stock. Josh Scheinfeld and Jonathan Cope, the Managing Members of Lincoln Park Capital, LLC, the manager of Lincoln Park Capital Fund, LLC, are deemed to be beneficial owners of all of the Common Stock owned by Lincoln Park Capital Fund, LLC. Messrs. Cope and Scheinfeld have shared voting and investment power over the shares being offered under the prospectus supplement filed with the SEC in connection with the transactions contemplated under the Purchase Agreement. Lincoln Park Capital, LLC is not a licensed broker dealer or an affiliate of a licensed broker dealer.

October 24, 2019

Genocea Biosciences, Inc.
Cambridge Discovery Park
100 Acorn Park Drive, 5th Floor
Cambridge, MA 02140

Re: Registration Statement on Form S-3 (No. 333-225086)

Ladies and Gentlemen:

This opinion is furnished to you in connection with the above-referenced registration statement (the "Registration Statement"), the base prospectus dated June 5, 2018 (the "Base Prospectus") and the prospectus supplement dated October 24, 2019 (collectively with the Base Prospectus, the "Prospectus"). The Prospectus relates to the offering by Genocea Biosciences, Inc. (the "Company") of up to \$30,000,000.00 of shares (the "Shares") of the Company's common stock, par value \$0.001 per share (the "Common Stock"). We understand that the Shares are to be offered and sold in the manner described in the Prospectus.

We have acted as counsel for the Company in connection with the issuance of the Shares. For purposes of this opinion, we have examined and relied upon such documents, records, certificates and other instruments as we have deemed necessary. The opinions expressed below are limited to the Delaware General Corporation Law.

Based upon and subject to the foregoing, we are of the opinion that the Shares have been duly authorized and, when issued and paid for as described in the Prospectus, will be validly issued, fully paid and non-assessable.

We hereby consent to your filing this opinion as an exhibit to a Current Report on Form 8-K to be incorporated by reference in the Registration Statement and to the use of our name under the caption "Legal Matters" in the Prospectus contained therein. Our consent shall not be deemed an admission that we are experts whose consent is required under Section 7 of the Securities Act of 1933, as amended, or the rules and regulations of the Securities and Exchange Commission thereunder.

Very truly yours,

/s/ Ropes & Gray LLP
Ropes & Gray LLP

PURCHASE AGREEMENT

THIS PURCHASE AGREEMENT (the “Agreement”), dated as of October 23, 2019 (the “Execution Date”), is entered into by and between **GENOCEA BIOSCIENCES, INC.**, a Delaware corporation (the “Company”), and **LINCOLN PARK CAPITAL FUND, LLC**, an Illinois limited liability company (the “Investor”). Capitalized terms used herein and not otherwise defined herein are defined in Section 1 hereof.

WHEREAS:

Subject to the terms and conditions set forth in this Agreement, the Company wishes to sell to the Investor, and the Investor wishes to buy from the Company, up to Thirty Million Dollars (\$30,000,000.00) (the “Commitment Amount”) of the Company’s common stock, par value \$0.001 per share (the “Common Stock”). The shares of Common Stock to be purchased hereunder (including, without limitation, the Initial Purchase Shares (as defined herein)) are referred to herein as the “Purchase Shares”.

NOW THEREFORE, in consideration of the mutual covenants contained in this Agreement, and for other good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, the Company and the Investor hereby agree as follows:

1. CERTAIN DEFINITIONS.

For purposes of this Agreement, the following terms shall have the following meanings:

(a) “Accelerated Purchase Date” means, with respect to any Accelerated Purchase (as defined below) made pursuant to Section 2(c) hereof, the Business Day immediately following the applicable Purchase Date with respect to the corresponding Regular Purchase referred to in clause (i) of the second sentence of Section 2(c) hereof.

(b) “Accelerated Purchase Floor Price” means \$1.00, which shall be appropriately adjusted for any reorganization, recapitalization, non-cash dividend, stock split or other similar transaction and, effective upon the consummation of any such reorganization, recapitalization, non-cash dividend, stock split or other similar transaction, the Accelerated Purchase Floor Price shall mean the lower of (i) the adjusted price and (ii) \$1.00.

(c) “Accelerated Purchase Minimum Price Threshold” means, with respect to any Accelerated Purchase made pursuant to Section 2(c) hereof, the minimum per share price threshold set forth in the applicable Accelerated Purchase Notice.

(d) “Accelerated Purchase Notice” means, with respect to an Accelerated Purchase made pursuant to Section 2(c) hereof, an irrevocable written notice from the Company to the Investor directing the Investor to purchase the number of Purchase Shares specified by the Company therein as the Accelerated Purchase Share Amount to be purchased by the Investor (such specified Accelerated Purchase Share Amount subject to adjustment in accordance with Section 2(c) hereof as necessary to give effect to the Purchase Share amount limitations applicable to such Accelerated Purchase Share Amount as set forth in this Agreement) at the applicable Accelerated Purchase Price on the Accelerated Purchase Date for such Accelerated Purchase in accordance with this Agreement.

(e) “Accelerated Purchase Price” means, with respect to an Accelerated Purchase made pursuant to Section 2(c) hereof, the lower of (i) ninety-seven percent (97%) of the VWAP for the period beginning at 9:30:01 a.m., Eastern time, on the applicable Accelerated Purchase Date, or such other time publicly announced by the Principal Market as the official open (or commencement) of trading on the Principal Market on such applicable Accelerated Purchase Date (the “Accelerated Purchase Commencement Time”), and ending at the earliest of (A) 4:00:00 p.m., Eastern time, on such applicable Accelerated Purchase Date, or such other time publicly announced by the Principal Market as the official close of trading on the Principal Market on such applicable Accelerated Purchase Date, (B) such time, from and after the Accelerated Purchase Commencement Time for such Accelerated Purchase, that the total number (or volume) of shares of Common Stock traded on the Principal Market has exceeded the applicable Accelerated Purchase Share Volume Maximum, and (C) such time, from and after the Accelerated Purchase Commencement Time for such Accelerated Purchase, that the Sale Price has fallen below the applicable Accelerated Purchase Minimum Price Threshold (such earliest of (i)(A), (i)(B) and (i)(C) above, the “Accelerated Purchase Termination Time”), and (ii) the Closing Sale Price of the Common Stock on such applicable Accelerated Purchase Date (to be appropriately adjusted for any reorganization, recapitalization, non-cash dividend, stock split, reverse stock split or other similar transaction).

(f) “Accelerated Purchase Share Amount” means, with respect to an Accelerated Purchase made pursuant to Section 2(c) hereof, the number of Purchase Shares directed by the Company to be purchased by the Investor in an Accelerated Purchase Notice, which number of Purchase Shares shall not exceed the lesser of (i) 300% of the number of Purchase Shares directed by the Company to be purchased by the Investor pursuant to the corresponding Regular Purchase Notice for the corresponding Regular Purchase referred to in clause (i) of the second sentence of Section 2(c) hereof (subject to the Purchase Share limitations contained in Section 2(c) hereof) and (ii) an amount equal to (A) the Accelerated Purchase Share Percentage multiplied by (B) the total number (or volume) of shares of Common Stock traded on the Principal Market during the period on the applicable Accelerated Purchase Date beginning at the Accelerated Purchase Commencement Time for such Accelerated Purchase and ending at the Accelerated Purchase Termination Time for such Accelerated Purchase.

(g) “Accelerated Purchase Share Percentage” means, with respect to an Accelerated Purchase made pursuant to Section 2(c) hereof, thirty percent (30%).

(h) “Accelerated Purchase Share Volume Maximum” means, with respect to an Accelerated Purchase made pursuant to Section 2(c) hereof, a number of shares of Common Stock equal to (i) the number of Purchase Shares specified by the Company in the applicable Accelerated Purchase Notice as the Accelerated Purchase Share Amount to be purchased by the Investor in such Accelerated Purchase, divided by (ii) the Accelerated Purchase Share Percentage (to be appropriately adjusted for any reorganization, recapitalization, non-cash

dividend, stock split, reverse stock split or other similar transaction).

(i) “Additional Accelerated Purchase Date” means, with respect to an Additional Accelerated Purchase made pursuant to Section 2(d) hereof, the Business Day (i) that is the Accelerated Purchase Date with respect to the corresponding Accelerated Purchase referred to in Section 2(d) hereof and (ii) on which the Investor receives, prior to 1:00 p.m., Eastern time, on such Business Day, a valid Additional Accelerated Purchase Notice for such Additional Accelerated Purchase in accordance with this Agreement.

(j) “Additional Accelerated Purchase Minimum Price Threshold” means, with respect to an Additional Accelerated Purchase made pursuant to Section 2(d) hereof, the minimum per share price threshold set forth in the applicable Additional Accelerated Purchase Notice.

(k) “Additional Accelerated Purchase Notice” means, with respect to an Additional Accelerated Purchase made pursuant to Section 2(d) hereof, an irrevocable written notice from the Company to the Investor directing the Investor to purchase the number of Purchase Shares specified by the Company therein as the Additional Accelerated Purchase Share Amount to be purchased by the Investor (such specified Additional Accelerated Purchase Share Amount subject to adjustment in accordance with Section 2(d) hereof as necessary to give effect to the Purchase Share amount limitations applicable to such Additional Accelerated Purchase Share Amount as set forth in this Agreement) at the applicable Additional Accelerated Purchase Price on the applicable Additional Accelerated Purchase Date for such Additional Accelerated Purchase.

(l) “Additional Accelerated Purchase Price” means, with respect to an Additional Accelerated Purchase made pursuant to Section 2(d) hereof, the lower of (i) ninety-seven percent (97%) of the VWAP for the period on the applicable Additional Accelerated Purchase Date, beginning at the latest of (A) the applicable Accelerated Purchase Termination Time with respect to the corresponding Accelerated Purchase referred to in Section 2(c) hereof on such Additional Accelerated Purchase Date, (B) the applicable Additional Accelerated Purchase Termination Time with respect to the most recently completed prior Additional Accelerated Purchase on such Additional Accelerated Purchase Date, as applicable, and (C) the time at which all Purchase Shares subject to all prior Accelerated Purchases and Additional Accelerated Purchases (as applicable), including, without limitation, those that have been effected on the same Business Day as the applicable Additional Accelerated Purchase Date with respect to which the applicable Additional Accelerated Purchase relates, have theretofore been received by the Investor as DWAC Shares in accordance with this Agreement (such latest of (i)(A), (i)(B) and (i)(C) above, the “Additional Accelerated Purchase Commencement Time”), and ending at the earliest of (X) 4:00 p.m., Eastern time, on such Additional Accelerated Purchase Date, or such other time publicly announced by the Principal Market as the official close of trading on the Principal Market on such Additional Accelerated Purchase Date, (Y) such time, from and after the Additional Accelerated Purchase Commencement Time for such Additional Accelerated Purchase, that the total number (or volume) of shares of Common Stock traded on the Principal Market has exceeded the applicable Additional Accelerated Purchase Share Volume Maximum, and (Z) such time, from and after the Additional Accelerated Purchase Commencement Time for such Additional Accelerated Purchase, that the Sale Price has fallen below the applicable Additional Accelerated Purchase Minimum Price Threshold (if any) (such earliest of (i)(X), (i)(Y) and (i)(Z) above, the “Additional Accelerated Purchase Termination Time”), and (ii) the Closing Sale Price of the Common Stock on such Additional Accelerated Purchase Date (to be appropriately adjusted for any reorganization, recapitalization, non-cash dividend, stock split, reverse stock split or other similar transaction).

(m) “Additional Accelerated Purchase Share Amount” means, with respect to an Additional Accelerated Purchase made pursuant to Section 2(d) hereof, the number of Purchase Shares directed by the Company to be purchased by the Investor on an Additional Accelerated Purchase Notice, which number of Purchase Shares shall not exceed the lesser of (i) 300% of the number of Purchase Shares directed by the Company to be purchased by the Investor pursuant to the corresponding Regular Purchase Notice for the corresponding Regular Purchase referred to in Section 2(d) hereof (subject to the Purchase Share limitations contained in Section 2(b) hereof) and (ii) an amount equal to (A) the Additional Accelerated Purchase Share Percentage multiplied by (B) the total number (or volume) of shares of Common Stock traded on the Principal Market during the period on the applicable Additional Accelerated Purchase Date beginning at the Additional Accelerated Purchase Commencement Time for such Additional Accelerated Purchase and ending at the Additional Accelerated Purchase Termination Time for such Additional Accelerated Purchase.

(n) “Additional Accelerated Purchase Share Percentage” means, with respect to an Additional Accelerated Purchase made pursuant to Section 2(d) hereof, thirty percent (30%).

(o) “Additional Accelerated Purchase Share Volume Maximum” means, with respect to an Additional Accelerated Purchase made pursuant to Section 2(d) hereof, a number of shares of Common Stock equal to (i) the number of Purchase Shares specified by the Company in the applicable Additional Accelerated Purchase Notice as the Additional Accelerated Purchase Share Amount to be purchased by the Investor in such Additional Accelerated Purchase, divided by (ii) the Additional Accelerated Purchase Share Percentage (to be appropriately adjusted for any reorganization, recapitalization, non-cash dividend, stock split, reverse stock split or other similar transaction)

(p) “Alternate Adjusted Regular Purchase Share Limit” means, with respect to a Regular Purchase made pursuant to Section 2(b) hereof, the maximum number of Purchase Shares which, taking into account the applicable per share Purchase Price therefor calculated in accordance with this Agreement, would enable the Company to deliver to the Investor, on the applicable Purchase Date for such Regular Purchase, a Regular Purchase Notice for a Purchase Amount equal to, or as closely approximating without exceeding, One Hundred Fifty Thousand Dollars (\$150,000).

(q) “Available Amount” means, initially, Thirty Million Dollars (\$30,000,000.00) in the aggregate, which amount shall be reduced by the Purchase Amount each time the Investor purchases shares of Common Stock pursuant to Section 2 hereof.

(r) “Average Price” means a price per Purchase Share (rounded to the nearest tenth of a cent) equal to the quotient obtained by dividing (i) the aggregate gross purchase price paid by the Investor for all Purchase Shares purchased pursuant to this Agreement, by (ii) the aggregate number of Purchase Shares issued pursuant to this Agreement.

(s) “Bankruptcy Law” means Title 11, U.S. Code, or any similar federal or state law for the relief of debtors.

(t) “Base Prospectus” means the Company’s final base prospectus, dated June 5, 2018, a preliminary form of which is included in the Registration Statement, including the documents incorporated by reference therein, or any final prospectus in a registration statement filed after the date hereof to cover the sales of the Securities.

(u) “Business Day” means any day on which the Principal Market is open for trading, including any day on which the Principal Market is open for trading for a period of time less than the customary time.

(v) “Common Stock Equivalents” means any securities of the Company or its Subsidiaries which entitle the holder thereof to acquire at any time Common Stock, including, without limitation, any debt, preferred stock, rights, options, warrants or other instrument that is at any time convertible into or exercisable or exchangeable for, or otherwise entitles the holder thereof to receive, Common Stock.

(w) “Closing Sale Price” means, for any security as of any date, the last closing sale price for such security on the Principal Market as reported by the Principal Market.

(x) “Confidential Information” means any information disclosed by either party to the other party, either directly or indirectly, in writing, orally or by inspection of tangible objects (including, without limitation, documents, prototypes, samples, plant and equipment), which is designated as “Confidential,” “Proprietary” or some similar designation. Information communicated orally shall be considered Confidential Information if such information is confirmed in writing as being Confidential Information within ten (10) Business Days after the initial disclosure. Confidential Information may also include information disclosed to a disclosing party by third parties. Confidential Information shall not, however, include any information which (i) was publicly known and made generally available in the public domain prior to the time of disclosure by the disclosing party; (ii) becomes publicly known and made generally available after disclosure by the disclosing party to the receiving party, other than as a result of no action or inaction of the receiving party; (iii) is already in the possession of the receiving party on a non-confidential basis at the time of disclosure by the disclosing party as shown by the receiving party’s files and records immediately prior to the time of disclosure; (iv) is obtained by the receiving party from a third party without a breach of such third party’s obligations of confidentiality; (v) is independently developed by the receiving party without use of or reference to the disclosing party’s Confidential Information, as shown by documents and other competent evidence in the receiving party’s possession; or (vi) is required by law to be disclosed by the receiving party, provided that the receiving party gives the disclosing party prompt written notice of such requirement prior to such disclosure and assistance in obtaining an order protecting the information from public disclosure.

(y) “Custodian” means any receiver, trustee, assignee, liquidator or similar official under any Bankruptcy Law.

(z) “DTC” means The Depository Trust Company, or any successor performing substantially the same function for the Company.

(aa) “DWAC Shares” means shares of Common Stock that are (i) issued in electronic form, (ii) freely tradable and transferable and without restriction on resale and (iii) timely credited by the Company to the Investor’s or its designee’s specified Deposit/Withdrawal at Custodian (DWAC) account with DTC under its Fast Automated Securities Transfer (FAST) Program, or any similar program hereafter adopted by DTC performing substantially the same function.

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

(ac) Reserved.

(ad) “Fully Adjusted Regular Purchase Share Limit” means, with respect to any reorganization, recapitalization, non-cash dividend, stock split or other similar transaction from and after the date of this Agreement, the Regular Purchase Share Limit (as defined in Section 2(b) hereof) in effect on the applicable date of determination, after giving effect to the full proportionate adjustment thereto made pursuant to Section 2(b) hereof for or in respect of such reorganization, recapitalization, non-cash dividend, stock split or other similar transaction.

(ae) “Initial Prospectus Supplement” means the prospectus supplement of the Company relating to the Securities, including the accompanying Base Prospectus, to be prepared and filed by the Company with the U.S. Securities and Exchange Commission (the “SEC”) pursuant to Rule 424(b) under the Securities Act and in accordance with Section 5(a) hereof, together with all documents and information incorporated therein by reference.

