

ARCA biopharma, Inc.  
Form 424B4  
June 11, 2015

Prospectus Supplement No. 37      Filed pursuant to Rule 424(b)(4)  
Registration No. 333-187508  
(to Prospectus dated May 30, 2013)

125,000 Shares of Series A Convertible Preferred Stock  
12,500,000 Shares of Common Stock Underlying the Preferred Stock  
Warrants to Purchase up to 6,250,000 Shares of Common Stock and  
6,250,000 Shares of Common Stock Underlying the Warrants

ARCA biopharma, Inc.

This prospectus supplement supplements the prospectus dated May 30, 2013 (the "Prospectus"), as supplemented by that certain Prospectus Supplement No. 1 dated July 17, 2013 ("Supplement No. 1"), by that certain Prospectus Supplement No. 2 dated July 19, 2013 ("Supplement No. 2"), by that certain Prospectus Supplement No. 3 dated July 24, 2013 ("Supplement No. 3"), by that certain Prospectus Supplement No. 4 dated July 30, 2013 ("Supplement No. 4"), by that certain Prospectus Supplement No. 5 dated August 6, 2013 ("Supplement No. 5"), by that certain Prospectus Supplement No. 6 dated September 4, 2013 ("Supplement No. 6"), by that certain Prospectus Supplement No. 7 dated September 23, 2013 ("Supplement No. 7"), by that certain Prospectus Supplement No. 8 dated October 29, 2013 ("Supplement No. 8"), by that certain Prospectus Supplement No. 9 dated November 6, 2013 ("Supplement No. 9"), by that certain Prospectus Supplement No. 10 dated November 13, 2013 ("Supplement No. 10"), by that certain Prospectus Supplement No. 11 dated November 21, 2013 ("Supplement No. 11"), by that certain Prospectus Supplement No. 12 dated December 5, 2013 ("Supplement No. 12"), by that certain Prospectus Supplement No. 13 dated January 8, 2014 ("Supplement No. 13"), by that certain Prospectus Supplement No. 14 dated February 10, 2014 ("Supplement No. 14"), by that certain Prospectus Supplement No. 15 dated February 12, 2014 ("Supplement No. 15"), by that certain Prospectus Supplement No. 16 dated February 18, 2014 ("Supplement No. 16"), by that certain Prospectus Supplement No. 17 dated March 3, 2014 ("Supplement No. 17"), by that certain Prospectus Supplement No. 18 dated March 20, 2014 ("Supplement No. 18"), by that certain Prospectus Supplement No. 19 dated May 13, 2014 ("Supplement No. 19"), by that certain Prospectus Supplement No. 20 dated June 9, 2014 ("Supplement No. 20"), by that certain Prospectus Supplement No. 21 dated August 13, 2014 ("Supplement No. 21"), by that certain Prospectus Supplement No. 22 dated

August 18, 2014 (“Supplement No. 22”), by that certain Prospectus Supplement No. 23 dated November 12, 2014 (“Supplement No. 23”), by that certain Prospectus Supplement No. 24 dated December 1, 2014 (“Supplement No. 24”), by that certain Prospectus Supplement No. 25 dated December 10, 2014 (“Supplement No. 25”), by that certain Prospectus Supplement No. 26 dated December 11, 2014 (“Supplement No. 26”), by that certain Prospectus Supplement No. 27 dated December 30, 2014 (“Supplement No. 27”), by that certain Prospectus Supplement No. 28 dated February 4, 2015 (“Supplement No. 28”), by that certain Prospectus Supplement No. 29 dated February 17, 2015 (“Supplement No. 29”), by that certain Prospectus Supplement No. 30 dated February 23, 2015 (“Supplement No. 30”), by that certain Prospectus Supplement No. 31 dated March 16, 2015 (“Supplement No. 31”), by that certain Prospectus Supplement No. 32 dated March 19, 2015 (“Supplement No. 32”), by that certain Prospectus Supplement No. 33 dated April 13, 2015 (“Supplement No. 33”), by that certain Prospectus Supplement No. 34 dated April 14, 2015 (“Supplement No. 34”), by that certain Prospectus Supplement No. 35 dated May 12, 2015 (“Supplement No. 35”), and by that certain Prospectus Supplement No. 36 dated June 5, 2015 (“Supplement No. 36, and together with Supplement No. 1, Supplement No. 2, Supplement No. 3, Supplement No. 4, Supplement No. 5, Supplement No. 6, Supplement No. 7, Supplement No. 8, Supplement No. 9, Supplement No. 10, Supplement No. 11, Supplement No. 12, Supplement No. 13, Supplement No. 14, Supplement No. 15, Supplement No. 16, Supplement No. 17, Supplement No. 18, Supplement No. 19, Supplement No. 20, Supplement No. 21, Supplement No. 22, Supplement No. 23, Supplement No. 24, Supplement No. 25, Supplement No. 26, Supplement No. 27, Supplement No. 28, Supplement No. 29, Supplement No. 30, Supplement No. 31, Supplement No. 32, Supplement No. 33, Supplement No. 34, Supplement No. 35, and Supplement No. 36 (the “Supplements”), which form a part of our Registration Statement on Form S-1 (Registration No. 333-187508). This prospectus supplement is being filed to update and supplement the information in the Prospectus and the Supplements with the information contained in our Current Report on Form 8-K/A, filed with the Securities and Exchange Commission (the “Commission”) on June 11, 2015 (the “Amended Current Report”). Accordingly, we have attached the Amended Current Report to this prospectus supplement.

The Prospectus, the Supplements and this prospectus supplement relate to the offer and sale of up to 125,000 shares of Series A Convertible Preferred Stock (“Preferred Stock”) which are convertible into 12,500,000 shares of Common Stock, warrants to purchase up to 6,250,000 shares of our Common Stock and 6,250,000 shares of Common Stock underlying the warrants.

This prospectus supplement should be read in conjunction with the Prospectus and the Supplements. This prospectus supplement updates and supplements the information in the Prospectus and the Supplements. If there is any inconsistency between the information in the Prospectus, the Supplements and this prospectus supplement, you should rely on the information in this prospectus supplement.

Our common stock is traded on the Nasdaq Global Market under the trading symbol "ABIO." On June 11, 2015, the last reported sale price of our common stock was, rounded to the nearest penny, \$0.89 per share.

Investing in our securities involves a high degree of risk. You should review carefully the risks and uncertainties described under the heading "Risk Factors" beginning on page 5 of the Prospectus and beginning on page 22 of our quarterly report on Form 10-Q for the period ended March 31, 2015 before you decide whether to invest in shares of our common stock.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if the Prospectus or this prospectus supplement is truthful or complete. Any representation to the contrary is a criminal offense.

The date of this prospectus supplement is June 11, 2015

UNITED STATES

SECURITIES AND EXCHANGE COMMISSION

WASHINGTON, D.C. 20549

FORM 8-K/A

CURRENT REPORT

Pursuant to Section 13 or 15(d) of the

Securities Exchange Act of 1934

Date of Report (Date of earliest event reported): June 11, 2015 (June 10, 2015)

ARCA biopharma, Inc.

(Exact Name of Registrant as Specified in Charter)

Delaware 000-22873 36-3855489  
(State or Other Jurisdiction (Commission File Number) (I.R.S. Employer

of Incorporation) Identification No.)

11080 CirclePoint Road, Suite 140, Westminster, CO 80020

(Address of Principal Executive Offices) (Zip Code)

(720) 940-2200

(Registrant's telephone number, including area code)

Not Applicable

(Former Name or Former Address, if Changed Since Last Report)

Check the appropriate box below if the Form 8-K filing is intended to simultaneously satisfy the filing obligation of the registrant under any of the following provisions (see General Instruction A.2. below):

£ 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))

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EXPLANATORY NOTE

This Current Report on Form 8-K/A (this “Amendment”) is being filed as an amendment to the Current Report on Form 8-K filed by ARCA biopharma, Inc. on June 11, 2015 (the “Original Report”) with the U.S. Securities and Exchange Commission. The sole purpose of this Amendment is to furnish amended Exhibit 10.1. Accordingly, this Amendment consists only of the facing page, this explanatory note, the Exhibit Index disclosed in Item 9.01 and Exhibit 10.1.

Section 9 — Financial Statements and Exhibits

Item 9.01. Financial Statements and Exhibits.

(d) Exhibits.

Exhibit Number	Description
10.1	Securities Purchase Agreement by and among the Company and the purchasers identified therein, dated June 10, 2015

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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.

Dated: June 11, 2015

ARCA biopharma, Inc.  
(Registrant)

By: /s/ Brian L. Selby  
Name: Brian L. Selby  
Title: VP, Finance and Chief Accounting Officer

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INDEX TO EXHIBITS

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10.1	Securities Purchase Agreement by and among the Company and the purchasers identified therein, dated June 10, 2015

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Exhibit 10.1

SECURITIES PURCHASE AGREEMENT

This SECURITIES PURCHASE AGREEMENT (this “Agreement”), dated as of June 10, 2015, is made by and among ARCA biopharma, INC., a Delaware corporation (the “Company”), and the Purchasers, severally and not jointly, listed on Exhibit A hereto, together with their permitted transferees (each, a “Purchaser” and collectively, the “Purchasers”).

RECITALS:

A. The Company and the Purchasers are executing and delivering this Agreement in reliance upon the exemption from securities registration afforded by Section 4(a)(2) of the Securities Act.