(af) “Material Adverse Effect” means any material adverse effect on (i) the enforceability of any Transaction Document, (ii) the results of operations, assets, business or financial condition of the Company and its Subsidiaries, taken as a whole, other than any material adverse effect that resulted primarily from (A) any change in the United States or foreign economies or securities or financial markets in general that does not have a disproportionate effect on the Company and its Subsidiaries, taken as a whole, (B) any change that generally affects the industry in which the Company and its Subsidiaries operate that does not have a disproportionate effect on the Company and its Subsidiaries, taken as a whole, (C) any change arising in connection with earthquakes, hostilities, acts of war, sabotage or terrorism or military actions or any escalation or material worsening of any such hostilities, acts of war, sabotage or terrorism or military actions existing as of the date hereof, (D) any action taken by the Investor, its affiliates or its or their successors and assigns with respect to the transactions contemplated by this Agreement, (E) the effect of any change in applicable laws or accounting rules that does not have a disproportionate effect on the Company and its Subsidiaries, taken as a whole, or (F) any change resulting from compliance with terms of this Agreement or the consummation of the transactions contemplated by this Agreement, or (iii) the Company’s ability to perform in any material respect on a timely basis its obligations under any Transaction Document to be performed as of the date of determination.

(ag) “Maturity Date” means the first day of the month immediately following the thirty (30) month anniversary of the Commencement Date.

(ah) “PEA Period” means the period commencing at 9:30 a.m., Eastern time, on the fifth (5th) Business Day immediately prior to

the filing of any post-effective amendment to the Registration Statement (as defined herein) or New Registration Statement (as such term is defined in the Registration Rights Agreement), and ending at 9:30 a.m., Eastern time, on the Business Day immediately following, the effective date of any post-effective amendment to the Registration Statement (as defined herein) or New Registration Statement (as such term is defined in the Registration Rights Agreement).

(ai) “Person” means an individual or entity including but not limited to any limited liability company, a partnership, a joint venture, a corporation, a trust, an unincorporated organization and a government or any department or agency thereof.

(aj) “Principal Market” means the Nasdaq Capital Market (or any nationally recognized successor thereto); provided, however, that in the event the Company’s Common Stock is ever listed or traded on the Nasdaq Global Market, the Nasdaq Global Select Market, the New York Stock Exchange, the NYSE American, the NYSE Arca, the OTC Bulletin Board, or the OTCQX or OTCQB operated by the OTC Markets Group, Inc. (or any nationally recognized successor to any of the foregoing), then the “Principal Market” shall mean such other market or exchange on which the Company’s Common Stock is then listed or traded.

(ak) “Prospectus” means the Base Prospectus, as supplemented by any Prospectus Supplement (including the Initial Prospectus Supplement), including the documents and information incorporated by reference therein.

(al) “Prospectus Supplement” means any prospectus supplement to the Base Prospectus (including the Initial Prospectus Supplement) filed with the SEC pursuant to Rule 424(b) under the Securities Act in connection with the transactions contemplated by this Agreement, including the documents and information incorporated by reference therein.

(am) “Purchase Amount” means, with respect to any Regular Purchase, any Accelerated Purchase or any Additional Accelerated Purchase made hereunder, as applicable, the portion of the Available Amount to be purchased by the Investor pursuant to Section 2 hereof.

(an) “Purchase Date” means, with respect to a Regular Purchase made pursuant to Section 2(b) hereof, the Business Day on which the Investor receives by 5:00 p.m., Eastern time, on such Business Day, a valid Regular Purchase Notice for such Regular Purchase in accordance with this Agreement.

(ao) “Purchase Price” means, with respect to any Regular Purchase made pursuant to Section 2(b) hereof, the lower of: (i) the lowest Sale Price of the Common Stock on the applicable Purchase Date for such Regular Purchase and (ii) the arithmetic average of the three (3) lowest Closing Sale Prices for the Common Stock during the ten (10) consecutive Business Days ending on the Business Day immediately preceding such Purchase Date for such Regular Purchase (in each case, to be appropriately adjusted for any reorganization, recapitalization, non-cash dividend, stock split or other similar transaction that occurs on or after the date of this Agreement).

(ap) “Registration Period” has the meaning set forth in the Registration Rights Agreement.

(aq) “Registration Rights Agreement” means that certain Registration Rights Agreement, of even date herewith between the Company and the Investor.

(ar) “Registration Statement” has the meaning set forth in the Registration Rights Agreement.

(as) “Regular Purchase Notice” means, with respect to any Regular Purchase pursuant to Section 2(b) hereof, an irrevocable written notice from the Company to the Investor directing the Investor to buy such applicable amount of Purchase Shares at the applicable Purchase Price as specified by the Company therein on the applicable Purchase Date for such Regular Purchase.

(at) “Sale Price” means any trade price for the shares of Common Stock on the Principal Market as reported by the Principal Market.

(au) “SEC” means the U.S. Securities and Exchange Commission.

(av) “Securities” means, collectively, the Purchase Shares and the Commitment Shares (as defined below).

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

(ax) “Subsidiary” means any Person the Company wholly-owns or controls, or in which the Company, directly or indirectly, owns a majority of the voting stock or similar voting interest, in each case that would be disclosable pursuant to Item 601(b)(21) of Regulation S-K promulgated under the Securities Act.

(ay) “Transaction Documents” means, collectively, this Agreement and the schedules and exhibits hereto, the Registration Rights Agreement and the schedules and exhibits thereto, and each of the other agreements, documents, certificates and instruments entered into or furnished by the parties hereto in connection with the transactions contemplated hereby and thereby.

(az) “Transfer Agent” means Computershare Trust Company N.A., or such other Person who is then serving as the transfer agent for the Company in respect of the Common Stock.

(ba) “VWAP” means with respect to the Initial Purchase (as defined below), an Accelerated Purchase Date and an Additional Accelerated Purchase Date, as applicable, the volume weighted average price of the Common Stock on the Principal Market, as reported on the Principal Market.

2. PURCHASE OF COMMON STOCK.

Subject to the terms and conditions set forth in this Agreement, the Company has the right, but not the obligation, to sell to the Investor, in the Company's sole and absolute discretion, and the Investor has the obligation to purchase from the Company, Purchase Shares as follows:

(a) Initial Purchase. Upon the satisfaction of the conditions set forth in Sections 7 and 8 hereof (the "Commencement") and the date of satisfaction of such conditions the "Commencement Date"), the Investor shall purchase 966,370 Purchase Shares at \$2.587 per share (such purchase the "Initial Purchase" and such Purchase Shares, the "Initial Purchase Shares"). Upon issuance as provided herein, the Investor shall pay to the Company the price for the Initial Purchase Shares via wire transfer of immediately available funds on the Commencement Date pursuant to Section 2(e). Thereafter, the purchase and sale of the Purchase Shares hereunder shall occur from time to time upon written notices by the Company to the Investor on the terms and conditions as set forth herein.

(b) Commencement of Regular Sales of Common Stock. Beginning one (1) Business Day following the Commencement Date and thereafter, the Company shall have the right, but not the obligation, to direct the Investor, by its delivery to the Investor of a Regular Purchase Notice from time to time, to purchase up to One Hundred Thousand (100,000) Purchase Shares, subject to adjustment as set forth below in this Section 2(b) (such maximum number of Purchase Shares, as may be adjusted from time to time, the "Regular Purchase Share Limit"), at the Purchase Price on the Purchase Date (each such purchase a "Regular Purchase"); provided, however, that the Regular Purchase Share Limit shall be increased to: (i) One Hundred Fifty Thousand (150,000) Purchase Shares, if the Closing Sale Price of the Common Stock on the applicable Purchase Date is not below \$4.50; and (ii) Two Hundred Thousand (200,000) Purchase Shares, if the Closing Sale Price of the Common Stock on the applicable Purchase Date is not below \$6.00 (all of which share and dollar amounts shall be appropriately adjusted for any reorganization, recapitalization, non-cash dividend, stock split or other similar transaction; provided that if, after giving effect to the full proportionate adjustment to the Regular Purchase Share Limit therefor, the Fully Adjusted Regular Purchase Share Limit then in effect would preclude the Company from delivering to the Investor a Regular Purchase Notice hereunder for a Purchase Amount (calculated by multiplying (X) the number of Purchase Shares equal to the Fully Adjusted Regular Purchase Share Limit, by (Y) the Purchase Price per Purchase Share covered by such Regular Purchase Notice on the applicable Purchase Date therefor) equal to or greater than One Hundred Fifty Thousand Dollars (\$150,000), the Regular Purchase Share Limit for such Regular Purchase Notice shall not be fully adjusted to equal the applicable Fully Adjusted Regular Purchase Share Limit, but rather the Regular Purchase Share Limit for such Regular Purchase Notice shall be adjusted to equal the applicable Alternate Adjusted Regular Purchase Share Limit as of the applicable Purchase Date for such Regular Purchase Notice; and provided, further, however, that the Investor's committed obligation under any single Regular Purchase, other than any Regular Purchase with respect to which an Alternate Adjusted Regular Purchase Share Limit shall apply, shall not exceed Two Million Dollars (\$2,000,000) and provided, further, however, that the parties may mutually agree to increase the Regular Purchase Share Limit during a Business Day. If the Company delivers any Regular Purchase Notice for a Purchase Amount in excess of the limitations contained in the immediately preceding sentence, such Regular Purchase Notice shall be void *ab initio* to the extent of the amount by which the number of Purchase Shares set forth in such Regular Purchase Notice exceeds the number of Purchase Shares which the Company is permitted to include in such Regular Purchase Notice in accordance herewith, and the Investor shall have no obligation to purchase such excess Purchase Shares in respect of such Regular Purchase Notice; provided, however, that the Investor shall remain obligated to purchase the number of Purchase Shares which the Company is permitted to include in such Regular Purchase Notice. The Company may deliver Regular Purchase Notices to the Investor as often as every Business Day, so long as the Company has not failed to deliver Purchase Shares for all prior Regular Purchases, Accelerated Purchases and Additional Accelerated Purchases, including, without limitation, those that have been effected on the same Business Day as the applicable Purchase Date, have theretofore been received by the Investor as DWAC Shares in accordance with this Agreement. Notwithstanding the foregoing, the Company shall not deliver a Regular Purchase Notice to the Investor during the PEA Period.

(c) Accelerated Purchases. Subject to the terms and conditions of this Agreement, beginning one (1) Business Day following the Commencement Date, in addition to purchases of Purchase Shares as described in Section 2(b) above, the Company shall also have the right, but not the obligation, to direct the Investor, by its delivery to the Investor of an Accelerated Purchase Notice from time to time in accordance with this Agreement, to purchase the applicable Accelerated Purchase Share Amount at the Accelerated Purchase Price on the Accelerated Purchase Date therefor in accordance with this Agreement (each such purchase, an "Accelerated Purchase"). The Company may deliver an Accelerated Purchase Notice to the Investor only on a Purchase Date on which (i) the Company also properly submitted a Regular Purchase Notice providing for a Regular Purchase of a number of Purchase Shares not less than the Regular Purchase Share Limit then in effect on such Purchase Date in accordance with this Agreement (including, without limitation, giving effect to any automatic increase to the Regular Purchase Share Limit as a result of the Closing Sale Price of the Common Stock exceeding certain thresholds set forth in Section 2(b) above on such Purchase Date and any other adjustments to the Regular Purchase Share Limit, in each case pursuant to Section 2(b) above), (ii) if all Purchase Shares subject to all prior Regular Purchases, Accelerated Purchases and Additional Accelerated Purchases, including, without limitation, those that have been effected on the same Business Day as the applicable Accelerated Purchase Date with respect to which the applicable Accelerated Purchase relates, have theretofore been received by the Investor as DWAC Shares in accordance with this Agreement and (iii) the Closing Sale Price of the Common Stock is not less than the Accelerated Purchase Floor Price. If the Company delivers any Accelerated Purchase Notice directing the Investor to purchase an amount of Purchase Shares that exceeds the Accelerated Purchase Share Amount that the Company is then permitted to include in such Accelerated Purchase Notice, such Accelerated Purchase Notice shall be void *ab initio* to the extent of the amount by which the number of Purchase Shares set forth in such Accelerated Purchase Notice exceeds the Accelerated Purchase Share Amount that the Company is then permitted to include in such Accelerated Purchase Notice (which shall be confirmed in an Accelerated Purchase Confirmation), and the Investor shall have no obligation to purchase such excess Purchase Shares in respect of such Accelerated Purchase Notice; provided, however, that the Investor shall remain obligated to purchase the Accelerated Purchase Share Amount which the Company is permitted to include in such Accelerated Purchase Notice; and provided, further, however, that the parties may mutually agree to increase the Accelerated Purchase Share Amount applicable to any Accelerated Purchase, and all of the Purchase Shares subject to such increased Accelerated Purchase shall be purchased by the Investor at the Accelerated Purchase Price for such increased Accelerated Purchase in accordance with this Agreement. Within one (1) Business Day after completion of each Accelerated Purchase Date for an Accelerated Purchase, the Investor will provide to the Company a written confirmation of such Accelerated Purchase setting forth the applicable Accelerated Purchase Share Amount and Accelerated Purchase Price for such Accelerated Purchase (each, an "Accelerated Purchase Confirmation"). Notwithstanding the foregoing, the Company shall not deliver any Accelerated Purchase Notices

during the PEA Period.

(d) Additional Accelerated Purchases. Subject to the terms and conditions of this Agreement, beginning two (2) Business Days following the Commencement Date and thereafter, in addition to purchases of Purchase Shares as described in Section 2(b) and Section 2(c) above, the Company shall also have the right, but not the obligation, to direct the Investor, by its timely delivery to the Investor of an Additional Accelerated Purchase Notice on an Additional Accelerated Purchase Date in accordance with this Agreement, to purchase the applicable Additional Accelerated Purchase Share Amount at the applicable Additional Accelerated Purchase Price therefor in accordance with this Agreement (each such purchase, an “Additional Accelerated Purchase”). The Company may deliver multiple Additional Accelerated Purchase Notices to the Investor on an Additional Accelerated Purchase Date; provided, however, that the Company may deliver an Additional Accelerated Purchase Notice to the Investor only (i) on a Business Day that is also the Accelerated Purchase Date for an Accelerated Purchase with respect to which the Company properly submitted to the Investor an Accelerated Purchase Notice in accordance with this Agreement on the applicable Purchase Date for a Regular Purchase of a number of Purchase Shares not less than the Regular Purchase Share Limit then in effect in accordance with this Agreement (including, without limitation, giving effect to any automatic increase to the Regular Purchase Share Limit as a result of the Closing Sale Price of the Common Stock exceeding certain thresholds set forth in Section 2(b) above on such Purchase Date and any other adjustments to the Regular Purchase Share Limit, in each case pursuant to Section 2(b) above) and (ii) if all Purchase Shares subject to all prior Regular Purchases, Accelerated Purchases and Additional Accelerated Purchases, including, without limitation, those that have been effected on the same Business Day as the applicable Additional Accelerated Purchase Date with respect to which the applicable Additional Accelerated Purchase relates, have theretofore been received by the Investor as DWAC Shares in accordance with this Agreement. If the Company delivers any Additional Accelerated Purchase Notice directing the Investor to purchase an amount of Purchase Shares that exceeds the Additional Accelerated Purchase Share Amount that the Company is then permitted to include in such Additional Accelerated Purchase Notice in accordance with the terms of this Agreement, such Additional Accelerated Purchase Notice shall be void *ab initio* to the extent of the amount by which the number of Purchase Shares set forth in such Additional Accelerated Purchase Notice exceeds the Additional Accelerated Purchase Share Amount that the Company is then permitted to include in such Additional Accelerated Purchase Notice in accordance with the terms of this Agreement (which shall be confirmed in an Additional Accelerated Purchase Confirmation (defined below)), and the Investor shall have no obligation to purchase such excess Purchase Shares in respect of such Additional Accelerated Purchase Notice; provided, however, that the Investor shall remain obligated to purchase the Additional Accelerated Purchase Share Amount which the Company is permitted to include in such Additional Accelerated Purchase Notice; and provided, further, however, that the parties may mutually agree to increase the Additional Accelerated Purchase Share Amount applicable to any Additional Accelerated Purchase, and all of the Purchase Shares subject to such increased Additional Accelerated Purchase shall be purchased by the Investor at the Additional Accelerated Purchase Price for such increased Additional Accelerated Purchase in accordance with this Agreement. Within one (1) Business Day after completion of each Additional Accelerated Purchase Date, the Investor will provide to the Company a written confirmation of each Additional Accelerated Purchase on such Additional Accelerated Purchase Date setting forth the applicable Additional Accelerated Purchase Share Amount and Additional Accelerated Purchase Price for each such Additional Accelerated Purchase on such Additional Accelerated Purchase Date (each, an “Additional Accelerated Purchase Confirmation”). Notwithstanding the foregoing, the Company shall not deliver any Additional Accelerated Purchase Notices during the PEA Period.

(e) Payment for Purchase Shares. The Investor shall pay to the Company the price for the Initial Purchase Shares pursuant to Section 2(a) via wire transfer of immediately available funds on the same Business Day that the Investor receives the Initial Purchase Shares as DWAC Shares, if such Initial Purchase Shares are so received by the Investor before 1:00 p.m., Eastern time, or, if such Initial Purchase Shares are so received by the Investor after 1:00 p.m., Eastern time, the next Business Day. For each Regular Purchase, the Investor shall pay to the Company an amount equal to the Purchase Amount with respect to such Regular Purchase as full payment for such Purchase Shares via wire transfer of immediately available funds on the same Business Day that the Investor receives such Purchase Shares, if such Purchase Shares are received by the Investor before 1:00 p.m., Eastern time, or, if such Purchase Shares are received by the Investor after 1:00 p.m., Eastern time, the next Business Day. For each Accelerated Purchase and each Additional Accelerated Purchase, the Investor shall pay to the Company an amount equal to the Purchase Amount with respect to such Accelerated Purchase and Additional Accelerated Purchase, respectively, as full payment for such Purchase Shares via wire transfer of immediately available funds on the second Business Day following the date that the Investor receives such Purchase Shares. If the Company or the Transfer Agent shall fail for any reason or for no reason to electronically transfer any Purchase Shares as DWAC Shares submitted by the Investor or its agent in respect of the Initial Purchase, or with respect to any Regular Purchase, Accelerated Purchase or Additional Accelerated Purchase (as applicable) within two (2) Business Days following the receipt by the Company of the price for the Initial Purchase Shares pursuant to Section 2(a), Purchase Price, Accelerated Purchase Price or Additional Accelerated Purchase Price, respectively, therefor in compliance with this Section 2(e), and if on or after such Business Day the Investor purchases (in an open market transaction or otherwise) shares of Common Stock to deliver in satisfaction of a sale by the Investor of such Purchase Shares that the Investor anticipated receiving from the Company in respect of such Initial Purchase, Regular Purchase, Accelerated Purchase or Additional Accelerated Purchase (as applicable), then the Company shall, within two (2) Business Days after the Investor’s request, either (i) pay cash to the Investor in an amount equal to the Investor’s total purchase price (including customary brokerage commissions, if any) for the shares of Common Stock so purchased (the “Cover Price”), at which point the Company’s obligation to deliver such Purchase Shares as DWAC Shares shall terminate, or (ii) promptly honor its obligation to deliver to the Investor such Purchase Shares as DWAC Shares and pay cash to the Investor in an amount equal to the excess (if any) of the Cover Price over the total Purchase Amount paid by the Investor pursuant to this Agreement for all of the Purchase Shares to be purchased by the Investor in connection with such purchases. The Company shall not issue any fraction of a share of Common Stock upon the Initial Purchase or any Regular Purchase, Accelerated Purchase or Additional Accelerated Purchase. If the issuance would result in the issuance of a fraction of a share of Common Stock, the Company shall round such fraction of a share of Common Stock up or down to the nearest whole share. All payments made under this Agreement shall be made in lawful money of the United States of America or wire transfer of immediately available funds to such account as the Company may from time to time designate by written notice in accordance with the provisions of this

Agreement. Whenever any amount expressed to be due by the terms of this Agreement is due on any day that is not a Business Day, the same shall instead be due on the next succeeding day that is a Business Day.

(f) Compliance with Principal Market Rules.

(i) Exchange Cap. Subject to Section 2(f)(ii) below, the Company shall not issue or sell any shares of Common Stock pursuant to this Agreement, and the Investor shall not purchase or acquire any shares of Common Stock pursuant to this Agreement, to the extent that after giving effect thereto, the aggregate number of shares of Common Stock that would be issued pursuant to this Agreement and the transactions contemplated hereby would be equal to or greater than 5,227,323 shares of Common Stock, representing 19.99% of the shares of Common Stock outstanding on the date of this Agreement (which number of shares shall be reduced, on a share-for-share basis, by the number of shares of Common Stock issued or issuable pursuant to any transaction or series of transactions that may be aggregated with the transactions contemplated by this Agreement under applicable rules of the Nasdaq Capital Market or any other Principal Market on which the Common Stock may be listed or quoted) (the “Exchange Cap”), unless and until the Company elects to solicit stockholder approval of the issuance of Common Stock as contemplated by this Agreement and the stockholders of the Company have in fact approved such issuance in accordance with the applicable rules and regulations of the Nasdaq Capital Market, any other Principal Market on which the Common Stock may be listed or quoted, and the Company’s Certificate of Incorporation, in effect as of the Execution Date (the “Certificate of Incorporation”), and the Company’s Amended and Restated Bylaws, in effect as of the Execution Date (the “Bylaws”). For the avoidance of doubt, the Company may, but shall be under no obligation to, request its stockholders to approve the issuance of Common Stock as contemplated by this Agreement; provided, that if stockholder approval is not obtained in accordance with this Section 2(f)(i), the Exchange Cap shall be applicable for all purposes of this Agreement and the transactions contemplated hereby at all times during the term of this Agreement (except as set forth in Section 2(f)(ii) below).

(ii) At-Market Transaction. Notwithstanding Section 2(f)(i) above and subject to the prior approval of the Nasdaq Capital Market or any other Principal Market on which the Common Stock may be listed or quoted (to the extent required), the Exchange Cap shall not be applicable for any purposes of this Agreement and the transactions contemplated hereby, solely to the extent that (and only for so long as) the Average Price shall equal or exceed the Base Price and in accordance with any other applicable rules of the Nasdaq Capital Market or any other Principal Market on which the Common Stock may be listed or quoted (it being hereby acknowledged and agreed that the Exchange Cap shall be applicable for all purposes of this Agreement and the transactions contemplated hereby at all other times during the term of this Agreement, unless the stockholder approval referred to in Section 2(f)(i) is obtained). “Base Price” means a price per Purchase Share equal to the sum of (i) the Signing Market Price and (ii) \$0.1533 (subject to adjustment for any reorganization, recapitalization, non-cash dividend, stock split, reverse stock split or other similar transaction that occurs on or after the date of this Agreement). “Signing Market Price” means \$2.61, representing the lower of (i) the Nasdaq Official Closing Price of the Common Stock as reported on the Nasdaq Capital Market immediately preceding the date of this Agreement or (ii) the average of the Nasdaq Official Closing Prices of the Common Stock as reported on The Nasdaq Capital Market for the five (5) Business Days immediately preceding the signing of this Agreement.

(iii) General. The Company shall not issue any Securities pursuant to this Agreement if such issuance would reasonably be expected to result in (A) a violation of the Securities Act or (B) a breach of the rules and regulations of the Principal Market. Furthermore, the Company agrees that it shall not issue any Securities pursuant to this Agreement if, at the time of such issuance (Y) the effectiveness of the Registration Statement registering the Securities has lapsed for any reason (including, without limitation, the issuance of a stop order or similar order) or (Z) the Registration Statement is unavailable for the sale by the Company to the Investor (or the resale by the Investor, as the case may be) of any or all of the Securities to be issued to the Investor under the Transaction Documents. The provisions of this Section 2(f) shall be implemented in a manner otherwise than in strict conformity with the terms hereof only if necessary to ensure compliance with the Securities Act and the rules and regulations of the Principal Market.

(g) Beneficial Ownership Limitation. Notwithstanding anything to the contrary contained in this Agreement, the Company shall not issue or sell, and the Investor shall not purchase or acquire, any Common Stock under this Agreement which, when aggregated with all other shares of Common Stock then beneficially owned by the Investor and its affiliates (as calculated pursuant to Section 13(d) of the Exchange Act and Rule 13d-3 promulgated thereunder) would result in the beneficial ownership by the Investor and its affiliates of more than 9.99% of the then issued and outstanding Common Stock (the “Beneficial Ownership Limitation”); provided that, if such Beneficial Ownership Limitation is reached due, in whole or in part, to purchases of Common Stock by the Investor other than from the Company, the Investor shall dispose of such shares purchased other than from the Company to the extent necessary to permit the Company to issue Common Stock to the Investor pursuant to this Agreement. Upon the written or oral request of the Investor, the Company shall promptly (but not later than 24 hours) confirm orally or in writing to the Investor the amount of Common Stock then outstanding. The Investor and the Company shall each cooperate in good faith in the determinations required hereby and the application hereof. The Investor’s written certification to the Company of the applicability of the Beneficial Ownership Limitation, and the resulting effect thereof hereunder at any time, shall be conclusive absent manifest error.

3. INVESTOR'S REPRESENTATIONS AND WARRANTIES.

The Investor represents and warrants to the Company that as of the Execution Date and as of the Commencement Date:

(a) Organization, Authority. Investor is an entity duly organized, validly existing and in good standing under the laws of the jurisdiction of its organization, with the requisite power and authority to enter into and to consummate the transactions contemplated by this Agreement and otherwise to carry out its obligations hereunder and thereunder.

(b) Accredited Investor Status. The Investor is an “accredited investor” as that term is defined in Rule 501(a)(3) of Regulation D promulgated under the Securities Act.

(c) Information. The Investor understands that its investment in the Securities involves a high degree of risk. The Investor (i) is able to bear the economic risk of an investment in the Securities including a total loss thereof, (ii) has such knowledge and experience in financial and business matters that it is capable of evaluating the merits and risks of the proposed investment in the Securities and (iii) has had an opportunity to ask questions of and receive answers from the officers of the Company concerning the financial condition and business of the Company and others matters related to an investment in the Securities. Neither such inquiries nor any other due diligence investigations conducted by the Investor or its representatives shall modify, amend or affect the Investor's right to rely on the Company's representations and warranties contained in Section 4 below. The Investor has sought such accounting, legal and tax advice as it has considered necessary to make an informed investment decision with respect to its acquisition of the Securities.

(d) No Governmental Review. The Investor understands that no federal, state or any other government or governmental agency has passed on or made any recommendation or endorsement of the Securities or the fairness or suitability of an investment in the Securities nor have such authorities passed upon or endorsed the merits of the offering of the Securities.

(e) Validity; Enforcement. This Agreement has been duly and validly authorized, executed and delivered on behalf of the Investor and is a valid and binding agreement of the Investor enforceable against the Investor in accordance with its terms, subject as to enforceability to general principles of equity and to applicable bankruptcy, insolvency, reorganization, moratorium, liquidation and other similar laws relating to, or affecting generally, the enforcement of applicable creditors' rights and remedies.

(f) Residency. The Investor's principal place of business is in the State of Illinois.

(g) No Short Selling. The Investor represents and warrants to the Company that at no time prior to the date of this Agreement has any of the Investor, its agents, representatives or affiliates engaged in or effected, in any manner whatsoever, directly or indirectly, any (i) “short sale” (as such term is defined in Rule 200 of Regulation SHO of the Exchange Act) of the Common Stock or (ii) hedging transaction, which establishes a net short position with respect to the Common Stock.

(h) Certain Transactions and Confidentiality. Other than consummating the transactions contemplated hereunder, Investor has not, nor has any Person acting on behalf of or pursuant to any understanding with Investor, directly or indirectly executed any purchases or sales of the securities of the Company during the period commencing as of the time that Investor first received a term sheet (written or oral) as of the Company or any other Person representing the Company setting forth the material terms of the transactions contemplated hereunder and ending immediately prior to the execution hereof. Other than to other Persons party to this Agreement, Investor has maintained the confidentiality of all disclosures made to it in connection with this transaction (including the existence and terms of this transaction)

4. REPRESENTATIONS AND WARRANTIES OF THE COMPANY.

The Company represents and warrants to the Investor that as of the Execution Date and as of the Commencement Date:

(a) Organization and Qualification. The Company and each of its Subsidiaries is an entity duly incorporated or otherwise organized, validly existing and in good standing under the laws of the jurisdiction of its incorporation or organization, with the requisite corporate power and authority to own and use its properties and assets and to carry on its business as currently conducted. Neither the Company nor any of its Subsidiaries is in violation or default of any of the provisions of its respective certificate or articles of incorporation, bylaws or other organizational or charter documents. Each of the Company and its Subsidiaries is duly qualified to conduct business and is in good standing as a foreign corporation or other entity in each jurisdiction in which the nature of the business conducted or property owned by it makes such qualification necessary, except where the failure to be so qualified or in good standing, as the case may be, would not have or reasonably be expected to result in a Material Adverse Effect and no proceeding has been instituted in any such jurisdiction revoking, limiting or curtailing or seeking to revoke, limit or curtail such power and authority or qualification. The Company has no Subsidiaries except as set forth on Exhibit 21.1 to the Company's Annual Report on Form 10-K for the year ended December 31, 2018 filed with the SEC on February 28, 2019.

(b) Authorization; Enforcement; Validity. (i) The Company has the requisite corporate power and authority to enter into and perform its obligations under this Agreement and each of the other Transaction Documents to which it is a party, and to issue the Securities in accordance with the terms hereof and thereof, (ii) the execution and delivery of the Transaction Documents by the Company to which it is a party and the consummation by it of the transactions contemplated hereby and thereby, including without limitation, the issuance of the Commitment Shares and subject to having sufficient authorized and unissued shares under the Company's certificate of incorporation, the reservation for issuance and issuance of the Purchase Shares issuable under this Agreement, have been duly authorized by the Board of Directors of the Company (the “Board of Directors”) and no further consent or authorization is required by the Company, its Board of Directors or its stockholders, (iii) this Agreement has been, and each other Transaction Document shall be on the Commencement Date, duly executed and delivered by the Company and (iv) this Agreement constitutes, and each other Transaction Document upon its execution on behalf of the Company, shall constitute, the valid and binding obligations of the Company enforceable against the Company in accordance with their terms, except as such enforceability may be limited by general principles of equity or applicable bankruptcy, insolvency,

reorganization, moratorium, liquidation or similar laws relating to, or affecting generally, the enforcement of creditors' rights and remedies. The Board of Directors has passed all applicable resolutions (the "Resolutions") to authorize this Agreement and the transactions contemplated hereby. The Resolutions are valid, in full force and effect and have not been modified or supplemented in any respect. The Company has delivered to the Investor a certified copy of the Resolutions passed by the Board of Directors. Except as set forth in this Agreement, no other approvals or consents of the Board of Directors, any authorized committee thereof, and/or stockholders is necessary under applicable laws, and the Certificate of Incorporation and Bylaws of the Company, to authorize the execution and delivery of this Agreement or any of the transactions contemplated hereby, including, but not limited to, the issuance of the Commitment Shares and the issuance of the Purchase Shares.

(c) Capitalization. As of the date hereof, the authorized capital stock of the Company is set forth in the SEC Documents (as defined below). Except as disclosed in the SEC Documents, (i) no shares of the Company's capital stock are subject to preemptive rights or any other similar rights or any liens or encumbrances suffered or permitted by the Company, (ii) there are no outstanding debt securities, (iii) there are no outstanding options, warrants, scrip, rights to subscribe to, calls or commitments of any character whatsoever relating to, or securities or rights convertible into, any shares of capital stock of the Company or any of its Subsidiaries, or contracts, commitments, understandings or arrangements by which the Company or any of its Subsidiaries is or may become bound to issue additional shares of capital stock of the Company or any of its Subsidiaries or options, warrants, scrip, rights to subscribe to, calls or commitments of any character whatsoever relating to, or securities or rights convertible into, any shares of capital stock of the Company or any of its Subsidiaries, (iv) there are no agreements or arrangements under which the Company or any of its Subsidiaries is obligated to register the sale of any of their securities under the Securities Act, (v) there are no outstanding securities or instruments of the Company or any of its Subsidiaries which contain any redemption or similar provisions, and there are no contracts, commitments, understandings or arrangements by which the Company or any of its Subsidiaries is or may become bound to redeem a security of the Company or any of its Subsidiaries, (vi) there are no securities or instruments containing anti-dilution or similar provisions that will be triggered by the issuance of the Securities as described in this Agreement and (vii) the Company does not have any stock appreciation rights or "phantom stock" plans or agreements or any similar plan or agreement. The Company has furnished to the Investor true and correct copies of (A) the Certificate of Incorporation, (B) the Bylaws, and (C) summaries of the material terms of all securities convertible into or exercisable for Common Stock, if any, and copies of any documents containing the material rights of the holders thereof in respect thereto, which in the case of this clause (C), are not disclosed in any SEC Document or filed as an exhibit thereto.

(d) Issuance of Securities. Upon issuance and payment thereof in accordance with the terms and conditions of this Agreement, the Purchase Shares shall be validly issued, fully paid and nonassessable and free from all taxes, liens, charges, restrictions, rights of first refusal and preemptive rights with respect to the issue thereof, with the holders being entitled to all rights accorded to a holder of Common Stock. Upon issuance in accordance with the terms and conditions of this Agreement, the Commitment Shares shall be validly issued, fully paid and nonassessable and free from all taxes, liens, charges, restrictions, rights of first refusal and preemptive rights with respect to the issue thereof, with the holders being entitled to all rights accorded to a holder of Common Stock. 5,500,000 shares of Common Stock (the "Reserve Amount") have been duly authorized and reserved for issuance upon purchase under this Agreement as Purchase Shares.

(e) No Conflicts. The execution, delivery and performance of the Transaction Documents by the Company and the consummation by the Company of the transactions contemplated hereby and thereby (including, without limitation, the reservation for issuance and issuance of the Purchase Shares and the Commitment Shares) will not (i) result in a violation of the Certificate of Incorporation, any Certificate of Designations, Preferences and Rights of any outstanding series of preferred stock of the Company or the Bylaws or (ii) conflict with, or constitute a default (or an event which with notice or lapse of time or both would become a default) under, or give to others any rights of termination, amendment, acceleration or cancellation of, any agreement, indenture or instrument to which the Company or any of its Subsidiaries is a party, or result in a violation of any law, rule, regulation, order, judgment or decree (including federal and state securities laws and regulations and the rules and regulations of the Principal Market applicable to the Company or any of its Subsidiaries) or by which any property or asset of the Company or any of its Subsidiaries is bound or affected, except in the case of conflicts, defaults, terminations, amendments, accelerations, cancellations and violations under clause (ii), which would not reasonably be expected to result in a Material Adverse Effect. Neither the Company nor any of its Subsidiaries is in violation of any term of or in default under its respective certificate or articles of incorporation, any certificate of designation, preferences and rights of any outstanding series of preferred stock, organizational charter or bylaws, respectively. Neither the Company nor any of its Subsidiaries is in violation of any term of or is in default under any material contract, agreement, mortgage, indebtedness, indenture, instrument, judgment, decree or order or any statute, rule or regulation applicable to the Company or its Subsidiaries, except for possible conflicts, defaults, terminations or amendments that would not reasonably be expected to have a Material Adverse Effect. The business of the Company and its Subsidiaries is not being conducted, and shall not be conducted, in violation of any law, ordinance or regulation of any governmental entity, except for possible violations, the sanctions for which either individually or in the aggregate would not reasonably be expected to have a Material Adverse Effect. Except as specifically contemplated by this Agreement and as required under the Securities Act or applicable state securities laws and the rules and regulations of the Principal Market, the Company is not required to obtain any consent, authorization or order of, or make any filing or registration with, any court or governmental agency or any regulatory or self-regulatory agency in order for it to execute, deliver or perform any of its obligations under or contemplated by the Transaction Documents in accordance with the terms hereof or thereof. Except as set forth elsewhere in this Agreement, all consents, authorizations, orders, filings and registrations which the Company is required to obtain pursuant to the preceding sentence shall be obtained or effected on or prior to the Commencement Date. Except as disclosed in the SEC Documents (as defined below), since one year prior to the date hereof, the Company has not received nor delivered any notices or correspondence from or to the Principal Market, other than notices with respect to listing of additional shares of Common Stock and other routine correspondence. Except as disclosed in the SEC Documents, the Principal Market has not commenced any delisting proceedings against the Company.