B. The Purchasers desire to purchase and the Company desires to sell, upon the terms and conditions stated in this Agreement, up to a maximum of \$37,000,000 of Common Stock and warrants to purchase Common Stock of the Company.

C. The capitalized terms used herein and not otherwise defined have the meanings given to them in Article 7.

AGREEMENT

In consideration of the premises 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 Purchasers (severally and not jointly) hereby agree as follows:

ARTICLE 1

PURCHASE AND SALE OF SECURITIES

1.1 Purchase and Sale of Securities. At the Closing, the Company will issue and sell to each Purchaser, and each Purchaser will, severally and not jointly, purchase from the Company the number of shares of Common Stock (the “Shares”) and the number of warrants to purchase shares of Common Stock (the “Warrants”) as set forth opposite such Purchaser’s name on the Schedule of Purchasers set forth on Exhibit A hereto (the Shares and Warrants referred to collectively as the “Securities”). The purchase price for each Security shall be \$0.8805 (the “Purchase Price”), which is the sum of (i) \$0.8305 (the “Stock Purchase Price”), the consolidated closing bid price of the Common Stock as reported on Nasdaq (symbol “ABIO”) on the date of this Agreement, and (ii) \$0.05. For each one Share purchased by a Purchaser, such Purchaser shall receive a Warrant to purchase 0.4 of a share of Common Stock at an exercise price per share equal to \$0.8716, which represents 120% of the Stock Purchase Price minus \$0.125 (subject to adjustments as provided in the Warrant) pursuant to a warrant substantially in the forms attached as Exhibit B-1 and B-2 hereto.

1.2 Payment. At the Closing, each Purchaser will pay the aggregate Purchase Price set forth opposite its name on Exhibit A hereto by wire transfer of immediately available funds in accordance with wire instructions provided by the Company to the Purchasers prior to the Closing.

1.3 Closing Date. The closing of the transaction contemplated by this Agreement will take place on June 16, 2015 (the “Closing Date”) and the closing (the “Closing”) will be held at the offices of Cooley LLP, 380 Interlocken Crescent, Suite 900, Broomfield, CO 80021, or at such other time and place as shall be agreed upon by the Company and the Purchasers holding a majority in interest of the Securities.

1.4 Issuance of Securities at the Closing. The Company will instruct its transfer agent to credit each Purchaser the number of Shares set forth on the Schedule of Purchasers on Exhibit A (and, upon request, will deliver stock certificates to the Purchasers representing the Shares). At the Closing, the Company shall issue or deliver to each Purchaser (a) evidence of a book entry position evidencing the Shares purchased by such Purchaser hereunder, registered in the name of such Purchaser, or in such nominee name(s) as designated by such Purchaser, representing the number of Shares to be purchased by such Purchaser at such Closing as set forth in the Schedule of Purchasers on Exhibit A hereto against payment of the purchase price for such Shares and (b) a Warrant registered in the name of such Purchaser, or in such nominee name(s) as designated by such Purchaser, representing the number of Underlying Shares as set forth in the Schedule of Purchasers on Exhibit A hereto. The name(s) in which the shares and Warrant are to be issued to each Purchaser are set forth in the Schedule of Purchasers.

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## ARTICLE 2

### REPRESENTATIONS AND WARRANTIES OF THE COMPANY

Except as specifically contemplated by this Agreement, the Company hereby represents and warrants to the Purchasers that:

2.1 Organization and Qualification. The Company is duly incorporated, validly existing and in good standing under the laws of the State of Delaware, with full corporate power and authority to conduct its business as currently conducted as disclosed in the SEC Documents. The Company is duly qualified to do business and is in good standing in every jurisdiction in which the nature of the business conducted by it 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 reasonably be expected to have a Material Adverse Effect.

2.2 Authorization; Enforcement. The Company has all requisite corporate power and authority to enter into and to perform its obligations under this Agreement, to consummate the transactions contemplated hereby and to issue the Securities in accordance with the terms hereof. The execution, delivery and performance of this Agreement by the Company and the consummation by it of the transactions contemplated hereby (including the issuance of the Securities) have been duly authorized by the Company's board of directors and no further consent or authorization of the Company, its board of directors, or its stockholders is required. This Agreement and the Warrant has been (or upon delivery will have been) duly executed by the Company and constitutes a legal, valid and binding obligation of the Company enforceable against the Company in accordance with its terms, except as enforceability may be limited by applicable bankruptcy, insolvency, reorganization, or moratorium or similar laws affecting creditors' and contracting parties' rights generally and except as enforceability may be subject to general principles of equity and except as rights to indemnity and contribution may be limited by state or federal securities laws or public policy underlying such laws.

2.3 Capitalization. The authorized capital stock of the Company, as of June 10, 2015, consisted of 100,000,000 shares of Common Stock, of which 21,198,411 shares were issued and outstanding and 5,000,000 shares of blank check Preferred Stock, none of which are currently designated. All of the issued and outstanding shares of Common Stock have been duly authorized, validly issued, fully paid, and nonassessable. As of June 10, 2015, options to purchase an aggregate of 1,205,295 shares of Common Stock and restricted stock units with respect to an aggregate of 635,424 shares of Common Stock were outstanding. Except as disclosed in or contemplated by the SEC Documents, the Company does not have outstanding any options to purchase, or any preemptive rights or other rights to subscribe for or to purchase, any securities or obligations convertible into, or any contracts or commitments to issue or sell, shares of its capital stock or any such options, rights, convertible securities or obligations other than options and restricted stock units granted under the Company's stock option plans. There are no bonds, debentures, notes or other indebtedness having general voting rights (or convertible into securities having such rights) ("Voting Debt") of the Company issued and outstanding. The issuance and sale of the Shares and Warrants will not obligate the Company to issue shares of Common Stock or other securities to any Person (other than the Purchasers) and will not result in a right of any holder of Company securities to adjust the exercise, conversion, exchange or reset price under any of such securities. There are no stockholders agreements, voting agreements or other similar agreements with respect to the Company's capital stock to which the Company is a party or, to the Company's knowledge, between or among any of the Company's stockholders except as disclosed in SEC documents. The Company's Amended and Restated Certificate of Incorporation, as amended (the "Certificate of Incorporation"), as in effect on the date hereof, and the Company's Second Amended and Restated Bylaws, as amended (the "Bylaws"), as in effect on the date hereof, are each filed as exhibits to the SEC Documents.

2.4 Issuance of Securities. The Shares and all of the shares of Common Stock issuable upon exercise of the Warrants (the "Exercise Shares") are duly authorized and, upon issuance in accordance with the terms of this Agreement (and in case of the Exercise Shares, the Warrants), will be validly issued, fully paid and non-assessable and will not be subject to preemptive rights or other similar rights of stockholders of the Company. Assuming the accuracy of the representations and warranties of the Purchasers in this Agreement, the offer and issuance by the Company of the Securities is exempt from registration under the Securities Act and the Securities will be issued in compliance in all material respects with all applicable federal and state securities laws.

2.5 No Conflicts; Government Consents and Permits.

(a) The execution, delivery and performance of this Agreement by the Company and the consummation by the Company of the transactions contemplated hereby (including the issuance of the Securities) will not (i) conflict with or result in a violation of any provision of its Certificate of Incorporation or Bylaws or require the approval of the Company's stockholders, (ii) violate or conflict with, or result in a breach of any provision of, or constitute a default under, any agreement, credit facility, indenture, or instrument to which the Company is a party, or (iii) result in a violation of any law, rule, regulation, order, judgment or decree (including federal and state securities laws and regulations and regulations of any self-regulatory organizations to which the Company or its securities are subject) applicable to the Company, except in the case of clauses (ii) and (iii) only, for such conflicts, breaches, defaults, and violations as would not reasonably be expected to have a Material Adverse Effect.

(b) 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 this Agreement in accordance with the terms hereof, or to issue and sell the Securities in accordance with the terms hereof other

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than such as have been made or obtained, and except for the registration of the Shares and Exercise Shares under the Securities Act pursuant to Section 6 hereof, any filings required to be made under federal or state securities laws, and any required filings or notifications regarding the issuance or listing of additional shares with Nasdaq.

(c) The Company has all franchises, permits, licenses, and any similar authority necessary for the conduct of its business as now being conducted by it and as currently proposed to be conducted as disclosed in the SEC Documents, except for such franchise, permit, license or similar authority, the lack of which would not reasonably be expected to have a Material Adverse Effect. The Company has not received any actual notice of any proceeding relating to revocation or modification of any such franchise, permit, license, or similar authority except where such revocation or modification would not reasonably be expected to have a Material Adverse Effect.