(f) SEC Documents; Financial Statements. The Company has filed all reports, schedules, forms, statements and other documents required to be filed by the Company with the SEC under the Securities Act and Exchange Act, including pursuant to Section 13(a) or 15(d) thereof, for the twelve months preceding the date of this Agreement (the foregoing materials, including the exhibits thereto and documents incorporated by reference therein together with each Prospectus, being collectively referred to herein as the “SEC Documents”) on a timely basis or has received a valid extension of such time of filing and has filed any such SEC Documents prior to the expiration of any such extension. As of their respective dates, the SEC Documents complied in all material respects with the requirements of the Securities Act and the Exchange Act, as applicable. None of the SEC Documents, when filed, contained any untrue statement of a material fact or omitted to state a material fact required to be stated therein or necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading. The financial statements of the Company included in the SEC Documents comply in all material respects with applicable accounting requirements and the rules and regulations of the SEC with respect thereto as in effect at the time of filing. Such financial statements have been prepared in accordance with United States generally accepted accounting principles applied on a consistent basis during the periods involved (“GAAP”), except as may be otherwise specified in such financial statements or the notes thereto and except that unaudited financial statements may not contain all footnotes required by GAAP, and fairly present in all material respects the financial position of the Company and its consolidated Subsidiaries as of and for the dates thereof and the results of operations and cash flows for the periods then ended, subject, in the case of unaudited statements, to normal, immaterial, year-end audit adjustments. Except as set forth in the SEC Documents, the Company has received no notices or correspondence from the SEC for the one year preceding the date hereof. The SEC has not commenced any enforcement proceedings against the Company or any of its Subsidiaries.

(g) Absence of Certain Changes. Except as disclosed in the SEC Documents, since December 31, 2018, there has been no material adverse change in the business, properties, operations, financial condition or results of operations of the Company or its Subsidiaries. The Company is not in violation or default of (i) any provision of the Certificate of Incorporation or Bylaws, (ii) the terms of any indenture, contract, lease, mortgage, deed of trust, note agreement, loan agreement or other agreement, obligation, condition, covenant or instrument to which it is a party or bound or to which its property is subject, or (iii) any statute, law, rule, regulation, judgment, order or decree of any court, regulatory body, administrative agency, governmental body, arbitrator or other authority having jurisdiction over the Company or any of its properties, which, in the case of clauses (ii) or (iii), would be reasonably expected to have a Material Adverse Effect. Except as described in the SEC Documents, no dispute between the Company and any third party exists or, to the knowledge of the Company, is threatened or imminent that would reasonably be expected to have a Material Adverse Effect. The Company has not taken any steps, and does not currently expect to take any steps, to seek protection pursuant to any Bankruptcy Law nor does the Company or any of its Subsidiaries have any knowledge or reason to believe that its creditors intend to initiate involuntary bankruptcy or insolvency proceedings. The Company is financially solvent and is generally able to pay its debts as they become due.

(h) Absence of Litigation. Except as disclosed in the SEC Documents, there is no action, suit, proceeding, inquiry or investigation before or by any court, public board, government agency, self-regulatory organization or body pending or, to the knowledge of the Company or any of its Subsidiaries, threatened against or affecting the Company, the Common Stock or any of the Company’s or its Subsidiaries’ officers or directors in their capacities as such, which would reasonably be expected to have a Material Adverse Effect.

(i) Acknowledgment Regarding Investor’s Status. The Company acknowledges and agrees that the Investor is acting solely in the capacity of arm’s length purchaser with respect to the Transaction Documents and the transactions contemplated hereby and thereby. The Company further acknowledges that the Investor is not acting as a financial advisor or fiduciary of the Company (or in any similar capacity) with respect to the Transaction Documents and the transactions contemplated hereby and thereby and any advice given by the Investor or any of its representatives or agents in connection with the Transaction Documents and the transactions contemplated hereby and thereby is merely incidental to the Investor’s purchase of the Securities. The Company further represents to the Investor that the Company’s decision to enter into the Transaction Documents has been based solely on the independent evaluation by the Company and its representatives and advisors.

(j) No Aggregated Offering. Neither the Company, nor any of its affiliates, nor any Person acting on its or their behalf has, directly or indirectly, made any offers or sales of any security or solicited any offers to buy any security, under circumstances that would cause this offering of the Securities to be aggregated with prior offerings by the Company in a manner that would require stockholder approval pursuant to the rules of the Principal Market on which any of the securities of the Company are listed or designated. The issuance and sale of the Securities hereunder does not contravene the rules and regulations of the Principal Market.

(k) Intellectual Property Rights. The Company and its Subsidiaries own or possess adequate rights or licenses to use all material trademarks, trade names, service marks, service mark registrations, service names, patents, patent rights, copyrights, inventions, licenses, approvals, governmental authorizations, trade secrets and rights necessary to conduct their respective businesses as now conducted. None of the Company’s material trademarks, trade names, service marks, service mark registrations, service names, patents, patent rights, copyrights, inventions, licenses, approvals, governmental authorizations, trade secrets or other intellectual property rights have expired or terminated, or, by the terms and conditions thereof, could expire or terminate within two years from the date of this Agreement. The Company and its Subsidiaries do not have any knowledge of any infringement by the Company or its Subsidiaries of any material trademark, trade name rights, patents, patent rights, copyrights, inventions, licenses, service names, service marks, service mark registrations, trade secret or other similar rights of others, or of any such development of similar or identical trade secrets or technical information by others, and there is no claim, action or proceeding being made or brought against, or to the Company’s knowledge, being threatened against, the Company or its

Subsidiaries regarding trademark, trade name, patents, patent rights, invention, copyright, license, service names, service marks, service mark registrations, trade secret or other infringement, which would reasonably be expected to have a Material Adverse Effect.

(l) Environmental Laws. The Company and its Subsidiaries (i) are in compliance with any and all applicable foreign, federal, state and local laws and regulations relating to the protection of human health and safety, the environment or hazardous or toxic substances or wastes, pollutants or contaminants (“Environmental Laws”), (ii) have received all permits, licenses or other approvals required of them under applicable Environmental Laws to conduct their respective businesses and (iii) are in compliance with all terms and conditions of any such permit, license or approval, except where, in each of the three foregoing clauses, the failure to so comply would not reasonably be expected to have, individually or in the aggregate, a Material Adverse Effect.

(m) Title. Except as set forth in the SEC Documents, the Company and its Subsidiaries have good and marketable title in fee simple to all real property owned by them and good and marketable title in all personal property owned by them that is material to the business of the Company and its Subsidiaries, in each case free and clear of all liens, encumbrances and defects (“Liens”) and, except for Liens as do not materially affect the value of such property and do not materially interfere with the use made and proposed to be made of such property by the Company and its Subsidiaries and Liens for the payment of federal, state or other taxes, the payment of which is neither delinquent nor subject to penalties. Any real property and facilities held under lease by the Company and its Subsidiaries are held by them under valid, subsisting and enforceable leases with which the Company and its Subsidiaries are in compliance with such exceptions as are not material and do not interfere with the use made and proposed to be made of such property and buildings by the Company and its Subsidiaries.

(n) Insurance. The Company and each of its Subsidiaries are insured by insurers of recognized financial responsibility against such losses and risks and in such amounts as management of the Company believes to be prudent and customary in the businesses in which the Company and its Subsidiaries are engaged. Neither the Company nor any such Subsidiary has been refused any insurance coverage sought or applied for and neither the Company nor any such Subsidiary has any reason to believe that it will not be able to renew its existing insurance coverage as and when such coverage expires or to obtain similar coverage from similar insurers as may be necessary to continue its business at a cost that would not materially and adversely affect the condition, financial or otherwise, or the earnings, business or operations of the Company and its Subsidiaries, taken as a whole.

(o) Regulatory Permits. The Company and its Subsidiaries possess all material certificates, authorizations and permits issued by the appropriate federal, state, local or foreign regulatory authorities necessary to conduct their respective businesses, and neither the Company nor any such Subsidiary has received any notice of proceedings relating to the revocation or modification of any such certificate, authorization or permit, which would reasonably be expected to result in a Material Adverse Effect.

(p) Tax Status. Except as set forth in the SEC Documents, the Company and each of its Subsidiaries has made or filed all federal and state income and all other material tax returns, reports and declarations required by any jurisdiction to which it is subject (unless and only to the extent that the Company and each of its Subsidiaries has set aside on its books provisions reasonably adequate for the payment of all unpaid and unreported taxes) and has paid all taxes and other governmental assessments and charges that are material in amount, shown or determined to be due on such returns, reports and declarations, except those being contested in good faith and has set aside on its books provision reasonably adequate for the payment of all taxes for periods subsequent to the periods to which such returns, reports or declarations apply, which would reasonably be expected to result in a Material Adverse Effect. There are no unpaid taxes in any material amount claimed to be due by the taxing authority of any jurisdiction, and the officers of the Company know of no basis for any such claim, which would reasonably be expected to result in a Material Adverse Effect.

(q) Transactions With Affiliates. Except as set forth in the SEC Documents, none of the officers or directors of the Company and, to the knowledge of the Company, none of the Company’s stockholders, the officers or directors of any stockholder of the Company, or any family member or affiliate of any of the foregoing, has either directly or indirectly any interest in, or is a party to, any transaction that would be required to be disclosed as a related party transaction pursuant to Rule 404 of Regulation S-K promulgated under the Securities Act.

(r) Application of Takeover Protections. The Company and its Board of Directors have taken or will take prior to the Commencement Date all necessary action, if any, in order to render inapplicable any control share acquisition, business combination, poison pill (including any distribution under a rights agreement) or other similar anti-takeover provision under the Certificate of Incorporation or the laws of the state of its incorporation which is or could become applicable to the Investor as a result of the transactions contemplated by this Agreement, including, without limitation, the Company’s issuance of the Securities and the Investor’s ownership of the Securities.

(s) Disclosure. Except with respect to the material terms and conditions of the transactions contemplated by the Transaction Documents that will be timely publicly disclosed by the Company, the Company confirms that neither it nor any other Person acting on its behalf has provided the Investor or its agents or counsel with any information that it believes constitutes or may reasonably be considered to constitute material, non-public information which is not otherwise disclosed in the Registration Statement or the SEC Documents. The Company understands and confirms that the Investor will rely on the foregoing representation in effecting purchases and sales of securities of the Company. All of the disclosure furnished by or on behalf of the Company to the Investor regarding the Company, its business and the transactions contemplated hereby, including the disclosure schedules to this Agreement, is true and correct in all material respects and does not contain any untrue statement of a material fact or omit to state any material fact necessary in order to make the statements made therein, in light of the circumstances under which they were made, not misleading. The press releases disseminated by the Company during the twelve (12) months preceding the date of this Agreement that have not been superseded by a later disseminated public disclosure, including any SEC

Document, as of the date hereof did not contain any untrue statement of a material fact or omit to state a material fact required to be stated therein or necessary in order to make the statements therein, in light of the circumstances under which they were made not misleading (or, if amended or superseded by a later disseminated press release or other public disclosure, did not contain any untrue statement of a material fact or omit to state a material fact necessary in order to make the statements made, in light of the circumstances under which they were made, not misleading as so amended or superseded). The Company acknowledges and agrees that the Investor neither makes nor has made any representations or warranties with respect to the transactions contemplated hereby other than those specifically set forth in Section 3 hereof.

(t) Foreign Corrupt Practices; Money Laundering Laws; Sanctions. Neither the Company nor any of its Subsidiaries nor, to the knowledge of the Company, any director, officer, agent, employee or affiliate of the Company or any of its Subsidiaries is aware of or has taken any action, directly or indirectly, that would result in a violation by such persons of the Foreign Corrupt Practices Act of 1977, as amended, and the rules and regulations thereunder (the “FCPA”), including, without limitation, making use of the mails or any means or instrumentality of interstate commerce corruptly in furtherance of an offer, payment, promise to pay or authorization of the payment of any money, or other property, gift, promise to give, or authorization of the giving of anything of value to any “foreign official” (as such term is defined in the FCPA) or any foreign political party or official thereof or any candidate for foreign political office, in contravention of the FCPA; and the Company, the Subsidiaries and, to the knowledge of the Company, its affiliates have conducted their 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. The operations of the Company are and have been conducted at all times in compliance with applicable financial recordkeeping and reporting requirements and the money laundering statutes and 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 with respect to the Money Laundering Laws is pending or, to the knowledge of the Company, threatened. Neither the Company nor, to the knowledge of the Company, any director, officer, agent, employee or affiliate of the Company (i) is currently subject to any sanctions administered or imposed by the United States (including any administered or enforced by the Office of Foreign Assets Control of the U.S. Treasury Department (“OFAC”)) or (ii) will, directly or indirectly, use the proceeds of this offering, or lend, contribute or otherwise make available such proceeds to any subsidiary, joint venture partner or other person in any manner that will result in a violation of any economic sanctions imposed by the United States (including any administered or enforced by OFAC, the U.S. Department of State, or the Bureau of Industry and Security of the U.S. Department of Commerce), the United Nations Security Council, the European Union, or the United Kingdom (including sanctions administered or controlled by Her Majesty’s Treasury) (collectively, “Sanctions” and such persons, “Sanction Persons”) by, or would result in the imposition of Sanctions against, any person (including any person participating in the offering, whether as underwriter, advisor, investor or otherwise). Neither the Company nor, to the knowledge of the Company, any director, officer, agent, employee or affiliate of the Company, is a person that is, or is 50% or more owned or otherwise controlled by a person that is: (i) the subject of any Sanctions; or (ii) located, organized or resident in a country or territory that is, or whose government is, the subject of Sanctions that broadly prohibit dealings with that country or territory (currently, Cuba, Iran, North Korea, Syria and the Crimea Region of the Ukraine) (collectively, “Sanctioned Countries” and each, a “Sanctioned Country”). The Company has not engaged in any dealings or transactions with or for the benefit of a Sanctioned Person, or with or in a Sanctioned Country, in the preceding three years, nor does the Company have any plans to increase its dealings or transactions with Sanctioned Persons, or with or in Sanctioned Countries.

(u) Registration Statement. The Company has prepared and filed the Registration Statement with the SEC in accordance with the Securities Act. The Registration Statement was declared effective by order of the SEC on June 5, 2018. The Registration Statement is effective pursuant to the Securities Act and available for the issuance of the Securities thereunder, and the Company has not received any written notice that the SEC has issued or intends to issue a stop order or other similar order with respect to the Registration Statement or the Prospectus or that the SEC otherwise has (i) suspended or withdrawn the effectiveness of the Registration Statement or (ii) issued any order preventing or suspending the use of the Prospectus or any Prospectus Supplement, in either case, either temporarily or permanently or intends or has threatened in writing to do so. The “Plan of Distribution” section of the Prospectus permits the issuance of the Securities under the terms of this Agreement. At the time the Registration Statement and any amendments thereto became effective, at the date of this Agreement and at each deemed effective date thereof pursuant to Rule 430B(f)(2) of the Securities Act, the Registration Statement and any amendments thereto complied and will comply in all material respects with the requirements of the Securities Act and did not and will not contain any untrue statement of a material fact or omit to state any material fact required to be stated therein or necessary to make the statements therein not misleading; and the Base Prospectus and any Prospectus Supplement thereto, at the time such Base Prospectus or such Prospectus Supplement thereto was issued and on the Commencement Date, complied and will comply in all material respects with the requirements of the Securities Act and did not and will 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 light of the circumstances under which they were made, not misleading; provided that this representation and warranty does not apply to statements in or omissions from any Prospectus Supplement made in reliance upon and in conformity with information relating to the Investor furnished to the Company in writing by or on behalf of the Investor expressly for use therein. The Company meets all of the requirements for the use of a registration statement on Form S-3 pursuant to the Securities Act for the offering and sale of the Securities contemplated by this Agreement, and the SEC has not notified the Company of any objection to the use of the form of the Registration Statement pursuant to Rule 401(g)(1) of the Securities Act. The Company hereby confirms that the issuance of the Securities to the Investor pursuant to this Agreement would not result in non-compliance with the Securities Act or any of the General Instructions to Form S-3. The Registration Statement, as of its effective date, meets the requirements set forth in Rule 415(a)(1)(x) pursuant to the Securities Act. At the earliest time after the filing of the Registration Statement that the Company or another offering participant made a bona fide offer (within the meaning of Rule 164(h)(2) of the Securities Act) relating to any of the Securities, the Company was not, and as of the date of this Agreement the Company is not, an Ineligible Issuer (as defined in Rule 405 of the Securities Act). The Company has not distributed any

offering material in connection with the offering and sale of any of the Securities, and, until the Investor does not hold any of the Securities, shall not distribute any offering material in connection with the offering and sale of any of the Securities, to or by the Investor, in each case, other than the Registration Statement or any amendment thereto, the Prospectus or any Prospectus Supplement required pursuant to applicable law or the Transaction Documents. The Company has not made and agrees that unless it obtains the prior written consent of the Investor it will not make an offer relating to the Securities that would constitute a “free writing prospectus” as defined in Rule 405 under the Securities Act.

(v) DTC Eligibility. The Company, through the Transfer Agent, currently participates in the DTC Fast Automated Securities Transfer (FAST) Program and the Common Stock can be transferred electronically to third parties via the DTC Fast Automated Securities Transfer (FAST) Program.

(w) Accounting Controls; Sarbanes-Oxley. The Company maintains a system of internal accounting controls sufficient to provide reasonable assurance that (i) transactions are executed in accordance with management’s general or specific authorizations; (ii) transactions are recorded as necessary to permit preparation of financial statements in conformity with generally accepted accounting principles and to maintain asset accountability; (iii) access to assets is permitted only in accordance with management’s general or specific authorization; and (iv) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action is taken with respect to any differences. Except as disclosed in the SEC Documents, the Company’s internal controls over financial reporting are effective and the Company is not aware of any material weakness in its internal controls over financial reporting. The Company maintains “disclosure controls and procedures” (as such term is defined in Rule 13a-15(e) under the Exchange Act); such disclosure controls and procedures are effective. There is and has been no failure on the part of the Company and any of the Company’s directors or officers, in their capacities as such, to comply with any provision of the Sarbanes-Oxley Act of 2002, as amended, and the rules and regulations promulgated in connection therewith, including Section 402 relating to loans.

(x) Certain Fees. No brokerage or finder’s fees or commissions are or will be payable by the Company to any broker, financial advisor or consultant, finder, placement agent, investment banker, bank or other Person with respect to the transactions contemplated by the Transaction Documents. The Investor shall have no obligation with respect to any fees or with respect to any claims made by or on behalf of other Persons engaged by the Company for fees of a type contemplated in this Section 4(x) that may be due in connection with the transactions contemplated by the Transaction Documents.

(y) Investment Company. The Company is not, and immediately after receipt of payment for the Securities will not be, an “investment company” within the meaning of the Investment Company Act of 1940, as amended (the “Investment Company Act”).

(z) Listing and Maintenance Requirements. The Common Stock is registered pursuant to Section 12(b) of the Exchange Act, and the Company has taken no action designed to, or which to its knowledge is likely to have the effect of, terminating the registration of the Common Stock pursuant to the Exchange Act nor has the Company received any notification that the SEC is currently contemplating terminating such registration. Except as disclosed in the SEC Documents, the Company has not, in the twelve (12) months preceding the date hereof, received any notice from the Principal Market to the effect that the Company is not in compliance with the listing or maintenance requirements of the Principal Market.

(aa) Accountants. The Company’s accountants are set forth in the SEC Documents and, to the knowledge of the Company, such accountants are an independent registered public accounting firm as required by the Securities Act.

(bb) No Market Manipulation. The Company has not, and to its knowledge no Person acting on its behalf has, (i) taken, directly or indirectly, any action which is designed, or would be reasonably likely to cause or result in, the stabilization or manipulation of the price of any security of the Company to facilitate the sale or resale of any of the Securities, (ii) sold, bid for, purchased, or paid any compensation for soliciting purchases of, any of the Securities, or (iii) paid or agreed to pay to any Person any compensation for soliciting another to purchase any other securities of the Company..

(cc) Benefit Plans; Labor Matters. Each benefit and compensation plan, agreement, policy and arrangement that is maintained, administered or contributed to by the Company for current or former employees or directors of, or independent contractors with respect to, the Company has been maintained in compliance with its terms and the requirements of any applicable statutes, orders, rules and regulations and the Company has complied in all material respects with all applicable statutes, orders, rules and regulations in regard to such plans, agreements, policies and arrangements. Each stock option granted under any stock option plan of the Company (each, a “Stock Plan”) was granted with a per share exercise price no less than the market price per common share on the grant date of such option in accordance with the rules of the Principal Market, and no such grant involved any “back-dating,” “forward-dating” or similar practice with respect to the effective date of such grant; each such option (i) was granted in compliance in all material respects with applicable laws and with the applicable Stock Plan(s), (ii) was duly approved by the Board of Directors (or a duly authorized committee thereof) of the Company, and (iii) has been properly accounted for in the Company’s financial statements and disclosed, to the extent required, in the Company’s filings or submissions with the SEC, and the Principal Market. No labor problem or dispute with the employees of the Company exists or is threatened or imminent, and the Company is not aware of any existing or imminent labor disturbance by the employees of any of its principal suppliers or contractors, that would have a Material Adverse Effect.

(dd) Regulatory. Except as described in the SEC Documents, the Company and each of its Subsidiaries: (A) is and at all times has

been in material compliance with all applicable U.S. and foreign statutes, rules, regulations, or guidance applicable to Company and its Subsidiaries (“Applicable Laws”), except as would not, individually or in the aggregate, reasonably be expected to result in a Material Adverse Effect; (B) have not received any notice of adverse finding, warning letter, untitled letter or other correspondence or notice from the U.S. Food and Drug Administration or any other federal, state, or foreign governmental authority having authority over the Company (“Governmental Authority”) alleging or asserting noncompliance with any Applicable Laws or any licenses, certificates, approvals, clearances, authorizations, permits and supplements or amendments thereto required by any such Applicable Laws (“Authorizations”); (C) possess all material Authorizations and such material Authorizations are valid and in full force and effect and are not in violation of any term of any such material Authorizations; (D) have not received notice of any claim, action, suit, proceeding, hearing, enforcement, investigation, arbitration or other action from any Governmental Authority or third party alleging that any product operation or activity is in violation of any Applicable Laws or Authorizations and have no knowledge that any such Governmental Authority or third party is considering any such claim, litigation, arbitration, action, suit, investigation or proceeding; (E) have not received notice that any Governmental Authority has taken, is taking or intends to take action to limit, suspend, modify or revoke any Authorizations and the Company has no knowledge that any such Governmental Authority is considering such action; and (F) have filed, obtained, maintained or submitted all material reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments as required by any Applicable Laws or material Authorizations and that all such reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments were complete and correct in all material respects on the date filed (or were corrected or supplemented by a subsequent submission). To the Company's knowledge, the studies, tests and preclinical and clinical trials conducted by or on behalf of the Company were and, if still pending, are, in all material respects, being conducted in accordance with experimental protocols, procedures and controls pursuant to accepted professional scientific standards and all applicable laws, including, without limitation, the United States Federal Food, Drug and Cosmetic Act and the laws, rules and regulations of the Therapeutic Products Directorate, the European Medicines Agency, the European Commission's Enterprise Directorate General and the regulatory agencies within each Member State granting Marketing Authorization through the Mutual Recognition Procedure or any other federal, provincial, state, local or foreign governmental or quasi-governmental body exercising comparable authority; the descriptions of the results of such studies, tests and trials contained in the SEC Documents are accurate and complete in all material respects and fairly present the data derived from such studies, tests and trials; the descriptions in the SEC Documents of the results of such clinical trials are consistent in all material respects with such results and to the Company's knowledge there are no other studies or other clinical trials whose results are materially inconsistent with or otherwise materially call into question the results described or referred to in the SEC Documents; and the Company has not received any notices or correspondence from any Governmental Authority requiring the termination, suspension or material modification of any studies, tests or preclinical or clinical trials conducted by or on behalf of the Company or its Subsidiaries. The Company has concluded that it uses commercially reasonable efforts to review, from time to time, the progress and results of the studies, tests and preclinical and clinical trials and, based upon (i) the information provided to the Company by the third parties conducting such studies, tests, preclinical studies and clinical trials that are described in the SEC Documents and the Company's review of such information, and (ii) the Company's actual knowledge, the Company reasonably believes that the descriptions of the results of such studies, tests, preclinical studies and clinical trials are accurate and complete in all material respects.

(ee) No Disqualification Events. None of the Company, or to the knowledge of the Company, any affiliated issuer, any director, executive officer, other officer of the Company participating in the offering contemplated hereby, any beneficial owner of 20% or more of the Company's outstanding voting equity securities, calculated on the basis of voting power, nor any promoter (as that term is defined in Rule 405 under the Securities Act) connected with the Company in any capacity at the time of sale (each, an “Issuer Covered Person”) is subject to any of the “Bad Actor” disqualifications described in Rule 506(d)(1)(i) to (viii) under the Securities Act (a “Disqualification Event”), except for a Disqualification Event covered by Rule 506(d)(2) or (d)(3) under the Securities Act. The Company has exercised reasonable care to determine whether any Issuer Covered Person is subject to a Disqualification Event.

5. COVENANTS.

(a) Filing of Current Report and Registration Statement. The Company agrees that it shall, within the time required under the Exchange Act, file with the SEC a Current Report on Form 8-K relating to the transactions contemplated by, and describing the material terms and conditions of, the Transaction Documents (the “Current Report”). The Company further agrees that it shall, within the time required under Rule 424(b) under the Securities Act, file with the SEC the Initial Prospectus Supplement pursuant to Rule 424(b) under the Securities Act specifically relating to the transactions contemplated by, and describing the material terms and conditions of, the Transaction Documents, containing information previously omitted at the time of effectiveness of the Registration Statement in reliance on Rule 430B under the Securities Act, and disclosing all information relating to the transactions contemplated hereby required to be disclosed in the Registration Statement and the Prospectus as of the date of the Initial Prospectus Supplement, including, without limitation, information required to be disclosed in the section captioned “Plan of Distribution” in the Prospectus. The Investor acknowledges that it will be identified in the Initial Prospectus Supplement as an underwriter within the meaning of Section 2(a)(11) of the Securities Act. The Company shall permit the Investor to review and comment upon the Current Report and the Initial Prospectus Supplement at least two (2) Business Days prior to their filing with the SEC, the Company shall give due consideration to all such comments, and the Company shall not file the Current Report or the Initial Prospectus Supplement with the SEC in a form to which the Investor reasonably objects. The Investor shall use its reasonable best efforts to comment upon the Current Report and the Initial Prospectus Supplement within one (1) Business Day from the date the Investor receives the final pre-filing draft version thereof from the Company. The Investor shall furnish to the Company such information regarding itself, the Securities held by it and the intended method of distribution thereof, including any arrangement between the Investor and any other Person relating to the sale or distribution of the Securities, as shall be reasonably requested by the Company in connection with the preparation and filing of the Current Report and the Initial Prospectus Supplement, and shall otherwise cooperate with the Company as

reasonably requested by the Company in connection with the preparation and filing of the Current Report and the Initial Prospectus Supplement with the SEC.

(b) Blue Sky. The Company shall take all such action, if any, as is reasonably necessary in order to obtain an exemption for or to register or qualify (i) the issuance of the Commitment Shares and the sale of the Purchase Shares to the Investor under this Agreement and (ii) any subsequent resale of all Commitment Shares and all Purchase Shares by the Investor, in each case, under applicable securities or "Blue Sky" laws of the states of the United States in such states as is reasonably requested by the Investor during the Registration Period, and shall provide evidence of any such action so taken to the Investor.

(c) Listing/DTC. To the extent applicable, the Company shall promptly secure the listing of all of the Purchase Shares and Commitment Shares to be issued to the Investor hereunder on the Principal Market (subject to official notice of issuance) and upon each other national securities exchange or automated quotation system, if any, upon which the Common Stock is then listed, and shall use commercially reasonable efforts to maintain, so long as any shares of Common Stock shall be so listed, such listing of all such Securities from time to time issuable hereunder. The Company shall use commercially reasonable efforts to maintain the listing of the Common Stock on the Principal Market and shall comply in all respects with the Company's reporting, filing and other obligations under the bylaws or rules and regulations of the Principal Market. Neither the Company nor any of its Subsidiaries shall take any action that would reasonably be expected to result in the delisting or suspension of the Common Stock on the Principal Market. The Company shall promptly, and in no event later than the following Business Day, provide to the Investor copies of any notices it receives from the Principal Market regarding the continued eligibility of the Common Stock for listing on the Principal Market; provided, however, that the Company shall not be required to provide the Investor copies of any such notice that the Company reasonably believes constitutes material non-public information and the Company would not be required to publicly disclose such notice in any report or statement filed with the SEC and under the Exchange Act or the Securities Act. The Company shall pay all fees and expenses in connection with satisfying its obligations under this Section 5(c). The Company shall take all action necessary to ensure that its Common Stock can be transferred electronically as DWAC Shares.

(d) Prohibition of Short Sales and Hedging Transactions. The Investor agrees that, beginning on the date of this Agreement and ending on the date of termination of this Agreement as provided in Section 11, the Investor and its agents, representatives and affiliates shall not in any manner whatsoever enter into or effect, directly or indirectly, any (i) "short sale" (as such term is defined in Rule 200 of Regulation SHO of the Exchange Act) of the Common Stock or (ii) hedging transaction, which establishes a net short position with respect to the Common Stock.

(e) Issuance of Commitment Shares. In consideration for the Investor's execution and delivery of this Agreement, the Company shall cause the Transfer Agent to issue, on the Commencement Date, 289,966 shares of Common Stock (the "Commitment Shares") directly to the Investor and shall deliver to the Transfer Agent the Irrevocable Transfer Agent Instructions with respect to the issuance of the Commitment Shares. For the avoidance of doubt, all of the Commitment Shares shall be fully earned as of the Execution Date, whether or not any other Purchase Shares are purchased by the Investor under this Agreement and irrespective of any termination of this Agreement.

(f) Due Diligence; Non-Public Information. During the term of this Agreement, the Investor shall have the right, from time to time as the Investor may reasonably deem appropriate, to perform reasonable due diligence on the Company during normal business hours. The Company and its officers and employees shall provide information and reasonably cooperate with the Investor in connection with any reasonable request by the Investor related to the Investor's due diligence of the Company. Each party hereto agrees not to disclose any Confidential Information of the other party to any third party and shall not use the Confidential Information for any purpose other than in connection with, or in furtherance of, the transactions contemplated hereby. Each party hereto acknowledges that the Confidential Information shall remain the property of the disclosing party and agrees that it shall take all reasonable measures to protect the secrecy of any Confidential Information disclosed by the other party. The receiving party may disclose Confidential Information to the extent such information is required to be disclosed by law, regulation or order of a court of competent jurisdiction or regulatory authority, provided that the receiving party shall promptly notify the disclosing party when such requirement to disclose arises, and shall cooperate with the disclosing party so as to enable the disclosing party to: (i) seek an appropriate protective order; and (ii) make any applicable claim of confidentiality in respect of such Confidential Information; and provided, further, that the receiving party shall disclose Confidential Information only to the extent required by the protective order or other similar order, if such an order is obtained, and, if no such order is obtained, the receiving party shall disclose only the minimum amount of such Confidential Information required to be disclosed in order to comply with the applicable law, regulation or order. In addition, any such Confidential Information disclosed pursuant to this section shall continue to be deemed Confidential Information. Notwithstanding anything in this Agreement to the contrary, the Company and the Investor agree that neither the Company nor any other Person acting on its behalf shall provide the Investor or its agents or counsel with any information that constitutes or may reasonably be considered to constitute material, non-public information, unless a simultaneous public announcement thereof is made by the Company in the manner contemplated by Regulation FD. The Company shall not deliver to the Investor any Regular Purchase Notice or Accelerated Purchase Notice, and the Investor shall not be obligated to purchase any shares of Common Stock under this Agreement, during the continuation of any a breach of the foregoing covenant by the Company or any Person acting on its behalf (as determined in the reasonable good faith judgment of the Investor), in addition to any other remedy provided herein or in the other Transaction Documents, the Investor shall have the right to make a public disclosure, in the form of a press release, public advertisement or otherwise, of such material, non-public information without the prior approval by the Company; provided the Investor shall have first provided notice to the Company that it believes it has received information that constitutes material, non-public information, the Company shall have at least 24 hours to publicly disclose such material, non-public information prior to any such disclosure by the Investor, and the Company shall have failed to publicly disclose such material, non-public information within such time period. The Investor shall not

have any liability to the Company, any of its Subsidiaries, or any of their respective directors, officers, employees, stockholders or agents, for any such disclosure. The Company understands and confirms that the Investor shall be relying on the foregoing covenants in effecting transactions in securities of the Company.

(g) Purchase Records. The Investor and the Company shall each maintain records showing the remaining Available Amount at any given time and the dates and Purchase Amounts for each Regular Purchase, Accelerated Purchase and Additional Accelerated Purchase or shall use such other method, reasonably satisfactory to the Investor and the Company.

(h) Taxes. The Company shall pay any and all transfer, stamp or similar taxes that may be payable with respect to the issuance and delivery of any Common Stock to the Investor made under this Agreement.

(i) Effective Registration Statement; Current Prospectuses. The Company shall use its reasonable best efforts to keep the Registration Statement effective pursuant to Rule 415 promulgated under the Securities Act, and to keep the Registration Statement and the Prospectus current and available for issuances and sales of all of the Securities by the Company to the Investor, and for the resale by the Investor as prescribed by Registration Rights Agreement, the Company shall comply with all applicable federal, state and foreign securities laws in connection with the offer, issuance and sale of the Securities contemplated by the Transaction Documents. Without limiting the generality of the foregoing, neither the Company nor any of its officers, directors or affiliates will take, directly or indirectly, any action designed or intended to stabilize or manipulate the price of any security of the Company, or which would reasonably be expected to cause or result in, stabilization or manipulation of the price of any security of the Company.