2.6 SEC Documents, Financial Statements. The Company has timely filed all reports, schedules, forms, statements and other documents required to be filed by it with the SEC since March 31, 2014, pursuant to the reporting requirements of the Exchange Act (all of the foregoing filed prior to the date hereof and all exhibits included therein and financial statements and schedules thereto and documents (other than exhibits) incorporated by reference therein, being hereinafter referred to herein as the “SEC Documents”). The Company is eligible to register its Common Stock for resale using Form S-3 promulgated under the Securities Act. The Company has delivered to each Purchaser, or each Purchaser has had access to, true and complete copies of the SEC Documents. As of their respective dates, the SEC Documents complied in all material respects with the requirements of the Exchange Act or the Securities Act, as the case may be, and none of the SEC Documents, at the time they were filed with the SEC, 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 light of the circumstances under which they were made, not misleading. As of their respective dates, the Financial Statements and the related notes complied as to form in all material respects with applicable accounting requirements and the published rules and regulations of the SEC with respect thereto. The Financial Statements and the related notes have been prepared in accordance with accounting principles generally accepted in the United States (“U.S. GAAP”), consistently applied, during the periods involved (except (i) as may be otherwise indicated in the Financial Statements or the notes thereto, or (ii) in the case of unaudited interim statements, to the extent they may not include footnotes, may be condensed or summary statements or may conform to the SEC’s rules and instructions for Reports on Form 10-Q) and fairly present in all material respects the consolidated financial position of the Company as of the dates thereof and the consolidated results of its operations and cash flows for the periods then ended (subject, in the case of unaudited statements, to normal and recurring year-end audit adjustments). All material agreements that were required to be filed as exhibits to the SEC Documents under Item 601 of Regulation S-K (collectively, the “Material Agreements”) to which the Company or any Subsidiary of the Company is a party, or the property or assets of the Company or any Subsidiary of the Company are subject, have been filed as exhibits to the SEC Documents. All Material Agreements are valid and enforceable against the Company in accordance with their respective terms, except (i) as enforceability may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or similar laws affecting creditors’ and contracting parties’ rights generally, and (ii) as enforceability may be subject to general principles of equity and except as rights to indemnity and contribution may be limited by federal or state securities laws or public policy underlying such laws. The Company is not in breach of or default under any of the Material Agreements, and to the Company’s knowledge, no other party to a Material Agreement is in breach of or default under such Material Agreement, except in each case, for such breaches or defaults as would not reasonably be expected to have a Material Adverse Effect. The Company has not received a notice of termination nor is the Company otherwise aware of any threats to terminate any of the Material Agreements.

2.7 Disclosure Controls and Procedures. Except as disclosed in the SEC Documents, the Company has established and maintains disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) that are effective in all material respects to ensure that material information relating to the Company, including any consolidated Subsidiaries, is made known to its principal executive officer and principal financial officer by others within those entities. The Company’s certifying officers have evaluated the effectiveness of the Company’s disclosure

controls and procedures as of the end of the period covered by the most recently filed quarterly or annual periodic report under the Exchange Act (such date, the "Evaluation Date"). The Company presented in its most recently filed quarterly or annual periodic report under the Exchange Act the conclusions of the certifying officers about the effectiveness of the disclosure controls and procedures based on their evaluations as of the Evaluation Date. Since the Evaluation Date, there have been no significant changes in the Company's internal control over financial reporting (as such term is defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) or, to the Company's knowledge, in other factors that could significantly affect the Company's internal control over financial reporting.

2.8 Accounting Controls. Except as disclosed in the SEC Documents, the Company maintains a system of internal accounting controls sufficient to provide reasonable assurances that (i) transactions are executed in accordance with management's general or specific authorization, (ii) transactions are recorded as necessary to permit preparation of financial statements in conformity with U.S. GAAP and to maintain accountability for assets, (iii) access to assets is permitted only in accordance with management's general or specific authorization, and (iv) the recorded accountability for assets is compared with existing assets at reasonable intervals and appropriate action is taken with respect to any differences. The Company's internal controls over financial reporting are effective to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with U.S. GAAP and the Company is not aware of any material weakness in its internal controls over financial

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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.

2.9 Sarbanes-Oxley Act. 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 applicable provision of the Sarbanes-Oxley Act of 2002 and the rules and regulations promulgated in connection therewith in all material respects, including, without limitation, Section 402 relating to loans.

2.10 Absence of Litigation. As of the date hereof, there is no action, suit, proceeding or investigation before or by any court, public board, government agency, self-regulatory organization or body pending or, to the Company’s knowledge, threatened against the Company that if determined adversely to the Company would reasonably be expected to have a Material Adverse Effect or would reasonably be expected to impair the ability of the Company to perform its obligations under this Agreement. Neither the Company, nor any director or officer thereof, is or has been the subject of any action involving a claim of violation of or liability under federal or state securities laws or a claim of breach of fiduciary duty relating to the Company. There has not been, and to the knowledge of the Company, there is not pending or contemplated, any investigation by the SEC of the Company or any current or former director or officer of the Company. The Company has not received any stop order or other order suspending the effectiveness of any registration statement filed by the Company under the Exchange Act or the Securities Act and, to the Company’s knowledge, the SEC has not issued any such order.

2.11 Intellectual Property Rights. The Company owns or possesses, or has a reasonable basis on which it believes it can obtain on reasonable terms, licenses or sufficient rights to use all patents, patent applications, patent rights, inventions, know-how, trade secrets, trademarks, trademark applications, service marks, service names, trade names and copyrights necessary to conduct its business as conducted as of the date hereof and, to its knowledge, as proposed to be conducted as described in the SEC Documents (the “Intellectual Property”). To the Company’s knowledge, the Company has not materially infringed the intellectual property rights of third parties and no third party, to the Company’s knowledge, is materially infringing the Intellectual Property. There is no pending or, to the Company’s knowledge, threatened action, suit, proceeding or claim by a third party that the Company’s business as now conducted infringes or otherwise violates any patent, trademark, copyright, trade secret or other proprietary rights of another. Except as disclosed in the SEC Documents, there are no material options, licenses or agreements relating to the Intellectual Property, nor is the Company bound by or a party to any material options, licenses or agreements relating to the patents, patent applications, patent rights, inventions, know-how, trade secrets, trademarks, trademark applications, service marks, service names, trade names or copyrights of any other person or entity. There is no material claim or action or proceeding pending or, to the Company’s knowledge, threatened that challenges any of the rights of the Company in or to, or otherwise with respect to, any Intellectual Property.

2.12 Placement Agent. The Company has taken no action that would give rise to any claim by any Person for brokerage commissions, placement agent’s fees or similar payments relating to this Agreement or the transactions contemplated hereby, except for dealings with the Placement Agent, whose commissions and fees will be paid by the Company.

2.13 Investment Company. The Company is not and, after giving effect to the offering and sale of the Securities, will not be an “investment company” as such term is defined in the Investment Company Act of 1940, as amended (the “Investment Company Act”). The Company shall conduct its business in a manner so that it will not become subject to the Investment Company Act.

2.14 No Material Adverse Change. Since March 31, 2015, except as described or referred to in the SEC Documents and except for cash expenditures in the ordinary course of business, there has not been any change in the assets, business, properties, financial condition or results of operations of the Company that would reasonably be expected to

have a Material Adverse Effect. Since March 31, 2015, (i) there has not been any dividend or distribution of any kind declared, set aside for payment, paid or made by the Company on any class of capital stock, (ii) the Company has not sustained any material loss or interference with the Company's business from fire, explosion, flood or other calamity, whether or not covered by insurance, or from any labor disturbance or dispute or any action, order or decree of any court or arbitrator or governmental or regulatory authority, (iii) the Company has not incurred any material liabilities except in the ordinary course of business, and (vi) the Company has not altered materially its method of accounting or the manner in which it keeps its accounting books and records.

2.15 The Nasdaq Capital Market. The Common Stock is listed on The Nasdaq Capital Market, and, except as disclosed in the SEC Documents, to the Company's knowledge, there are no proceedings to revoke or suspend such listing or for the listing of the Shares and the Exercise Shares. Except as disclosed in the SEC Documents, the Company is in compliance with the requirements of Nasdaq for continued listing of the Common Stock thereon and any other Nasdaq listing and maintenance requirements.

2.16 Acknowledgment Regarding Purchasers' Purchase of Securities. The Company acknowledges and agrees that each of the Purchasers is acting solely in the capacity of an arm's length purchaser with respect to this Agreement and the transactions contemplated hereby. The Company further acknowledges that no Purchaser is acting as a financial advisor or fiduciary of the Company (or in any similar capacity with respect to the Company) with respect to this Agreement and the transactions contemplated hereby and any advice given by any Purchaser or any of their respective representatives or agents to the Company in connection with this Agreement and the transactions contemplated hereby is merely incidental to such Purchaser's purchase of the Securities. The

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Company further represents to each Purchaser that the Company's decision to enter into this Agreement has been based on the independent evaluation of the transactions contemplated hereby by the Company and its representatives.

2.17 Accountants. The Company's independent registered public accounting firm is identified in the SEC Reports and such accounting firm is a registered public accounting firm as required by the Exchange Act and are independent public accountants with respect to the Company within the meaning of Sarbanes-Oxley Act of 2002 and the applicable published rules and regulations thereunder.

2.18 Insurance. The Company is insured by insurers of recognized financial responsibility against such losses and risks and in such amounts as the Company believes are prudent and customary for a company (i) in the businesses and location in which the Company is engaged, (ii) with the resources of the Company, and (iii) at a similar stage of development as the Company. All policies of insurance and fidelity or surety bonds insuring the Company or its businesses, assets, employees, officers and directors are in full force and effect. The Company is in compliance with the terms of such policies and instruments in all material respects; and there are no claims by the Company under any such policy or instrument as to which any insurance company is denying liability or defending under a reservation of rights clause. The Company has not received any written notice that the Company will not be able to renew its existing insurance coverage as and when such coverage expires. The Company believes it will be able to obtain similar coverage at reasonable cost from similar insurers as may be necessary to continue its business.