(j) [Reserved]

(k) Stop Orders. The Company shall advise the Investor promptly (but in no event later than 24 hours) and shall confirm such advice in writing: (i) of the Company's receipt of notice of any request by the SEC for amendment of or a supplement to the Registration Statement, the Prospectus, any Prospectus Supplement or for any additional information; (ii) of the Company's receipt of notice of the issuance by the SEC of any stop order suspending the effectiveness of the Registration Statement or prohibiting or suspending the use of the Prospectus or any Prospectus Supplement, or of the Company's receipt of any notification of the suspension of qualification of the Securities for offering or sale in any jurisdiction or the initiation or contemplated initiation of any proceeding for such purpose; and (iii) of the Company becoming aware of the happening of any event, which makes any statement of a material fact made in the Registration Statement, the Prospectus or any Prospectus Supplement untrue or which requires the making of any additions to or changes to the statements then made in the Registration Statement, the Prospectus or any Prospectus Supplement in order to state a material fact required by the Securities Act to be stated therein or necessary in order to make the statements then made therein (in the case of the Prospectus or any Prospectus Supplement, in light of the circumstances under which they were made) not misleading, or of the necessity to amend the Registration Statement or supplement the Prospectus or any Prospectus Supplement to comply with the Securities Act or any other law. The Company shall not be required to disclose to the Investor the substance or specific reasons of any of the events set forth in clauses (i) through (iii) of the immediately preceding sentence, but rather, shall only be required to disclose that the event has occurred. The Company shall not deliver to the Investor any Regular Purchase Notice, Accelerated Purchase Notice or Additional Accelerated Purchase Notice, and the Investor shall not be obligated to purchase any shares of Common Stock under this Agreement, during the continuation or pendency of any of the foregoing events. If at any time the SEC shall issue any stop order suspending the effectiveness of the Registration Statement or prohibiting or suspending the use of the Prospectus or any Prospectus Supplement, the Company shall use its reasonable best efforts to obtain the withdrawal of such order at the earliest possible time. The Company shall furnish to the Investor, without charge, a copy of any correspondence from the SEC or the staff of the SEC to the Company or its representatives relating to the Registration Statement or the Prospectus, as the case may be.

(l) Amendments to Registration Statement; Prospectus Supplements. Except as provided in this Agreement and other than periodic and current reports required to be filed pursuant to the Exchange Act, the Company shall not file with the SEC any amendment to the Registration Statement or any supplement to the Base Prospectus that refers to the Investor, the Transaction Documents or the transactions contemplated thereby (including, without limitation, any Prospectus Supplement filed in connection with the transactions contemplated by the Transaction Documents), in each case with respect to which (a) the Investor shall not previously have been advised and afforded the opportunity to review and comment thereon at least two (2) Business Days prior to filing with the SEC, as the case may be, (b) the Company shall not have given due consideration to any comments thereon received from the Investor or its counsel, or (c) the Investor shall reasonably object, unless the Company reasonably has determined that it is necessary to amend the Registration Statement or make any supplement to the Prospectus to comply with the Securities Act or any other applicable law or regulation, in which case the Company shall promptly (but in no event later than 24 hours) so inform the Investor, the Investor shall be provided with a reasonable opportunity to review and comment upon any disclosure referring to the Investor, the Transaction Documents or the transactions contemplated thereby, as applicable, and the Company shall promptly furnish to the Investor a copy thereof. In addition, for so long as, in the reasonable opinion of counsel for the Investor, the Prospectus is required to be delivered in connection with any acquisition or sale of Securities by the Investor, the Company shall not file any Prospectus Supplement with respect to the Securities without furnishing to the Investor as many copies of such Prospectus Supplement, together with the Prospectus, as the Investor may reasonably request.

(m) Prospectus Delivery. The Company consents to the use of the Prospectus (and of each Prospectus Supplement thereto) in accordance with the provisions of the Securities Act and with the securities or "blue sky" laws of the jurisdictions in which the Securities may be sold by the Investor, in connection with the offering and sale of the Securities and for such period of time thereafter as the Prospectus is required by the Securities Act to be delivered in connection with sales of the Securities. The Company will make available to the Investor

upon request, and thereafter from time to time will furnish to the Investor, as many copies of the Prospectus (and each Prospectus Supplement thereto) as the Investor may reasonably request for the purposes contemplated by the Securities Act within the time during which the Prospectus is required by the Securities Act to be delivered in connection with sales of the Securities. If during such period of time any event shall occur that in the reasonable judgment of the Company and its counsel, or in the reasonable judgment of the Investor and its counsel, is required to be set forth in the Registration Statement, the Prospectus or any Prospectus Supplement or should be set forth therein in order to make the statements made therein (in the case of the Prospectus or any Prospectus Supplement, in light of the circumstances under which they were made) not misleading, or if in the reasonable judgment of the Company and its counsel, or in the reasonable judgment of the Investor and its counsel, it is otherwise necessary to amend the Registration Statement or supplement the Prospectus or any Prospectus Supplement to comply with the Securities Act or any other applicable law or regulation, the Company shall forthwith prepare and, subject to Section 5(l) above, file with the SEC an appropriate amendment to the Registration Statement or an appropriate Prospectus Supplement and in each case shall promptly furnish to the Investor, at the Company's expense, such amendment to the Registration Statement or such Prospectus Supplement, as applicable, as may be necessary to reflect any such change or to effect such compliance. The Company shall have no obligation to separately advise the Investor of, or deliver copies to the Investor of, the SEC Documents, all of which the Investor shall be deemed to have notice of.

(n) Use of Proceeds. The Company will use the net proceeds from the offering contemplated hereby as described in the Prospectuses in the section entitled "Use of Proceeds."

(o) Aggregation. From and after the date of this Agreement, neither the Company, nor any of its affiliates will, and the Company shall use its commercially reasonable efforts to ensure that no Person acting on their behalf will, directly or indirectly, make any offers or sales of any security or solicit any offers to buy any security, under circumstances that would cause this offering of the Securities by the Company to the Investor to be aggregated with other offerings by the Company in a manner that would require stockholder approval pursuant to the rules of the Principal Market on which any of the securities of the Company are listed or designated, unless stockholder approval is obtained before the closing of such subsequent transaction in accordance with the rules of such Principal Market.

(p) Other Transactions. During the term of this Agreement, the Company shall not enter into, announce or recommend to its stockholders any agreement, plan, arrangement or transaction in or of which the terms thereof would restrict, materially delay, conflict with or impair the ability or right of the Company to perform its obligations under the Transaction Documents, including, without limitation, the obligation of the Company to deliver the Purchase Shares and the Commitment Shares to the Investor in accordance with the terms of the Transaction Documents.

(q) Required Filings Relating to Purchases. To the extent required under the Securities Act or under interpretations by the SEC thereof, as promptly as practicable after the close of each of the Company's fiscal quarters (or on such other dates as required under the Securities Act or under interpretations by the SEC thereof), the Company shall prepare a Prospectus Supplement, which will set forth the number of Purchase Shares sold to the Investor during such quarterly period (or other relevant period), the purchase price for such Purchase Shares and the net proceeds received by the Company from such sales, and shall file such Prospectus Supplement with the SEC pursuant to Rule 424(b) under the Securities Act (and within the time periods required by Rule 424(b) and Rule 430B under the Securities Act). If any such quarterly Prospectus Supplement is not required to be filed under the Securities Act or under interpretations by the SEC thereof, the Company shall disclose the information referenced in the immediately preceding sentence in its annual report on Form 10-K or its quarterly report on Form 10-Q (as applicable) in respect of the quarterly period that ended immediately before the filing of such report in which sales of Purchase Shares were made to the Investor under this Agreement, and file such report with the SEC within the applicable time period required by the Exchange Act. The Company shall not file any Prospectus Supplement pursuant to this Section 5(q), and shall not file any report containing disclosure relating to such sales of Purchase Shares, unless a copy of such Prospectus Supplement or disclosure has been submitted to the Investor a reasonable period of time before the filing and the Investor has not reasonably objected thereto (it being acknowledged and agreed that the Company shall not submit any portion of any Form 10-K or Form 10-Q other than the specific disclosure relating to any sales of Purchase Shares). The Company shall also furnish copies of all such Prospectus Supplements to each exchange or market in the United States on which sales of the Purchase Shares may be made as may be required by the rules or regulations of such exchange or market, if applicable.

(r) Limitation on Variable Rate Transactions. From and after the later of (i) thirty (30) months from the date of this Agreement or (ii) the Maturity Date, the Company and its Subsidiaries shall be prohibited from effecting or entering into an agreement to effect any issuance by the Company or any of its Subsidiaries of Common Stock or Common Stock Equivalents (or a combination of units thereof) involving a Variable Rate Transaction, other than in connection with an Exempt Issuance (as defined below). The Investor shall be entitled to seek injunctive relief against the Company and its Subsidiaries to preclude any such issuance, which remedy shall be in addition to any right to collect damages, without the necessity of showing economic loss and without any bond or other security being required. "Variable Rate Transaction" means a transaction in which the Company (i) issues or sells any equity or debt securities that are convertible into, exchangeable or exercisable for, or include the right to receive additional shares of Common Stock or Common Stock Equivalents either (A) at a conversion price, exercise price, exchange rate or other price that is based upon and/or varies with the trading prices of or quotations for the Common Stock at any time after the initial issuance of such equity or debt securities (including, without limitation, pursuant to any "cashless exercise" provision), or (B) with a conversion, exercise or exchange price that is subject to being reset at some future date after the initial issuance of such equity or debt security or upon the occurrence of specified or contingent events directly or indirectly related to the business of the Company or the market for the Common Stock (including, without limitation, any "full ratchet" or "weighted average" anti-dilution provisions, but not including any standard anti-dilution protection for any reorganization, recapitalization, non-cash dividend, stock

split or other similar transaction), (ii) issues or sells any equity or debt securities, including without limitation, Common Stock or Common Stock Equivalents, either (A) at a price that is subject to being reset at some future date after the initial issuance of such debt or equity security or upon the occurrence of specified or contingent events directly or indirectly related to the business of the Company or the market for the Common Stock (other than standard anti-dilution protection for any reorganization, recapitalization, non-cash dividend, stock split or other similar transaction), or (B) that is subject to or contains any put, call, redemption, buy-back, price-reset or other similar provision or mechanism (including, without limitation, a “Black-Scholes” put or call right) that provides for the issuance of additional equity securities of the Company or the payment of cash by the Company, or (iii) enters into any agreement, including, but not limited to, an “equity line”, “at-the-market offering” that is not an Exempt Issuance or other continuous offering or similar offering of Common Stock or Common Stock Equivalents, whereby the Company may sell Common Stock or Common Stock Equivalents at a future determined price. “Exempt Issuance” means the issuance of (a) Common Stock, options or other equity incentive awards to employees, officers, directors or vendors of the Company pursuant to any equity incentive plan duly adopted for such purpose, by the Board of Directors or a majority of the members of a committee of directors established for such purpose, (b) any Securities issued to the Investor pursuant to this Agreement, (c) shares of Common Stock, Common Stock Equivalents or other securities issued to the Investor pursuant to any other existing or future contract, agreement or arrangement between the Company and the Investor, (d) shares of Common Stock, Common Stock Equivalents or other securities upon the exercise, exchange or conversion of any shares of Common Stock, Common Stock Equivalents or other securities held by the Investor at any time, (e) any securities issued upon the exercise or exchange of or conversion of any Common Stock Equivalents issued and outstanding on the date of this Agreement, provided that such securities or Common Stock Equivalents referred to in this clause (e) have not been amended since the date of this Agreement to increase the number of such securities or Common Stock underlying such securities or to decrease the exercise price, exchange price or conversion price of such securities, (f) Common Stock Equivalents that are convertible into, exchangeable or exercisable for, or include the right to receive shares of Common Stock at a conversion price, exercise price, exchange rate or other price (which may be below the then current market price of the Common Stock) that is fixed at the time of initial issuance of such Common Stock Equivalents (subject only to standard anti-dilution protection for any reorganization, recapitalization, non-cash dividend, stock split or other similar transaction), which fixed conversion price, exercise price, exchange rate or other price shall not at any time after the initial issuance of such Common Stock Equivalent be based upon or varying with the trading prices of or quotations for the Common Stock or subject to being reset at some future date, (g) securities issued pursuant to acquisitions, divestitures, licenses, partnerships, collaborations or strategic transactions approved by the Board of Directors or a majority of the members of a committee of directors established for such purpose, which acquisitions, divestitures, licenses, partnerships, collaborations or strategic transactions can have a Variable Rate Transaction component, provided that any such issuance shall only be to a Person (or to the equity holders of a Person) which is, itself or through its subsidiaries, an operating company or an asset in a business synergistic with the business of the Company and shall provide to the Company additional benefits in addition to the investment of funds, but shall not include a transaction in which the Company is issuing securities primarily for the purpose of raising capital or to an entity whose primary business is investing in securities, (h) Common Stock issued pursuant to an “at-the-market offering” by the Company exclusively through a registered broker-dealer acting as agent of the Company pursuant to a written agreement between the Company and such registered broker-dealer or (i) securities (such as warrants) or Common Stock issued in connection with future financings or offerings of the Company, such as but not limited to, registered direct offerings, rights offerings, and confidentially marketed public offerings; provided such transactions do not involve a Variable Rate Transaction.

6. TRANSFER AGENT INSTRUCTIONS.

On the Commencement Date, the Company shall issue to the Transfer Agent irrevocable instructions, in the form substantially similar to those used by the Investor in substantially similar transactions and in any case agreed to by the Investor, to issue the Commitment Shares in accordance with the terms of this Agreement (the “Irrevocable Transfer Agent Instructions”). The Company warrants to the Investor that no instruction other than as set forth in this Section 6 will be given by the Company to the Transfer Agent with respect to the Securities, and the Securities shall otherwise be freely transferable on the books and records of the Company.

7. CONDITIONS TO THE COMPANY'S RIGHT TO COMMENCE SALES OF COMMON STOCK.

The right of the Company hereunder to commence sales of the Purchase Shares on the Commencement Date is subject to the satisfaction or, where legally permissible, the waiver of each of the following conditions:

- (a) The Investor shall have executed each of the Transaction Documents and delivered the same to the Company;
- (b) No stop order with respect to the Registration Statement shall be pending or threatened by the SEC; and
- (c) The representations and warranties of the Investor shall be true and correct in all material respects as of the Execution Date and as of the Commencement Date as though made at that time.

8. CONDITIONS TO THE INVESTOR'S OBLIGATION TO PURCHASE COMMON STOCK.

The obligation of the Investor to buy Purchase Shares under this Agreement is subject to the satisfaction or, where legally permissible, the waiver of each of the following conditions on or prior to the Commencement Date and, once such conditions have been

initially satisfied, there shall not be any ongoing obligation to satisfy such conditions after the Commencement has occurred:

- (a) The Company shall have executed each of the Transaction Documents and delivered the same to the Investor;
- (b) The Common Stock shall be listed or quoted on the Principal Market and all Securities to be issued by the Company to the Investor pursuant to this Agreement shall have been approved for listing on the Principal Market in accordance with the applicable rules and regulations of the Principal Market, subject only to official notice of issuance;
- (c) The Investor shall have received the opinions of the Company's legal counsel dated as of the Commencement Date substantially in the forms agreed to prior to the date of this Agreement by the Company's legal counsel and the Investor's legal counsel;
- (d) The representations and warranties of the Company contained in this Agreement shall be true and correct in all material respects (except to the extent that any of such representations and warranties is qualified as to materiality, in which case, any of such representations and warranties shall be true and correct as so qualified) as of the Execution Date and as of the Commencement Date as though made at that time (except for representations and warranties that speak as of a specific date, which shall be true and correct in all material respects as of such date) and the Company shall have performed, satisfied and complied in all material respects with the covenants, agreements and conditions required by the Transaction Documents to be performed, satisfied or complied with by the Company at or prior to the Commencement Date. The Investor shall have received a certificate, executed by the CEO, President or CFO of the Company, dated as of the Commencement Date, to the foregoing effect in the form attached hereto as **Exhibit A**;
- (e) The Board of Directors shall have adopted resolutions in connection with this Agreement and the transactions contemplated hereby which shall be in full force and effect without any amendment or supplement thereto as of the Commencement Date;
- (f) As of the Commencement Date, the Company shall have reserved out of its authorized and unissued Common Stock the Reserve Amount, solely for the purpose of effecting purchases of Purchase Shares hereunder;
- (g) The Irrevocable Transfer Agent Instructions, the Commencement Irrevocable Transfer Agent Instructions and the Notice of Effectiveness of Registration Statement shall have been delivered to the Company's Transfer Agent (or any successor transfer agent) and acknowledged in writing by the Company and the Company's Transfer Agent (or any successor transfer agent), and the Commitment Shares shall have been issued directly to the Investor electronically as DWAC Shares;
- (h) The Company shall have delivered to the Investor a certificate evidencing the incorporation and good standing of the Company in the State of Delaware issued by the Secretary of State of the State of Delaware as of a date within ten (10) Business Days of the Commencement Date;
- (i) The Company shall have delivered to the Investor a certified copy of the Certificate of Incorporation as certified by the Secretary of State of the State of Delaware within ten (10) Business Days of the Commencement Date;
- (j) The Company shall have delivered to the Investor a secretary's certificate executed by the Secretary of the Company, dated as of the Commencement Date, in the form attached hereto as **Exhibit B**;
- (k) The Registration Statement shall continue to be effective and no stop order with respect to the Registration Statement shall be pending or threatened by the SEC. The Company shall have a maximum dollar amount of Common Stock registered under the Registration Statement which is sufficient to issue to the Investor not less than (i) the full Available Amount worth of Purchase Shares plus (ii) all of the Commitment Shares. The Current Report and the Initial Prospectus Supplement each shall have been filed with the SEC, as required pursuant to Section 5(a), and copies of the Prospectus shall have been delivered to the Investor in accordance with Section 5(m) hereof. The Prospectus shall be current and available for issuances and sales of all of the Securities by the Company to the Investor, and for the resale of all of the Securities by the Investor. Any other Prospectus Supplements required to have been filed by the Company with the SEC under the Securities Act at or prior to the Commencement Date shall have been filed with the SEC within the applicable time periods prescribed for such filings under the Securities Act. All reports, schedules, registrations, forms, statements, information and other documents required to have been filed by the Company with the SEC at or prior to the Commencement Date pursuant to the reporting requirements of the Exchange Act shall have been filed with the SEC within the applicable time periods prescribed for such filings under the Exchange Act;
- (l) No Event of Default has occurred, or any event which, after notice and/or lapse of time, would become an Event of Default has occurred;
- (m) All federal, state and local governmental laws, rules and regulations applicable to the transactions contemplated by the Transaction Documents and necessary for the execution, delivery and performance of the Transaction Documents and the consummation of the transactions contemplated thereby in accordance with the terms thereof shall have been complied with, and all consents, authorizations and orders of, and all filings and registrations with, all federal, state and local courts or governmental agencies and all federal, state and local regulatory or self-regulatory agencies necessary for the execution, delivery and performance of the Transaction Documents and the consummation of the transactions contemplated thereby in accordance with the terms thereof shall have been obtained or made, including, without limitation, in each case those required under the Securities Act, the Exchange Act, applicable state securities or "Blue Sky" laws or

applicable rules and regulations of the Principal Market, or otherwise required by the SEC, the Principal Market or any state securities regulators;

(n) No statute, regulation, order, decree, writ, ruling or injunction shall have been enacted, entered, promulgated, threatened or endorsed by any federal, state, local or foreign court or governmental authority of competent jurisdiction which prohibits the consummation of or which would materially modify or delay any of the transactions contemplated by the Transaction Documents;

(o) No action, suit or proceeding before any federal, state, local or foreign arbitrator or any court or governmental authority of competent jurisdiction shall have been commenced or threatened, and no inquiry or investigation by any federal, state, local or foreign governmental authority of competent jurisdiction shall have been commenced or threatened, against the Company, or any of the officers, directors or affiliates of the Company, seeking to restrain, prevent or change the transactions contemplated by the Transaction Documents, or seeking material damages in connection with such transactions; and

(p) The Company shall have provided the Investor with the information requested by the Investor in connection with its due diligence requests in accordance with the terms of Section 5(f) hereof.