2.19 Foreign Corrupt Practices. Since June 1, 2010, neither the Company, nor to the Company's knowledge, any director, officer, agent, employee or other Person acting on behalf of the Company has, in the course of its actions for, or on behalf of, the Company (i) used any corporate funds for any unlawful contribution, gift, entertainment or other unlawful expenses relating to political activity, (ii) made any direct or indirect unlawful payment to any foreign or domestic government official or employee from corporate funds, (iii) violated or is in violation of in any material respect any provision of the U.S. Foreign Corrupt Practices Act of 1977, as amended (the "FCPA"), or (iv) made any unlawful bribe, rebate, payoff, influence payment, kickback or other unlawful payment to any foreign or domestic government official or employee. Neither the Company, nor, to the Company's knowledge, any of its officers, directors, agents, employees or any other person acting on behalf of the Company are the subject of any allegation, voluntary disclosure, investigation, prosecution or other enforcement action related to the FCPA or any other anti-corruption law.

2.20 Private Placement. Neither the Company nor its Subsidiary or any 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 any circumstances that would require (i) registration of the Securities under the Securities Act or (ii) cause the offering of the Securities pursuant to this Agreement to be integrated with prior offerings by the Company for purposes of any applicable law, regulation or stockholder approval provisions, including, without limitation, under the rules and regulations of Nasdaq. Assuming the accuracy of the representations and warranties of the Purchasers contained in Article 3 hereof, the issuance of the Securities and the Exercise Shares are exempt from registration under the Securities Act. Neither the Company nor any Person acting on its behalf, has engaged in any form of general solicitation or general advertising (within the meaning of Regulation D promulgated under the Securities Act) in connection with the offer or sale of the Securities.

2.21 No Registration Rights. No Person has the right to (i) prohibit the Company from filing a Registration Statement or (ii) other than as disclosed in the SEC Documents, require the Company to register any securities for sale under the Securities Act by reason of the filing of a Registration Statement except in the case of clause (ii) for rights which have been properly waived. The granting and performance of the registration rights under this Agreement will not violate or conflict with, or result in a breach of any provision of, or constitute a default under, any agreement, indenture, or instrument to which the Company is a party.

2.22 Taxes. The Company has timely filed (or has obtained an extension of time within which to file) all necessary federal, state and foreign income and franchise tax returns and has paid all taxes shown as due on such tax returns, except where the failure to so file or the failure to so pay would not reasonably be expected to have a Material Adverse Effect. There are no unpaid taxes in any material amount claimed by the taxing authority of any jurisdiction to be due by the Company, and, to the Company's knowledge, there is no basis for any such claim.

2.23 Real and Personal Property. The Company has good and marketable title to, or has valid rights to lease or otherwise use, all items of real and personal property that are material to the business of the Company free and clear of all liens, encumbrances, claims and defects and imperfections of title except those that (i) do not materially interfere with the use of such property by the Company or (ii) would not reasonably be expected to have a Material Adverse Effect.

2.24 Application of Takeover Protections. The execution and delivery of this Agreement and the consummation of the transactions contemplated hereby will not impose any restriction on any Purchaser, or create in any party (including any current stockholder of the Company) any rights, under any share acquisition, business combination, poison pill (including any distribution under a rights agreement), or other similar anti-takeover provisions under the Company's Certificate of Incorporation or the laws of its state of incorporation.

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2.25 No Manipulation of Stock. The Company has not taken, nor will it take, directly or indirectly any action designed to stabilize or manipulate the price of the Common Stock or any security of the Company to facilitate the sale or resale of any of the Shares.

2.26 Related-Party Transactions. Except with respect to the transactions (i) that are not required to be disclosed and (ii) contemplated hereby to the extent an Affiliate of any director purchases Securities hereunder, all transactions that have occurred between or among the Company, on the one hand, and any of its officers or directors, or any Affiliate or Affiliates of any such officer or director, on the other hand, prior to the date hereof have been disclosed in the SEC Documents.

2.27 Use of Proceeds. The Company shall use the net proceeds of the sale of the Securities hereunder for research and development of the Company's product candidates, working capital and general corporate purposes.

2.28 Compliance. The Company: (i) is not in default under or in violation of (and no event has occurred that has not been waived that, with notice or lapse of time or both, would result in a default by the Company), nor has the Company received notice of a claim that it is in default under or that it is in violation of, any indenture, loan or credit agreement or any other agreement or instrument to which it is a party or by which it or any of its properties is bound (whether or not such default or violation has been waived); (ii) is not in violation of any judgment, decree, or order of any court, arbitrator or other governmental authority; or (iii) is not nor has it been in violation of any statute, rule, ordinance or regulation of any governmental authority, including without limitation all foreign, federal, state and local laws relating to taxes, environmental protection, occupational health and safety, product quality and safety and employment and labor matters, except in each case as would not reasonably be expected to result in a Material Adverse Effect.

2.29 No Change in Control. The sale of the Securities will not constitute a corporate transaction, as such term is defined in and, for the purposes of any employment agreement between the Company and any of its executive officers. Further, the sale of the Securities will not (a) constitute a change of control of the Company or any similar transaction under (i) the Company's certificate of incorporation or (ii) the Company's bylaws, (b) constitute a breach or default, or provide the basis for termination, of any Material Agreement, or (c) constitute an event that would accelerate any rights or payment obligations under any Material Agreement.

2.30 FDA Compliance. Except as would not, individually or in the aggregate, result in a Material Adverse Effect or as disclosed described in or referred to in the SEC Documents: (i) the Company is and has been in compliance with statutes, laws, ordinances, rules and regulations applicable to the Company for the ownership, testing, development, manufacture, packaging, processing, use, labeling, storage, or disposal of any product manufactured by or on behalf of the Company (a "Company Product"), including without limitation, the Federal Food, Drug, and Cosmetic Act, 21 U.S.C. § 301, et seq., the Public Health Service Act, 42 U.S.C. § 262, similar laws of other governmental entities and the regulations promulgated pursuant to such laws (collectively, "Applicable Laws"); (ii) the Company possesses all licenses, certificates, approvals, authorizations, permits and supplements or amendments thereto required by any such Applicable Laws and/or for the ownership of its properties or the conduct of its business as it relates to a Company Product and as described in the SEC Documents (collectively, "Authorizations") and such Authorizations are valid and in full force and effect and the Company is not in violation of any term of any such Authorizations; (iii) the Company has not received any written notice of adverse finding, warning letter or other written correspondence or notice from the U.S. Food and Drug Administration (the "FDA") or any other governmental entity alleging or asserting noncompliance with any Applicable Laws or Authorizations relating to a Company Product; (iv) the Company has not received written notice of any ongoing claim, action, suit, proceeding, hearing, enforcement, investigation, arbitration or other action from any governmental entity or third party alleging that any Company Product, operation or activity related to a Company Product is in violation of any Applicable Laws or Authorizations or has any knowledge that any such governmental entity or third party is considering any such claim, litigation, arbitration, action, suit, investigation

or proceeding, nor, to the Company's knowledge, has there been any noncompliance with or violation of any Applicable Laws by the Company that would reasonably be expected to require the issuance of any such written notice or result in an investigation, corrective action, or enforcement action by the FDA or similar governmental entity with respect to a Company Product; (v) the Company has not received written notice that any governmental entity has taken, is taking or intends to take action to limit, suspend, modify or revoke any Authorizations or has any knowledge that any such governmental entity has threatened or is considering such action with respect to a Company Product; and (vi) the Company has filed, obtained, maintained or submitted all material reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments as required by any Applicable Laws or Authorizations and that all such reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments were complete, correct and not misleading on the date filed (or were corrected or supplemented by a subsequent submission) in all material respects. To the Company's knowledge, neither the Company nor any of its directors, officers, employees or agents, has made, or caused the making of, any false statements on, or material omissions from, any other records or documentation prepared or maintained to comply with the requirements of the FDA or any other governmental entity related to a Company Product.

2.31 Compliance in Clinical Trials. The clinical studies and tests conducted by the Company or on behalf of the Company, have been and, if still pending, are being conducted in all material respects pursuant to all Applicable Laws and Authorizations; the descriptions of the results of such clinical studies and tests contained in the SEC Documents are accurate and complete in all material respects and fairly present the data derived from such clinical studies and tests.

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2.32 Environmental Laws. The Company (i) is in material 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) has received and is in material compliance with all permits, licenses or other approvals required of them under applicable Environmental Laws to conduct its business and (iii) has not received notice of any actual or potential liability under any environmental law, except where such non-compliance with Environmental Laws, failure to receive required permits, licenses or other approvals, or liability would not, individually or in the aggregate, have a Material Adverse Effect, whether or not arising from transactions in the ordinary course of business. The Company has not been named as a “potentially responsible party” under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended.

2.33 Labor. No labor problem or dispute with the employees of the Company exists or, to the knowledge of the Company, is threatened, 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 could have a Material Adverse Effect, whether or not arising from transactions in the ordinary course of business, except as contemplated in the SEC Documents.

2.34 ERISA. None of the following events has occurred or exists: (i) a failure to fulfill the obligations, if any, under the minimum funding standards of Section 302 of the United States Employee Retirement Income Security Act of 1974, as amended (“ERISA”), and the regulations and published interpretations thereunder with respect to a Plan that is required to be funded, determined without regard to any waiver of such obligations or extension of any amortization period; (ii) an audit or investigation by the Internal Revenue Service, the U.S. Department of Labor, the Pension Benefit Guaranty Corporation or any other federal or state governmental agency or any foreign regulatory agency with respect to the employment or compensation of employees by any of the Company that could have a Material Adverse Effect; (iii) any breach of any contractual obligation, or any violation of law or applicable qualification standards, with respect to the employment or compensation of employees by the Company that would reasonably be expected to have a Material Adverse Effect. None of the following events has occurred or is reasonably likely to occur: (i) a material increase in the aggregate amount of contributions required to be made to all Plans in the current fiscal year of the Company compared to the amount of such contributions made in the most recently completed fiscal year of the Company; (ii) a material increase in the “accumulated post-retirement benefit obligations” (within the meaning of Statement of Financial Accounting Standards 106) of the Company compared to the amount of such obligations in the most recently completed fiscal year of the Company; (iii) any event or condition giving rise to a liability under Title IV of ERISA that could have a Material Adverse Effect; or (iv) the filing of a claim by one or more employees or former employees of the Company related to their employment that could have a Material Adverse Effect. For purposes of this paragraph, the term “Plan” means a plan (within the meaning of Section 3(3) of ERISA) subject to Title IV of ERISA with respect to which the Company may have any liability.

### ARTICLE 3

#### PURCHASER’S REPRESENTATIONS AND WARRANTIES

Each Purchaser represents and warrants to the Company, severally and not jointly, with respect to itself and its purchase hereunder, that:

3.1 Investment Purpose. The Purchaser is purchasing the Securities for its own account and not with a present view toward the public sale or distribution thereof and has no intention of selling or distributing any of such Securities or any arrangement or understanding with any other Persons regarding the sale or distribution of such Securities except in accordance with the provisions of Article 7 and except as would not result in a violation of the Securities Act. The Purchaser will not, directly or indirectly, offer, sell, pledge, transfer or otherwise dispose of (or solicit any offers to buy, purchase or otherwise acquire or take a pledge of) any of the Securities except in accordance with the provisions

of Article 7 or pursuant to and in accordance with the Securities Act.

3.2 Questionnaires. The stock certificate and warrant questionnaire and the registration statement questionnaire submitted by the Purchaser to the Company in connection with its purchase of the Securities were accurate and correct when delivered and are accurate and correct as of the date hereof.

3.3 Reliance on Exemptions. The Purchaser understands that the Securities are being offered and sold to it in reliance upon specific exemptions from the registration requirements of federal and state securities laws and that the Company is relying upon the truth and accuracy of, and the Purchaser's compliance with, the representations, warranties, agreements, acknowledgments and understandings of the Purchaser set forth herein in order to determine the availability of such exemptions and the eligibility of the Purchaser to acquire the Securities.

3.4 Information. The Purchaser has been furnished with all relevant materials relating to the business, finances and operations of the Company necessary to make an investment decision, and materials relating to the offer and sale of the Securities, that have been requested by the Purchaser, including, without limitation, the Company's SEC Documents, and the Purchaser has had the opportunity to review the SEC Documents. The Purchaser has been afforded the opportunity to ask questions of the Company. Neither such inquiries nor any other investigation conducted by or on behalf of such Purchaser or its representatives or counsel shall modify, amend

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or affect such Purchaser's right to rely on the truth, accuracy and completeness of the SEC Documents and the Company's representations and warranties contained in the Agreement.

### 3.5 Acknowledgement of Risk.

(a) The Purchaser acknowledges and understands that its investment in the Securities involves a significant degree of risk, including, without limitation, that: (i) the Company is a business with limited operating history and requires substantial funds in addition to the proceeds from the sale of the Securities; (ii) an investment in the Company is speculative, and only Purchasers who can afford the loss of their entire investment should consider investing in the Company and the Securities; (iii) the Purchaser may not be able to liquidate its investment; (iv) transferability of the Securities is extremely limited; (v) in the event of a disposition of the Securities, the Purchaser could sustain the loss of its entire investment; and (vi) the Company has not paid any dividends on its Common Stock since inception and does not anticipate the payment of dividends in the foreseeable future. Such risks are more fully set forth in the SEC Documents;

(b) The Purchaser is able to bear the economic risk of holding the Securities for an indefinite period, and has knowledge and experience in financial and business matters such that it is capable of evaluating the risks of the investment in the Securities; and

(c) The Purchaser has, in connection with the Purchaser's decision to purchase Securities, not relied upon any representations or other information (whether oral or written) other than as set forth in the representations and warranties of the Company contained herein and the SEC Documents, and the Purchaser has, with respect to all matters relating to this Agreement and the offer and sale of the Securities, relied solely upon the advice of such Purchaser's own counsel and has not relied upon or consulted counsel to the Placement Agent or counsel to the Company.

(d) The Purchaser is an accredited investor as defined in Rule 501(a) of Regulation D promulgated under the Securities Act.

3.6 Governmental Review. The Purchaser understands that no United States federal or state agency or any other government or governmental agency has passed upon or made any recommendation or endorsement of the Securities or an investment therein.

3.7 Transfer or Resale. The Purchaser understands that:

(a) the Securities have not been and are not being registered under the Securities Act (other than as contemplated in Article 6) or any applicable state securities laws and, consequently, the Purchaser may have to bear the risk of owning the Securities for an indefinite period of time because the Securities may not be transferred unless: (i) the resale of the Securities is registered pursuant to an effective Registration Statement under the Securities Act, as contemplated in Article 6; (ii) the Purchaser has delivered to the Company an opinion of counsel (in form, substance and scope customary for opinions of counsel in comparable transactions) to the effect that the Securities to be sold or transferred may be sold or transferred pursuant to an exemption from such registration; (iii) the Securities are sold or transferred pursuant to Rule 144; or (iv) the Purchaser is a partnership transferring to its partners or former partners in accordance with partnership interests or a limited liability company transferring to its members or former members in accordance with their interest in the limited liability company;

(b) any sale of the Securities made in reliance on Rule 144 may be made only in accordance with the terms of Rule 144 and, if Rule 144 is not applicable, any resale of the Securities under circumstances in which the seller (or the Person through whom the sale is made) may be deemed to be an underwriter (as that term is defined in the Securities

Act) may require compliance with some other exemption under the Securities Act or the rules and regulations of the SEC thereunder; and

(c) except as set forth in Article 7, neither the Company nor any other Person is under any obligation to register the resale of the Shares or the Exercise Shares under the Securities Act or any state securities laws or to comply with the terms and conditions of any exemption thereunder.

### 3.8 Legends.

(a) The Purchaser understands that the certificates representing the Securities will bear a restrictive legend in substantially the following form (and a stop-transfer order may be placed against transfer of the certificates for such Securities):

THE SECURITIES REPRESENTED BY THIS CERTIFICATE HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED, OR THE SECURITIES LAWS OF ANY STATE OF THE UNITED STATES. THE SECURITIES MAY NOT BE SOLD, OFFERED FOR SALE, PLEDGED, HYPOTHECATED, TRANSFERRED OR ASSIGNED IN THE ABSENCE OF AN EFFECTIVE REGISTRATION STATEMENT FOR THE SECURITIES UNDER APPLICABLE SECURITIES LAWS, OR UNLESS OFFERED, SOLD, PLEDGED, HYPOTHECATED OR TRANSFERRED PURSUANT TO AN AVAILABLE EXEMPTION FROM THE REGISTRATION REQUIREMENTS OF THOSE LAWS. THE COMPANY SHALL BE ENTITLED TO REQUIRE AN OPINION OF COUNSEL SATISFACTORY TO THE COMPANY THAT SUCH REGISTRATION IS NOT REQUIRED TO THE EXTENT THAT SUCH OPINION IS REQUIRED PURSUANT TO THAT CERTAIN SECURITIES PURCHASE AGREEMENT UNDER WHICH THE SECURITIES WERE ISSUED.

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(b) The Company agrees that at such time as such legend is no longer required under this Section, it will, no later than three business days following the delivery by a Purchaser to the Company or the Company's transfer agent of a certificate representing Shares or Exercise Shares, as applicable, and if such Shares are certificated, issued with a restrictive legend, together with such representations and covenants of such Purchaser or such Purchaser's executing broker as the Company may reasonably require in connection therewith, deliver or cause to be delivered to such Purchaser a certificate or book entry position representing such shares that is free from any legend referring to the Securities Act. The Company shall not make any notation on its records or give instructions to any transfer agent of the Company that enlarge the restrictions on transfer set forth in this Section. Certificates for Securities subject to legend removal hereunder shall be transmitted by the transfer agent of the Company to the Purchasers by crediting the account of such Purchaser's prime broker with the Depository Trust Company (the "DTC"). All costs and expenses related to the removal of the legends and the reissuance of any Securities shall be borne by the Company.