9. INDEMNIFICATION.

In consideration of the Investor's execution and delivery of the Transaction Documents and acquiring the Securities hereunder and in addition to all of the Company's other obligations under the Transaction Documents, the Company shall defend, protect, indemnify and hold harmless the Investor and all of its affiliates, stockholders, officers, directors, members, managers, employees and direct or indirect investors and any of the foregoing Person's agents or other representatives (including, without limitation, those retained in connection with the transactions contemplated by this Agreement) (collectively, the "Indemnitees") from and against any and all actions, causes of action, suits, claims, losses, costs, penalties, fees, liabilities and damages, and expenses in connection therewith (irrespective of whether any such Indemnitee is a party to the action for which indemnification hereunder is sought), and including reasonable attorneys' fees and disbursements (the "Indemnified Liabilities"), incurred by any Indemnitee as a result of, or arising out of or relating to: (a) any misrepresentation or breach of any representation or warranty made by the Company in the Transaction Documents or any other certificate, instrument or document contemplated hereby or thereby, (b) any breach of any covenant, agreement or obligation of the Company contained in the Transaction Documents or any other certificate, instrument or document contemplated hereby or thereby, (c) any cause of action, suit or claim brought or made against such Indemnitee and arising out of or resulting from the execution, delivery, performance or enforcement of the Transaction Documents or any other certificate, instrument or document contemplated hereby or thereby, (d) any violation of the Securities Act, the Exchange Act, state securities or "Blue Sky" laws, or the rules and regulations of the Principal Market in connection with the transactions contemplated by the Transaction Documents by the Company, its affiliates, officers, directors or employees, (e) any untrue statement or alleged untrue statement of a material fact contained, or incorporated by reference, in the Registration Statement or any amendment thereto or any omission or alleged omission to state therein, or in any document incorporated by reference therein, a material fact required to be stated therein or necessary to make the statements therein not misleading, or (f) any untrue statement or alleged untrue statement of a material fact contained, or incorporated by reference, in the Prospectus, or any omission or alleged omission to state therein, or in any document incorporated by reference therein, a material fact required to be stated therein or necessary to make the statements therein, in light of the circumstances under which they were made, not misleading; provided, however, that (I) the indemnity contained in clause (c) of this Section 9 shall not apply to any Indemnified Liabilities which directly and primarily result from the fraud, gross negligence or willful misconduct of an Indemnitee, (II) the indemnity contained in clauses (d), (e) and (f) of this Section 9 shall not apply to any Indemnified Liabilities to the extent, but only to the extent, arising out of or based upon any untrue statement or alleged untrue statement or omission or alleged omission made in reliance upon and in conformity with written information furnished to the Company by or on behalf of the Investor expressly for use in any Prospectus Supplement (it being hereby acknowledged and agreed that the written information set forth on Exhibit C attached hereto is the only written information furnished to the Company by or on behalf of the Investor expressly for use in the Initial Prospectus Supplement), if the Prospectus was timely made available by the Company to the Investor pursuant to Section 5(l), (III) the indemnity contained in clauses (d), (e) and (f) of this Section 9 shall not inure to the benefit of the Investor to the extent such Indemnified Liabilities are based on a failure of the Investor to deliver or to cause to be delivered the Prospectus made available by the Company, if such Prospectus was timely made available by the Company pursuant to Section 5(l), and if delivery of the Prospectus would have cured the defect giving rise to such Indemnified Liabilities, and (IV) the indemnity in this Section 9 shall not apply to amounts paid in settlement of any claim if such settlement is effected without the prior written consent of the Company, which consent shall not be unreasonably withheld, conditioned or delayed. To the extent that the foregoing undertaking by the Company may be unenforceable for any reason, the Company shall make the maximum contribution to the payment and satisfaction of each of the Indemnified Liabilities which is permissible under applicable law. Payment under this indemnification shall be made within thirty (30) days from the date the Investor makes written request for it. A certificate containing reasonable detail as to the amount of such indemnification submitted to the Company by Investor shall be conclusive evidence, absent manifest error, of the amount due from the Company to Investor. If any action shall be brought against any Indemnitee in respect of which indemnity may be sought pursuant to this Agreement, such Indemnitee shall promptly notify the Company in writing, and the Company shall have the right to assume the defense thereof with counsel of its own choosing reasonably acceptable to the Indemnitee. Any Indemnitee shall have the right to employ separate counsel in any such action and participate in the defense thereof, but the fees and expenses of such counsel shall be at the expense of such Indemnitee, except to the extent that (i) the employment thereof has been specifically authorized by the Company in writing, (ii) the Company has failed after a reasonable period of time to assume such defense and to employ counsel or (iii) in such action there is, in the reasonable opinion of such separate counsel, a material conflict on any material issue between the position of the Company and the position of such Indemnitee, in which case the Company shall be responsible for the reasonable fees and

expenses of no more than one such separate counsel.

10. EVENTS OF DEFAULT.

An “Event of Default” shall be deemed to have occurred at any time as any of the following events occurs:

(a) the effectiveness of the Registration Statement registering the Securities lapses for any reason (including, without limitation, the issuance of a stop order or similar order), the Registration Statement or any Prospectus is unavailable for the sale by the Company to the Investor (or the resale by the Investor) of any or all of the Securities to be issued to the Investor under the Transaction Documents (including, without limitation, as a result of any failure of the Company to satisfy all of the requirements for the use of a registration statement on Form S-3 pursuant to the Securities Act for the offering and sale of the Securities contemplated by this Agreement at any time), and any such lapse or unavailability continues for a period of ten (10) consecutive Business Days or for more than an aggregate of thirty (30) Business Days in any 365-day period;

(b) the suspension of the Common Stock from trading or the failure of the Common Stock to be listed on the Principal Market for a period of one (1) Business Day, provided that the Company may not direct the Investor to purchase any Common Stock during any such suspension;

(c) the delisting of the Common Stock from the Nasdaq Capital Market provided, however, that the Common Stock are not immediately thereafter trading on the New York Stock Exchange, the Nasdaq Global Market, the Nasdaq Global Select Market, the NYSE American, the NYSE Arca, the OTC Bulletin Board or OTC Markets (or nationally recognized successor to any of the foregoing);

(d) the failure for any reason by the Transfer Agent to issue Purchase Shares to the Investor within three (3) Business Days after the Purchase Date, Accelerated Purchase Date or Additional Accelerated Purchase Date, as applicable, on which the Investor is entitled to receive such Purchase Shares;

(e) the Company breaches any representation, warranty, covenant or other term or condition under any Transaction Document if such breach would have a Material Adverse Effect and except, in the case of a breach of a covenant which is reasonably curable, only if such breach continues for a period of at least five (5) Business Days;

(f) if any Person commences a proceeding against the Company pursuant to or within the meaning of any Bankruptcy Law;

(g) if the Company is at any time insolvent, or pursuant to or within the meaning of any Bankruptcy Law, (i) commences a voluntary case, (ii) consents to the entry of an order for relief against it in an involuntary case, (iii) consents to the appointment of a Custodian of it or for all or substantially all of its property, or (iv) makes a general assignment for the benefit of its creditors or is generally unable to pay its debts as the same become due;

(h) a court of competent jurisdiction enters an order or decree under any Bankruptcy Law that (i) is for relief against the Company in an involuntary case, (ii) appoints a Custodian of the Company or for all or substantially all of its property, or (iii) orders the liquidation of the Company or any Subsidiary;

(i) if at any time the Company is not eligible to transfer its Common Stock electronically as DWAC Shares; or

(j) if at any time after the Commencement Date, the Exchange Cap is reached (to the extent the Exchange Cap is applicable pursuant to Section 2(e) hereof) and the Company’s stockholders have not approved the transactions contemplated by this Agreement in accordance with the applicable rules and regulations of the Nasdaq Capital Market, any other Principal Market on which the Common Stock may be listed or quoted after the date of this Agreement, the Certificate of Incorporation and the Bylaws.

In addition to any other rights and remedies under applicable law and this Agreement, so long as an Event of Default has occurred and is continuing, or if any event which, after notice and/or lapse of time would become an Event of Default has occurred and is continuing, the Company shall not deliver to the Investor any Regular Purchase Notice or Accelerated Purchase Notice, and the Investor shall not purchase any Common Stock under this Agreement.

11. TERMINATION

This Agreement may be terminated only as follows:

(a) If pursuant to or within the meaning of any Bankruptcy Law, the Company commences a voluntary case or any Person commences a proceeding against the Company, a Custodian is appointed for the Company or for all or substantially all of its property, or the Company makes a general assignment for the benefit of its creditors (any of which would be an Event of Default as described in Sections 10(f), 10(g) and 10(h) hereof), this Agreement shall automatically terminate without any liability or payment to the Company (except as set forth below) without further action or notice by any Person.

(b) In the event that the Commencement shall not have occurred on or before December 31, 2019, due to the failure to satisfy the conditions set forth in Sections 7 and 8 above with respect to the Commencement, either the Company or the Investor shall have the option to terminate this Agreement at the close of business on such date or thereafter without liability of any party to any other party (except as set forth below); provided, however, that the right to terminate this Agreement under this Section 11(b) shall not be available to any party if such party is then in breach of any covenant or agreement contained in this Agreement or any representation or warranty of such party contained in this Agreement fails to be true and correct such that the conditions set forth in Section 7(c) or Section 8(d), as applicable, could not then be satisfied.

(c) At any time after the Commencement Date, the Company may elect to terminate this Agreement for any reason or for no reason by delivering notice of the Company's election to the Investor (a "Company Termination Notice"). The Agreement shall automatically terminate, without any liability of the Company to the Investor or the Investor to the Company (except as set forth below), one (1) Business Day after the Company Termination Notice is received by the Investor.

(d) This Agreement shall automatically terminate on the date that the Company sells and the Investor purchases the full Available Amount as provided herein, without any action or notice on the part of any party and without any liability whatsoever of any party to any other party under this Agreement (except as set forth below).

(e) If for any reason or for no reason the full Available Amount has not been purchased in accordance with Section 2 of this Agreement by the Maturity Date, this Agreement shall automatically terminate on the Maturity Date, without any action or notice on the part of any party and without any liability whatsoever of any party to any other party under this Agreement (except as set forth below).

Except as set forth in Sections 11(a) (in respect of an Event of Default under Sections 10(f), 10(g), 10(h), 11(d) and 11(e)), any termination of this Agreement pursuant to this Section 11 shall be effected by written notice from the Company to the Investor, or the Investor to the Company, as the case may be, setting forth the basis for the termination hereof). The representations and warranties and covenants of the Company and the Investor contained in Sections 3, 4, 5, and 6 hereof, the indemnification provisions set forth in Section 9 hereof and the agreements and covenants set forth in Sections 10, 11 and 12 shall survive the Commencement and any termination of this Agreement. No termination of this Agreement shall (i) affect the Company's or the Investor's rights or obligations under this Agreement with respect to pending Regular Purchases, Accelerated Purchases and Additional Accelerated Purchases and the Company and the Investor shall complete their respective obligations with respect to any pending Regular Purchases, Accelerated Purchases and Additional Accelerated Purchases under this Agreement or (ii) be deemed to release the Company or the Investor from any liability for intentional misrepresentation or willful breach of any of the Transaction Documents.

12. MISCELLANEOUS.

(a) Governing Law; Jurisdiction; Jury Trial. The corporate laws of the State of Delaware shall govern all issues concerning the relative rights of the Company and its stockholders. All other questions concerning the construction, validity, enforcement and interpretation of this Agreement and the other Transaction Documents shall be governed by the internal laws of the State of New York, without giving effect to any choice of law or conflict of law provision or rule (whether of the State of New York or any other jurisdictions) that would cause the application of the laws of any jurisdictions other than the State of New York. Each party hereby irrevocably submits to the exclusive jurisdiction of the state and federal courts sitting in the State of New York, Borough of Manhattan, for the adjudication of any dispute hereunder or under the other Transaction Documents or in connection herewith or therewith, or with any transaction contemplated hereby or discussed herein, and hereby irrevocably waives, and agrees not to assert in any suit, action or proceeding, any claim that it is not personally subject to the jurisdiction of any such court, that such suit, action or proceeding is brought in an inconvenient forum or that the venue of such suit, action or proceeding is improper. Each party hereby irrevocably waives personal service of process and consents to process being served in any such suit, action or proceeding by mailing a copy thereof to such party at the address for such notices to it under this Agreement and agrees that such service shall constitute good and sufficient service of process and notice thereof. Nothing contained herein shall be deemed to limit in any way any right to serve process in any manner permitted by law. **EACH PARTY HEREBY IRREVOCABLY WAIVES ANY RIGHT IT MAY HAVE, AND AGREES NOT TO REQUEST, A JURY TRIAL FOR THE ADJUDICATION OF ANY DISPUTE HEREUNDER OR IN CONNECTION HEREWITH OR ARISING OUT OF THIS AGREEMENT OR ANY TRANSACTION CONTEMPLATED HEREBY.**

(b) Counterparts. This Agreement may be executed in two or more identical counterparts, all of which shall be considered one and the same agreement and shall become effective when counterparts have been signed by each party and delivered to the other party; provided that a facsimile signature or signature delivered by e-mail in a ".pdf" format data file shall be considered due execution and shall be binding upon the signatory thereto with the same force and effect as if the signature were an original signature.

(c) Headings. The headings of this Agreement are for convenience of reference and shall not form part of, or affect the interpretation of, this Agreement.

(d) Severability. If any provision of this Agreement shall be invalid or unenforceable in any jurisdiction, such invalidity or unenforceability shall not affect the validity or enforceability of the remainder of this Agreement in that jurisdiction or the validity or enforceability of any provision of this Agreement in any other jurisdiction.

(e) Entire Agreement; Amendment. This Agreement supersedes all other prior oral or written agreements between the Investor, the Company, their affiliates and Persons acting on their behalf with respect to the subject matter hereof, and this Agreement, the other Transaction Documents and the instruments referenced herein contain the entire understanding of the parties with respect to the matters covered herein and therein and, except as specifically set forth herein or therein, neither the Company nor the Investor makes any representation, warranty, covenant or undertaking with respect to such matters. The Company acknowledges and agrees that it has not relied on, in any manner whatsoever, any representations or statements, written or oral, other than as expressly set forth in the Transaction Documents. No provision of this Agreement may be amended other than by a written instrument signed by both parties hereto.

(f) Notices. Any notices, consents or other communications required or permitted to be given under the terms of this Agreement must be in writing and will be deemed to have been delivered: (i) upon receipt when delivered personally; (ii) upon receipt when sent by facsimile or email (provided confirmation of transmission is mechanically or electronically generated and kept on file by the sending party); (iii) upon receipt when sent by electronic mail (provided written confirmation is received via electronic mail by the party sending the notice or oral confirmation is received via telephone); or (iv) one Business Day after deposit with a nationally recognized overnight delivery service, in each case properly addressed to the party to receive the same. The addresses for such communications shall be:

If to the Company:

Genocea Biosciences, Inc.
100 Acorn Park Drive, 5th Floor
Cambridge, MA 02140
Telephone: 617.876.8191
E-mail: diantha.duvall@genocea.com
Attention: Diantha Duvall, Chief Financial Officer

With a copy to (which shall not constitute notice or service of process):

Ropes & Gray LLP
Prudential Tower
800 Boylston Street
Boston, MA 02199
Telephone: 617-951-7000
Facsimile: 617-951-7050
Email: Marc.Rubenstein@ropesgray.com
Attention: Marc Rubenstein, Esq.

If to the Investor:

Lincoln Park Capital Fund, LLC
440 North Wells, Suite 410
Chicago, IL 60654
Telephone: 312.822.9300
Facsimile: 312.822.9301
E-mail: jscheinfeld@lpcfunds.com/jcope@lpcfunds.com
Attention: Josh Scheinfeld/Jonathan Cope

With a copy to (which shall not constitute notice or service of process):

K&L Gates, LLP
200 South Biscayne Boulevard
Suite 3900
Miami, Florida 33131
Telephone: 305.539.3300
Facsimile: 305.358.7095
E-mail: clayton.parker@klgates.com/matthew.ogurick@klgates.com
Attention: Clayton E. Parker, Esq./Mathew Ogurick, Esq.