(c) Upon request by a Holder, the Company shall promptly cause the restrictive legend set forth in this section above to be removed and the Company shall issue a certificate or book entry position without such restrictive legend or any other restrictive legend to the holder of the applicable shares upon which it is stamped or issue to such holder by electronic delivery with the applicable balance account at the DTC or in physical certificated shares, if appropriate, if (i) such Shares and Exercise Shares are registered for resale under the Securities Act (provided that, if the Purchaser is selling pursuant to the effective registration statement registering the Securities for resale, the Purchaser agrees to only sell such Shares during such time that such registration statement is effective and such Purchaser is not aware or has not been notified by the Company that such registration statement has been withdrawn or suspended, and only as permitted by such registration statement); (ii) such Shares are sold or transferred pursuant to Rule 144 (if the transferor is not an affiliate of the Company); or (iii) such Shares are eligible for sale without compliance with the 90-day volume restrictions pursuant to Rule 144. Subject to receipt of such representations, and covenants as are contemplated hereby, following the earlier of (i) the effective date of the Registration Statement or (ii) Rule 144 becoming available for the resale of the Shares and Exercise Shares, without compliance with the volume restrictions pursuant to Rule 144, the Company shall issue to the Company's transfer agent the instructions with respect to legend removal consistent with this Section. Following the time a legend is no longer required for the Shares or Exercise Shares under this Section 3.8(c), the Company will, no later than three Business Days following the delivery by a Purchaser to the Company or the Company's transfer agent of a legended certificate representing such securities, (A) deliver or cause to be delivered to such Purchaser a certificate or book entry position representing such securities that is free from all restrictive and other legends or (B) at the request of the Purchaser, cause its transfer agent to issue such Shares and/or Exercise Shares without such legends to the holders thereof by electronic delivery at the applicable balance account at the DTC. Certificates for the Shares or Exercise Shares subject to legend removal hereunder may be transmitted by the Company's transfer agent to a Purchaser by crediting the account of the Purchaser's prime broker with DTC as directed by such Purchaser. Any fees (with respect to the transfer agent, the Company's counsel or otherwise) associated with the issuance of such opinion or the removal of such legend shall be borne by the Company.

3.9 Authorization; Enforcement. The Purchaser has the requisite power and authority to enter into this Agreement and to consummate the transactions contemplated hereby. The Purchaser has taken all necessary action to authorize the execution, delivery and performance of this Agreement. Upon the execution and delivery of this Agreement, this Agreement shall constitute a valid and binding obligation of the Purchaser enforceable in accordance with its terms, except as enforceability may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or similar laws affecting creditors' and contracting parties' rights generally and except as enforceability may be subject to general principles of equity and except as rights to indemnity and contribution may be limited by federal or state securities laws or public policy underlying such laws.

3.10 Residency. The Purchaser is a resident of the jurisdiction set forth immediately below such Purchaser's name on the signature pages hereto.

3.11 No Short Sales. Between the time the Purchaser learned about the Offering and the public announcement of the Offering, the Purchaser has not engaged in any short sales or similar transactions with respect to the Common Stock, nor has the Purchaser, directly or indirectly, caused any Person to engage in any short sales or similar transactions with respect to the Common Stock.

3.12 Acknowledgements Regarding Placement Agent. The Purchaser acknowledges that the Placement Agent is acting as the exclusive placement agent on a “best efforts” basis for the Securities being offered hereby and will be compensated by the Company for acting in such capacity. The Purchaser represents that (i) the Purchaser was contacted regarding the sale of the Securities by the Placement Agent (or an authorized agent or representative thereof) with whom the Purchaser entered into a confidentiality agreement and (ii) no Securities were offered or sold to it by means of any form of general solicitation or general advertising.

3.13 “Bad Actor” Matters. The Purchaser hereby represents that no Disqualification Events (as defined below) are applicable to Purchaser or any of its Rule 506(d) Related Parties (as defined below), except, if applicable, for a Disqualification Event as to which Rule 506(d)(2)(ii) or (iii) or (d)(3) is applicable. Purchaser hereby agrees that it shall notify the Company promptly in writing in the event a Disqualification Event becomes applicable to Purchaser or any of its Rule 506(d) Related Parties, except, if applicable, for a Disqualification Event as to which Rule 506(d)(2)(ii) or (iii) or (d)(3) is applicable. For purposes of this Section 3.13, (a) “Disqualification Event” shall mean any of the “bad actor” disqualifications described in Rule 506(d)(1)(i) through (viii) under the

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Securities Act and (b) “Rule 506(d) Related Party” shall mean a person or entity that is a beneficial owner of Purchaser’s securities for purposes of Rule 506(d) of the Securities Act.

## ARTICLE 4

### COVENANTS

4.1 Reporting Status. The Company’s Common Stock is registered under Section 12(g) of the Exchange Act. During the Registration Period, the Company will use commercially reasonable efforts to timely file all documents with the SEC, and the Company will not terminate its status as an issuer required to file reports under the Exchange Act even if the Exchange Act or the rules and regulations thereunder would permit such termination.

4.2 Expenses. The Company and each Purchaser is liable for, and will pay, its own expenses incurred in connection with the negotiation, preparation, execution and delivery of this Agreement, including, without limitation, attorneys’ and consultants’ fees and expenses; provided that at the Closing the Company will reimburse Venrock Healthcare Capital Partners, L.P. (“Venrock”) and Venrock Healthcare Capital Partners II, L.P. for all documented and reasonable consulting, legal and other out of pocket expenses incurred by them related to the consummation of the transactions contemplated by this Agreement up to a maximum of \$50,000.

4.3 Financial Information. The financial statements of the Company to be included in any documents filed with the SEC will be prepared in accordance with U.S. GAAP, consistently applied (except (i) as may be otherwise indicated in such financial statements or the notes thereto, or (ii) in the case of unaudited interim statements, to the extent they may not include footnotes, may be condensed or summary statements or may conform to the SEC’s rules and instructions for Reports on Form 10-Q), and will fairly present in all material respects the financial position of the Company and results of its operations and cash flows as of, and for the periods covered by, such financial statements (subject, in the case of unaudited statements, to normal and recurring year-end audit adjustments).

4.4 Securities Laws Disclosure; Publicity. On or before 9:30 a.m., New York local time, on June 11, 2015, the Company shall issue a press release announcing the signing of this Agreement and describing the terms of the transactions contemplated by this Agreement. On or before June 16, 2015, the Company shall file a Current Report on Form 8-K with the SEC describing the terms of the transactions contemplated by this Agreement and including as an exhibit to such Current Report on Form 8-K this Agreement and the Forms of Warrant in the form required by the Exchange Act. The Company shall not otherwise publicly disclose the name of any Purchaser (other than in the press release described in this Section 4.4), or include the name of any Purchaser in any filing with the SEC (other than in a Registration Statement and any exhibits to filings made in respect of this transaction in accordance with periodic filing requirements under the Exchange Act) or any regulatory agency, without the prior written consent of such Purchaser, except to the extent such disclosure is required by law or regulations, in which case the Company shall provide the Purchasers with prior notice of such disclosure.

4.5 Sales by Purchasers. Each Purchaser will sell any Securities and Exercise Shares held by it in compliance with applicable prospectus delivery requirements, if any, or otherwise in compliance with the requirements for an exemption from registration under the Securities Act. No Purchaser will make any sale, transfer or other disposition of the Securities in violation of federal or state securities laws.

4.6 Reservation of Common Stock. As of the Closing Date, the Company shall have reserved and shall keep available at all times during which the Warrants remain exercisable, free of preemptive rights, the number of shares of Common Stock issuable upon exercise of the Warrants (without taking into account any limitations on the exercise of the Warrants set forth in the Warrants).

4.7 Certain Board Rights. Effective upon the Closing, for so long as Venrock (with its Affiliates) beneficially owns at least 10% of the outstanding shares of Common Stock (as adjusted for stock splits and combinations) calculated in accordance with Section 13(d) and Rule 13d-3 of the Exchange Act:

(a) The Company shall allow one representative designated by Venrock to attend all meetings of the Company's board of directors and its committees in a nonvoting capacity, and in connection therewith, the Company shall give such representative copies of all notices, minutes, consents and other materials, financial or otherwise, which the Company provides to its board of directors; provided, however, that the Company reserves the right to exclude such representative from access to any material or meeting or portion thereof if the Company reasonably determines upon advice of counsel that such exclusion is reasonably necessary to preserve the attorney-client privilege or to protect highly confidential information;

(b) Venrock shall have the option, upon written notice to the Company, to require the Company's board of directors to authorize and appoint one additional director to serve on the board of directors, such director to be designated by Venrock and reasonably acceptable to the Company (the "Venrock Director"); and

(c) If the Venrock Director has been appointed to the Company's board of directors, the board of directors of the Company shall nominate for approval by the Company's stockholders, at each subsequent annual meeting of the Company's stockholders for the

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election of directors or special meeting for the election of directors, the Venrock Director for re-election to the Company's board of directors; provided that the term of office of the Venrock Director is expiring at such annual meeting or special meeting.

4.8 Compliance with Nasdaq Continued Listing Requirements. The Company will use commercially reasonable efforts to continue the listing and trading of its Common Stock on Nasdaq and, in accordance, therewith, will use commercially reasonable efforts to comply in all respects with the Company's reporting, filing and other obligations under the bylaws or rules of such market or exchange, as applicable. If the per share bid price of the Common Stock does not meet or exceed the \$1.00 minimum bid price requirement imposed by Nasdaq prior to the expiration of the 180-day grace period, the Company shall use commercially reasonable efforts to effect a reverse stock split in order to maintain compliance with the listing requirements for continued listing of the Common Stock on Nasdaq.

4.9 No Integration. The Company shall not, and shall use its commercially reasonable efforts to ensure that no Affiliate of the Company shall, sell, offer for sale or solicit offers to buy or otherwise negotiate in respect of any security (as defined in Section 2 of the Securities Act) that the Company reasonably determines would be integrated with the offer or sale of the Securities in a manner that would require the registration under the Securities Act of the sale of the Securities to the Purchasers, or that the Company reasonably determines would be integrated with the offer or sale of the Securities for purposes of the rules and regulations of Nasdaq such that it would require stockholder approval prior to the closing of such other transaction unless stockholder approval is obtained before the closing of such subsequent transaction.

4.10 Form D; Blue Sky Filings. The Company agrees to timely file a Form D with respect to the Securities as required under Regulation D of the Securities Act and to provide a copy thereof, promptly upon the written request of any Purchaser. The Company, on or before the Closing Date, shall take such action as the Company shall reasonably determine is necessary in order to obtain an exemption from, or to qualify the Securities for, sale to the Purchasers at the Closing pursuant to this Agreement under applicable securities or "Blue Sky" laws of the states of the United States, and shall provide evidence of such actions promptly upon the written request of any Purchaser.

## ARTICLE 5

### CONDITIONS TO CLOSING

5.1 Conditions to Obligations of the Company. The Company's obligation to complete the purchase and sale of the Securities and deliver such stock certificate(s) and Warrants to each Purchaser is subject to the waiver by the Company or fulfillment as of the Closing Date of the following conditions:

(a) Receipt of Funds. The Company shall have received immediately available funds in the aggregate amount of the Purchase Price for the Securities being purchased hereunder as set forth opposite such Purchaser's name on Exhibit A hereto.

(b) Representations and Warranties. The representations and warranties made by each Purchaser in Article 3 shall be true and correct in all material respects as of the Closing Date.

(c) Covenants. All covenants, agreements and conditions contained in this Agreement to be performed by the Purchasers on or prior to the Closing Date shall have been performed or complied with in all material respects.

(d) Absence of Litigation. No proceeding challenging this Agreement or the transactions contemplated hereby, or seeking to prohibit, alter, prevent or materially delay the Closing, shall have been instituted or be pending before any court, arbitrator, governmental body, agency or official.

(e) No Governmental Prohibition. The sale of the Securities by the Company shall not be prohibited by any law or governmental order or regulation.

5.2 Conditions to Purchasers' Obligations at the Closing. Each Purchaser's obligation to complete the purchase and sale of the Securities is subject to the waiver by such Purchaser or fulfillment as of the Closing Date of the following conditions:

(a) Representations and Warranties. The representations and warranties made by the Company in Article 2 shall be true and correct in all material respects as of the date when made and as of the Closing Date (except for those representations and warranties which are qualified as to materiality, in which case, for purposes of the Purchasers' Obligations to Closing, shall be correct as made in Article 2).

(b) Covenants. All covenants, agreements and conditions contained in this Agreement to be performed by the Company on or prior to the Closing Date shall have been performed or complied with in all material respects.

(c) Blue Sky. The Company shall have obtained all necessary blue sky law permits and qualifications, or secured exemptions therefrom, required by any state or foreign or other jurisdiction for the offer and sale of the Securities.

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- (d) Legal Opinion. The Company shall have delivered to such Purchaser an opinion, dated as of the Closing Date, from Cooley LLP, counsel to the Company, in substantially the form attached hereto as Exhibit C hereto.
- (e) Transfer Agent Instructions. The Company shall have delivered to its transfer agent irrevocable instructions to issue to such Purchaser or in such nominee name(s) as designated by such Purchaser in writing such number of Shares set forth opposite such Purchaser's name on Exhibit A hereto or, if requested by the Purchaser, one or more certificates representing such Shares, and Warrants to purchase the Exercise Shares.
- (f) Nasdaq Qualification. The Shares shall be duly authorized for listing by Nasdaq, subject to official notice of issuance, to the extent required by the listing rules of Nasdaq.
- (g) Absence of Litigation. No proceeding challenging this Agreement or the transactions contemplated hereby, or seeking to prohibit, alter, prevent or materially delay the Closing, shall have been instituted or be pending before any court, arbitrator, governmental body, agency or official.
- (h) No Governmental Prohibition. The sale of the Shares by the Company shall not be prohibited by any law or governmental order or regulation.
- (i) Certificate. Each Purchaser shall have received a certificate signed by the Chief Executive Officer or the Chief Financial Officer to the effect that the representations and warranties of the Company in Article 2 hereof are true and correct in all material respects as of, and as if made on, the date of this Agreement and as of the Closing Date and that the Company has satisfied in all material respects all of the conditions set forth in this Section 5.2.
- (j) Good Standing. The Company is validly existing as a corporation in good standing under the laws of Delaware.
- (k) Judgments. No judgment, writ, order, injunction, award or decree of or by any court, or judge, justice or magistrate, including any bankruptcy court or judge, or any order of or by any governmental authority, shall have been issued, and no action or proceeding shall have been instituted by any governmental authority, enjoining or preventing the consummation of the transactions contemplated hereby.
- (l) Stop Orders. No stop order or suspension of trading shall have been imposed by the NASDAQ Global Market, the SEC or any other governmental regulatory body with respect to public trading in the Common Stock.

## ARTICLE 6

### TERMINATION OF OBLIGATIONS TO EFFECT CLOSING; EFFECTS

6.1 The obligations of the Company, on the one hand, and the Purchasers, on the other hand, to effect the Closing shall terminate as follows:

- (a) upon the mutual written consent of the Company and Purchasers that agreed to purchase a majority of the Securities to be issued and sold pursuant to this Agreement;
- (b) by the Company if any of the conditions set forth in Section 5.1 shall have become incapable of fulfillment, and shall not have been waived by the Company; or
- (c) by a Purchaser (with respect to itself only) if any of the conditions set forth in Section 5.2 shall have become incapable of fulfillment, and shall not have been waived by the Purchaser;

provided, however, that, except in the case of clauses (b) and (c) above, the party seeking to terminate its obligation to effect the Closing shall not then be in breach of any of its representations, warranties, covenants or agreements contained in this Agreement if such breach has resulted in the circumstances giving rise to such party's seeking to terminate its obligation to effect the Closing.

6.2 Nothing in this Article 6 shall be deemed to release any party from any liability for any breach by such party of the terms and provisions of this Agreement or to impair the right of any party to compel specific performance by any other party of its obligations under this Agreement.

## ARTICLE 7

### REGISTRATION RIGHTS

7.1 As soon as reasonably practicable, but in no event later than 30 days after the Closing Date (the "Filing Date"), the Company shall file a registration statement covering the resale of the Registrable Securities with the SEC for an offering to be made on a

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continuous basis pursuant to Rule 415, or if Rule 415 is not available for offers and sales of the Registrable Securities, by such other means of distribution of Registrable Securities as the Holders of a majority of the Registrable Securities may reasonably specify (the "Initial Registration Statement"). The Initial Registration Statement shall be on Form S-3 (except if the Company is ineligible to register for resale the Registrable Securities on Form S-3, in which case such registration shall be on another appropriate form) and the Company shall effect the registration, qualifications or compliances (including, without limitation, the execution of any required undertaking to file post-effective amendments, appropriate qualifications or exemptions under applicable blue sky or other state securities laws and appropriate compliance with applicable securities laws, requirements or regulations) as promptly as possible after the filing thereof, but in any event prior to the date which is (x) 90 days after the Closing Date in the event of a "no-review" by the SEC or (z) 135 days after the Closing Date in the event of a full review the SEC (each such date an "Effective Deadline"). For purposes of clarification, any failure by the Company to file the Initial Registration Statement by the Filing Date or to effect such Registration Statement by the Effective Deadline shall not otherwise relieve the Company of its obligations to file or effect the Initial Registration Statement as set forth above in this Section 7.1. In the event the SEC informs the Company that all of the Registrable Securities cannot, as a result of the application of Rule 415, be registered for resale as a secondary offering on a single registration statement, the Company agrees to promptly (i) inform each of the Holders thereof, (ii) use its commercially reasonable efforts to file amendments to the Initial Registration Statement as required by the SEC and/or (iii) withdraw the Initial Registration Statement and file a new registration statement (a "New Registration Statement"), in either case covering the maximum number of Registrable Securities permitted to be registered by the SEC, on Form S-3 or, if the Company is ineligible to register for resale the Registrable Securities on Form S-3, such other form available to register for resale the Registrable Securities as a secondary offering; provided, however, that prior to filing such amendment or New Registration Statement, the Company shall be obligated to use its commercially reasonable efforts to advocate with the SEC for the registration of all of the Registrable Securities. In the event the Company amends the Initial Registration Statement or files a New Registration Statement, as the case may be, under clauses (ii) or (iii) above, the Company will use its commercially reasonable efforts to file with the SEC, as promptly as allowed by the SEC, one or more registration statements on Form S-3 or, if the Company is ineligible to register for resale the Registrable Securities on Form S-3, such other form available to register for resale those Registrable Securities that were not registered for resale on the Initial Registration Statement, as amended, or the New Registration Statement (the "Remainder Registration Statements").