If to the Transfer Agent:

Computershare Trust Company, N.A.
Meidinger Tower
462 South 4th Street, Suite 1600
Louisville, KY 40202
Telephone: 502.301.6472

E-mail: john.lapierre@computershare.com
Attention: John LaPierre

or at such other address and/or facsimile number and/or to the attention of such other Person as the recipient party has specified by written notice given to each other party three (3) Business Days prior to the effectiveness of such change. Written confirmation of receipt (A) given by the recipient of such notice, consent or other communication, (B) mechanically or electronically generated by the sender's facsimile machine or email account containing the time, date, and recipient facsimile number or email address, as applicable, and an image of the first page of such transmission or (C) provided by a nationally recognized overnight delivery service, shall be rebuttable evidence of personal service, receipt by facsimile or receipt from a nationally recognized overnight delivery service in accordance with clause (i), (ii) or (iii) above, respectively. Written confirmation of receipt via electronic mail by the party sending the notice or oral confirmation of receipt via telephone shall be rebuttable evidence of receipt by electronic mail in accordance with clause (iii) above.

(g) Successors and Assigns. This Agreement shall be binding upon and inure to the benefit of the parties and their respective successors and assigns. The Company shall not assign this Agreement or any rights or obligations hereunder without the prior written consent of the Investor, including by merger or consolidation. The Investor may not assign its rights or obligations under this Agreement.

(h) No Third Party Beneficiaries. This Agreement is intended for the benefit of the parties hereto and their respective permitted successors and assigns and, except as set forth in Section 9, is not for the benefit of, nor may any provision hereof be enforced by, any other Person.

(i) Publicity. The Company shall afford the Investor and its counsel with the opportunity to review and comment upon, shall consult with the Investor and its counsel on the form and substance of, and shall give due consideration to all such comments from the Investor or its counsel on, any press release, SEC filing or any other public disclosure by or on behalf of the Company relating to the Investor, its purchases hereunder or any aspect of the Transaction Documents or the transactions contemplated thereby, not less than 24 hours prior to the issuance, filing or public disclosure thereof. The Investor must be provided with a final version of any such press release, SEC filing or other public disclosure at least 24 hours prior to any release, filing or use by the Company thereof. To the extent the Company fails to provide the Investor an opportunity to review and comment on any disclosure relating to the Investor pursuant to this provision and such information is inaccurate, the Company shall promptly correct such inaccurate information. The Company agrees and acknowledges that until such inaccurate information is corrected by the Company it shall constitute a Material Adverse Effect.

(j) Further Assurances. Each party shall do and perform, or cause to be done and performed, all such further acts and things, and shall execute and deliver all such other agreements, certificates, instruments and documents, as the other party may reasonably request in order to carry out the intent and accomplish the purposes of this Agreement and the consummation of the transactions contemplated hereby.

(k) No Financial Advisor, Placement Agent, Broker or Finder. The Company represents and warrants to the Investor that, except as disclosed in Schedule 4(x), it has not engaged any financial advisor, placement agent, broker or finder in connection with the transactions contemplated hereby. The Investor represents and warrants to the Company that it has not engaged any financial advisor, placement agent, broker or finder in connection with the transactions contemplated hereby. The Company shall be responsible for the payment of any fees or commissions, if any, of any financial advisor, placement agent, broker or finder engaged by the Company relating to or arising out of the transactions contemplated hereby. The Company shall pay, and hold the Investor harmless against, any liability, loss or expense (including, without limitation, reasonable attorneys' fees and out of pocket expenses) arising in connection with any such claim.

(l) No Strict Construction. The language used in this Agreement will be deemed to be the language chosen by the parties to express their mutual intent, and no rules of strict construction will be applied against any party.

(m) Remedies, Other Obligations, Breaches and Injunctive Relief. The Investor's remedies provided in this Agreement, including, without limitation, the Investor's remedies provided in Section 9, shall be cumulative and in addition to all other remedies available to the Investor under this Agreement, at law or in equity (including a decree of specific performance and/or other injunctive relief), no remedy of the Investor contained herein shall be deemed a waiver of compliance with the provisions giving rise to such remedy and nothing herein shall limit the Investor's right to pursue actual damages for any failure by the other party to comply with the terms of this Agreement. The parties acknowledge that a breach by any party of its obligations hereunder will cause irreparable harm to the non-breaching party and that the remedy at law for any such breach may be inadequate. The parties therefore agree that, in the event of any such breach or threatened breach, the non-breaching party shall be entitled, in addition to all other available remedies, to an injunction restraining any breach, without the necessity of showing economic loss and without any bond or other security being required.

(n) Enforcement Costs. In the event of a dispute arising out of or relating to this Agreement, if a court of competent jurisdiction determines in a final, non-appealable order that a party has breached this Agreement, then in addition to any other available remedies, the non-breaching party shall be entitled to (in addition to all other available remedies), and the breaching party shall be liable for, the reasonable legal fees and expenses incurred by the non-breaching party in connection with such dispute, including any appeals in connection therewith.

(o) Waivers. No provision of this Agreement may be waived other than in a written instrument signed by the party against whom

enforcement of such waiver is sought. No failure or delay in the exercise of any power, right or privilege hereunder shall operate as a waiver thereof, nor shall any single or partial exercise of any such power, right or privilege preclude other or further exercise thereof or of any other right, power or privilege.

(p) Adjustments for Share Splits. The parties acknowledge and agree that all share-related numbers contained in this Agreement shall be adjusted to take into account any reorganization, recapitalization, non-cash dividend, stock split or other similar transaction effected with respect to the Common Stock except as specifically stated herein.

* * * * *

IN WITNESS WHEREOF, the Investor and the Company have caused this Agreement to be duly executed as of the Execution Date.

THE COMPANY:

GENOCEA BIOSCIENCES, INC.

By: /s/ Diantha Duvall
Name: Diantha Duvall
Title: Chief Financial Officer

INVESTOR:

LINCOLN PARK CAPITAL FUND, LLC
BY: LINCOLN PARK CAPITAL, LLC
BY:

By: /s/ Joshua Scheinfeld
Name: Joshua Scheinfeld
Title: President

EXHIBITS

Exhibit A Form of Officer's Certificate
Exhibit B Form of Secretary's Certificate
Exhibit C Information About Investor Furnished to the Company

EXHIBIT A

FORM OF OFFICER'S CERTIFICATE

This Officer's Certificate ("Certificate") is being delivered pursuant to Section 8(d) of that certain Purchase Agreement dated as of October 23, 2019, ("Purchase Agreement"), by and between **GENOCEA BIOSCIENCES, INC.**, a Delaware corporation (the "Company"), and **LINCOLN PARK CAPITAL FUND, LLC** (the "Investor"). Terms used herein and not otherwise defined shall have the meanings ascribed to them in the Purchase Agreement.

The undersigned, _____, _____ of the Company, hereby certifies as follows:

1. I am the _____ of the Company and make the statements contained in this Certificate;

2. The representations and warranties of the Company contained in the Purchase Agreement are true and correct in all material respects (except to the extent that any of such representations and warranties are qualified as to materiality in the Purchase Agreement, in which case, such representations and warranties are true and correct in all material respects as so qualified) as of the date of the Purchase Agreement and as of the Commencement Date as though made at that time (except for representations and warranties that speak as of a specific date, in which case such representations and warranties are true and correct in all material respects as of such date);

3. The Company has performed, satisfied and complied in all material respects with covenants, agreements and conditions required by the Transaction Documents to be performed, satisfied or complied with by the Company at or prior to the Commencement Date, to the extent not otherwise waived.

4. The Company has not taken any steps, and does not currently expect to take any steps, to seek protection pursuant to any Bankruptcy Law nor does the Company or any of its Subsidiaries have any knowledge or reason to believe that its creditors intend to initiate involuntary bankruptcy or insolvency proceedings. The Company is financially solvent and is generally able to pay its debts as they become due.

IN WITNESS WHEREOF, I have hereunder signed my name on this ___ day of _____.

Name:
Title:

The undersigned as Secretary of **GENOCEA BIOSCIENCES, INC.**, a Delaware corporation, hereby certifies that _____ is the duly elected, appointed, qualified and acting _____ of _____ and that the signature appearing above is a genuine signature.

Secretary

EXHIBIT B

FORM OF SECRETARY'S CERTIFICATE

This Secretary's Certificate ("Certificate") is being delivered pursuant to Section 8(j) of that certain Purchase Agreement dated as of October 23, 2019 (the "Purchase Agreement"), by and between **GENOCEA BIOSCIENCES, INC.**, a Delaware corporation (the "Company") and **LINCOLN PARK CAPITAL FUND, LLC** (the "Investor"). Terms used herein and not otherwise defined shall have the meanings ascribed to them in the Purchase Agreement.

The undersigned, _____, Secretary of the Company, hereby certifies as follows:

1. I am the Secretary of the Company and make the statements contained in this Secretary's Certificate.

2. Attached hereto as Exhibit A are true, correct and complete copies of the Company's Certificate of Incorporation and Bylaws, as amended through the date hereof, and no action has been taken by the Company, its directors, officers or stockholders, in contemplation of the filing of any further amendment relating to or affecting such documents.

3. Attached hereto as Exhibit B are true, correct and complete copies of the resolutions either duly adopted by the Board of Directors of the Company on _____, at which a quorum was present and acting throughout, or executed by all directors in accordance with Delaware General Corporations Law. Such resolutions have not been amended, modified or rescinded and remain in full force and effect and such resolutions are the only resolutions adopted by the Company's Board of Directors, or any committee thereof, or the stockholders of the Company relating to or affecting (i) the entering into and performance of the Purchase Agreement, or the issuance, offering and sale of the Purchase Shares and the Commitment Shares and (ii) and the performance of the Company of its obligation under the Transaction Documents as contemplated therein.

4. As of the date hereof, the authorized, issued and reserved capital stock of the Company is as set forth on Exhibit C hereto.

IN WITNESS WHEREOF, I have hereunder signed my name on this ___ day of October 2019 _____.

Secretary

The undersigned as Secretary of **GENOCEA BIOSCIENCES, INC.**, a Delaware corporation, hereby certifies that _____ is the duly

elected, appointed, qualified and acting _____ of _____ and that the signature appearing above is a genuine signature.

EXHIBIT C

**Information About The Investor Furnished To The Company By The Investor
Expressly For Use In Connection With Prospectuses**

Information With Respect to Lincoln Park Capital

Immediately prior to the date of the Purchase Agreement, Lincoln Park Capital Fund, LLC, beneficially owned 125,482 shares of Common Stock and warrants to purchase 62,500 shares of Common Stock. Josh Scheinfeld and Jonathan Cope, the Managing Members of Lincoln Park Capital, LLC, the manager of Lincoln Park Capital Fund, LLC, are deemed to be beneficial owners of all of the Common Stock owned by Lincoln Park Capital Fund, LLC. Messrs. Cope and Scheinfeld have shared voting and investment power over the shares being offered under the prospectus supplement filed with the SEC in connection with the transactions contemplated under the Purchase Agreement. Lincoln Park Capital, LLC is not a licensed broker dealer or an affiliate of a licensed broker dealer.



Investor Contact:

Dan Ferry
617-430-7576
daniel@lifesciadvisors.com

Genocea Provides Corporate Update and Reports Third Quarter 2019 Financial Results

***Generated unprecedented 98% GEN-009 immune response frequency with ATLAS™
Continued advancement of GEN-011, expect to file an IND in first half of 2020
Entered into a common stock purchase agreement for up to \$30M with Lincoln Park Capital***

Conference call today at 8:30 a.m. EDT

CAMBRIDGE, Mass., October 24, 2019 - [Genocea Biosciences, Inc.](#) (NASDAQ: GNCA), a biopharmaceutical company developing next-generation neoantigen immunotherapies, today reported its operating and financial results for the quarter ended September 30, 2019. Genocea presented a new interim GEN-009 clinical update at the European Society for Medical Oncology Congress 2019 (ESMO) in Barcelona. An analysis of GEN-009 Part A patients with both preliminary *ex vivo* and IVS data showed that GEN-009 generated immune responses to 98 percent of all immunized antigens, which is unprecedented for neoantigen vaccination administered without checkpoint inhibition. The study is currently accruing for Part B to evaluate GEN-009 in combination with standard-of care PD-1-based immunotherapy regimens in patients with advanced disease. Preliminary data for an initial cohort of patients from this study is expected in mid-2020. The company also announced plans to present additional GEN-009 Part A immunogenicity data at the 34th Annual Meeting of the Society for Immunotherapy of Cancer (SITC), taking place from November 6 - 10, 2019 in National Harbor, Maryland.

"The data presented at ESMO 2019 continued to showcase the power of our unique ATLAS™ platform to identify relevant neoantigens for driving broad and potent immune responses," said Chip Clark, President and Chief Executive Officer, Genocea. "We are further evaluating the potential of GEN-009 in combination with immune checkpoint inhibitors in multiple patient cohorts, including those with hard-to-treat cancers."

Third Quarter 2019 Operational Highlights

- Presented additional unprecedented immunogenicity results for GEN-009 Part A at ESMO 2019
- Continued advancement of GEN-011 (a neoantigen-specific adoptive cell therapy), expect to file an IND in 1H 2020

Third Quarter 2019 Financial Results

- Cash position: As of September 30, 2019, cash and cash equivalents were \$46.6 million versus \$26.4 million as of December 31, 2018.
 - Research and Development (R&D) expenses: R&D expenses were \$6.8 million for the quarter ended September 30, 2019, compared to \$6.4 million for the same period in 2018.
 - General and Administrative (G&A) expenses: G&A expenses were \$2.8 million for the quarter ended September 30, 2019, compared to \$4.1 million for the same period in 2018.
 - Net loss: Net loss was \$7.5 million for the quarter ended September 30, 2019, compared to a net loss of \$7.8 million for the quarter ended September 30, 2018.
-

Guidance

Yesterday Genocea entered into a common stock purchase agreement with Lincoln Park Capital Fund, LLC (LPC) for up to \$30 million, including an initial investment by LPC of \$2.5 million. LPC is an existing investor of Genocea, having participated in both of Genocea's 2019 financings. "We believe that the LPC agreements provide access to capital and can be used strategically to fund continued advancement of both GEN-009 and GEN-011," said Diantha Duvall, Chief Financial Officer. A description of the common stock purchase agreement and related registration rights agreement is set forth in Genocea's Current Report on Form 8-K filed today with the Securities and Exchange Commission (SEC). Genocea expects that its existing cash and cash equivalents are sufficient to support its operations into the first quarter of 2021.

Conference Call

Genocea will host a conference call and webcast today at 8:30 a .m. EDT. Interested participants may access the conference call by dialing (844) 826-0619 (domestic) or (315) 625-6883 (international) and referring to conference ID number 6158828. To join the live webcast, please visit the presentation page of the investor relations section of the Genocea website at <https://ir.genocea.com/events-and-presentations>. A webcast replay of the conference call will be available on the Genocea website beginning approximately two hours after the event and will be archived for 90 days.

About Genocea Biosciences, Inc.

Genocea is a biopharmaceutical company developing personalized cancer immunotherapies. Our unique ATLAS™ technology platform allows us to identify targets based on each person's tumor antigen-specific T cell responses. Using ATLAS, we can both optimize neoantigens for inclusion in our immunotherapies and exclude inhibitory antigens that exert an immunosuppressive effect on anti-tumor immune responses. We are advancing complementary programs built from ATLAS insights: GEN-009, our neoantigen vaccine candidate for which we are conducting a Phase 1/2a clinical trial across a variety of solid tumor types, and GEN-011, our neoantigen-specific adoptive T cell therapy, for which we intend to file an Investigational New Drug Application in the first half of 2020. To learn more, please visit www.genocea.com.

Forward-Looking Statements

This press release includes forward-looking statements, including statements relating to GEN-009 and GEN-011, within the meaning of the Private Securities Litigation Reform Act. Such forward-looking statements are subject to risks and uncertainties that could cause actual results to differ materially from those expressed or implied in such statements. Genocea cautions that these forward-looking statements are subject to numerous assumptions, risks and uncertainties that change over time. Applicable risks and uncertainties include those identified under the heading "Risk Factors" included in Genocea's Annual Report on Form 10-K for the year ended December 31, 2018 and any subsequent SEC filings. These forward-looking statements speak only as of the date of this press release and Genocea assumes no duty to update forward-looking statements, except as may be required by law.

(Tables to follow)

GENOCEA BIOSCIENCES, INC.
CONDENSED CONSOLIDATED BALANCE SHEETS (UNAUDITED)
(In thousands)

	September 30, 2019	December 31, 2018
Cash and cash equivalents	\$ 46,649	\$ 26,361
Other assets	12,638	4,754
Total assets	\$ 59,287	\$ 31,115
Debt, current and long-term	\$ 13,297	\$ 14,822
Accounts payable, accrued expenses and other liabilities	11,434	5,486
Warrant liability	3,183	3,472
Total liabilities	27,914	23,780
Stockholders' equity	31,373	7,335
Total liabilities and stockholders' equity	\$ 59,287	\$ 31,115

GENOCEA BIOSCIENCES, INC.
CONDENSED CONSOLIDATED STATEMENTS OF OPERATIONS (UNAUDITED)
(In thousands, except per share data)

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2019	2018	2019	2018
Operating expenses:				
Research and development	\$ 6,826	\$ 6,359	\$ 20,135	\$ 18,950
General and administrative	2,758	4,101	8,992	11,682
Total operating expenses	9,584	10,460	29,127	30,632
Loss from operations	(9,584)	(10,460)	(29,127)	(30,632)
Other income (expense)	2,052	2,627	(467)	2,471
Net loss	\$ (7,532)	\$ (7,833)	\$ (29,594)	\$ (28,161)
Net loss per share - basic and diluted	\$ (0.28)	\$ (0.72)	\$ (1.62)	\$ (2.77)
Weighted-average number of common shares used in computing net loss per share	26,681	10,829	18,297	10,149