7.2 All fees and expenses incident to the Company's performance of or compliance with its obligations under this Agreement (excluding any underwriting discounts and selling commissions) shall be borne by the Company whether or not any Registrable Securities are sold pursuant to a Registration Statement. The fees and expenses referred to in the foregoing sentence ("Registration Expenses") shall include, without limitation, (i) all registration and filing fees (including, without limitation, fees and expenses (A) with respect to filings required to be made with the Nasdaq (or principal market on which the Common Stock is then listed for trading), and (B) in compliance with applicable state securities or Blue Sky laws), (ii) printing expenses (including, without limitation, expenses of printing certificates for Registrable Securities and of printing prospectuses if the printing of prospectuses is reasonably requested by the holders of a majority of the Registrable Securities included in the Registration Statement), (iii) messenger, telephone and delivery expenses, (iv) reasonable fees and disbursements of counsel for the Company, and (v) Securities Act liability insurance, if the Company so desires such insurance. In addition, the Company shall be responsible for all of its internal expenses incurred in connection with the consummation of the transactions contemplated by this Agreement (including, without limitation, all salaries and expenses of its officers and employees performing legal or accounting duties), the expense of any annual audit and the fees and expenses incurred in connection with the listing of the Registrable Securities on any securities exchange as required hereunder. In no event shall the Company be responsible for any broker or similar commissions of any Holder or, except as set forth above, any legal fees or other costs of the Holders ("Selling Expenses").

7.3 The Company further agrees that, in the event that (i) the Initial Registration Statement has not been filed with the SEC within 30 days after the Closing Date, (ii) the Initial Registration Statement or the New Registration Statement,

as applicable, has not been declared effective by the SEC (a) within 90 days after the Closing Date (in the event of a “no-review” by the SEC), or (b) within 135 days after the Closing Date (in the event of a review by the SEC), or (iii) after such Registration Statement is declared effective by the SEC, is suspended by the Company or ceases to remain continuously effective as to all Registrable Securities for which it is required to be effective, other than, in each case, within the time period(s) permitted by Section 7.7(b) (each such event referred to in clauses (i), (ii) and (iii), (a “Registration Default”)), for all or part of any 30-day period (a “Penalty Period”) during which the Registration Default remains uncured (which initial 30-day period shall commence on the fifth Business Day after the date of such Registration Default if such Registration Default has not been cured by such date), the Company shall pay to each Holder one percent (1.0%) of such Holder’s aggregate purchase price of his or her Securities for each Penalty Period during which the Registration Default remains uncured; provided, however, that if a Holder fails to provide the Company with any material information that is reasonably required to be provided in such Registration Statement with respect to such Holder as set forth herein, then the commencement of the Penalty Period described above for such Holder shall be extended until two Business Days following the date of receipt by the Company of such required information; and provided, further, that in no event shall the Company be required hereunder to pay to any Holder pursuant to this Agreement more than one percent (1.0%) of such Holder’s aggregate purchase price of his or her securities in any Penalty Period and in no event shall the Company be required hereunder to pay to any Holder pursuant to this Agreement an aggregate amount that exceeds ten percent (10%) of the aggregate Purchase Price paid by such Holder for such Holder’s Securities. The Company shall deliver said cash payment to the Holder by the fifth Business Day after the end of such Penalty Period. If the Company fails to pay said cash payment to the Holders in full by the fifth Business Day after the end of such Penalty Period, the Company will

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pay interest thereon at a rate of twelve percent (12%) per annum (or such lesser maximum amount that is permitted to be paid by applicable law) to the Holders, accruing daily from the date such liquidated damages are due until such amounts, plus all such interest thereon, are paid in full. Notwithstanding the foregoing, in the event a Registration Default occurs pursuant to clause (iii) hereof, the 1% of liquidated damages referred to above for any Penalty Period shall be reduced to equal the percentage determined by multiplying 1% by a fraction, the numerator of which shall be the number of Registrable Securities covered by the Registration Statement that is suspended by the Company or ceases to remain continuously effective as to all Registrable Securities for which it is required to be effective which are still Registrable Securities at such time and for which there is not otherwise an effective Registration Statement at such time and the denominator of which shall be the number of Registrable Securities at such time. Notwithstanding the foregoing, nothing shall preclude any Holder from pursuing or obtaining any available remedies at law, specific performance or other equitable relief with respect to this Section 7.3 in accordance with applicable law.

7.4 In the case of the registration, qualification, exemption or compliance effected by the Company pursuant to this Agreement, the Company shall, upon reasonable request, inform each Holder as to the status of such registration, qualification, exemption and compliance. At its expense the Company shall:

(a) except for such times as the Company is permitted hereunder to suspend the use of the prospectus forming part of a Registration Statement pursuant to Section 7.4(h) or 7.7, use its commercially reasonable efforts to keep such registration, and any qualification, exemption or compliance under state securities laws which the Company determines to obtain, continuously effective with respect to a Holder, and to keep the applicable Registration Statement free of any material misstatements or omissions, until the earlier of the following: (i) the second anniversary of the Closing Date or (ii) the date all Shares and Exercise Shares held by such Holder may be sold under Rule 144 during any 90 day period. The period of time during which the Company is required hereunder to keep a Registration Statement effective is referred to herein as the “Registration Period.”

(b) advise the Holders within five Business Days:

(i) when a Registration Statement or any amendment thereto has been filed with the SEC and when such Registration Statement or any post-effective amendment thereto has become effective and shall also advise Holders (A) when a prospectus or any prospectus supplement or post-effective amendment to a Registration Statement is proposed to be filed; (B) when the SEC notifies the Company whether there will be a “review” of such Registration Statement and whenever the SEC comments in writing on such Registration Statement (in which case the Company shall provide true and complete copies thereof and all written responses thereto to each of the Holders that pertain to the Holders as a selling stockholder or to the plan of distribution, but not information which the Company believes would constitute material and non-public information); and (C) with respect to each Registration Statement or any post-effective amendment, when the same has been declared effective;

(ii) of any request by the SEC for amendments or supplements to any Registration Statement or the prospectus included therein or for additional information;

(iii) of the issuance by the SEC of any stop order suspending the effectiveness of any Registration Statement or the initiation of any proceedings for such purpose;

(iv) of the receipt by the Company of any notification with respect to the suspension of the qualification of the Registrable Securities included therein for sale in any jurisdiction or the initiation or threatening of any proceeding for such purpose;

(v) as promptly as reasonably possible provide the Holders true and complete copies of all correspondence from and to the SEC relating to such Registration Statement that pertains to the Holders as selling stockholders but not any

comments that would result in the disclosure to the Holders of material and non-public information concerning the Company; and

(vi) of the occurrence of any event that requires the making of any changes in any Registration Statement or prospectus so that, as of such date, the statements therein are not misleading and do not omit to state a material fact required to be stated therein or necessary to make the statements therein (in the case of a prospectus, in the light of the circumstances under which they were made) not misleading;

(c) use its commercially reasonable efforts to obtain the withdrawal of any order suspending the effectiveness of any Registration Statement as soon as reasonably practicable;

(d) if a Holder so requests in writing, promptly furnish to each such Holder, without charge, at least one copy of each Registration Statement and each post-effective amendment thereto, including financial statements and schedules, and, if explicitly requested, all exhibits in the form filed with the SEC;

(e) during the Registration Period, promptly deliver to each such Holder, without charge, as many copies of each prospectus included in a Registration Statement and any amendment or supplement thereto as such Holder may reasonably request in writing; and the Company consents to the use, consistent with the provisions hereof, of the prospectus or any amendment or supplement thereto by

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each of the selling Holders of Registrable Securities in connection with the offering and sale of the Registrable Securities covered by a prospectus or any amendment or supplement thereto;

(f) during the Registration Period, if a Holder so requests in writing, deliver to each Holder, without charge, (i) one copy of the following documents, other than those documents available via EDGAR: (A) its annual report to its stockholders, if any (which annual report shall contain financial statements audited in accordance with U.S. GAAP by a firm of certified public accountants of recognized standing); (B) if not included in substance in its annual report to stockholders, its annual report on Form 10-K (or similar form); (C) its definitive proxy statement with respect to its annual meeting of stockholders; (D) each of its quarterly reports to its stockholders, and, if not included in substance in its quarterly reports to stockholders, its quarterly report on Form 10-Q (or similar form); and (E) a copy of each full Registration Statement (the foregoing, in each case, excluding exhibits), and (ii) if explicitly requested, all exhibits excluded by the parenthetical to the immediately preceding clause (E);

(g) prior to any public offering of Registrable Securities pursuant to any Registration Statement, promptly take such actions as may be necessary to register or qualify or obtain an exemption for offer and sale under the securities or blue sky laws of such United States jurisdictions as any such Holders reasonably request in writing, provided that the Company shall not for any such purpose be required to qualify generally to transact business as a foreign corporation in any jurisdiction where it is not so qualified or to consent to general service of process in any such jurisdiction, and do any and all other acts or things reasonably necessary or advisable to enable the offer and sale in such jurisdictions of the Registrable Securities covered by any such Registration Statement;

(h) upon the occurrence of any event contemplated by Section 7.4(b)(v) above, except for such times as the Company is permitted hereunder to suspend the use of a prospectus forming part of a Registration Statement pursuant to Section 7.7, the Company shall use its commercially reasonable efforts to promptly prepare a post-effective amendment to such Registration Statement or a supplement to the related prospectus, or file any other required document so that, as thereafter delivered to purchasers of the Registrable Securities included therein, such prospectus will not include any untrue statement of a material fact or omit to state any material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading;

(i) otherwise use its commercially reasonable efforts to comply in all material respects with all applicable rules and regulations of the SEC which could affect the sale of the Registrable Securities;

(j) use its commercially reasonable efforts to cause all Registrable Securities to be listed on each securities exchange or market, if any, on which equity securities issued by the Company have been listed;

(k) use its commercially reasonable efforts to take all other steps necessary to effect the registration of the Registrable Securities contemplated hereby and to enable the Holders to sell Registrable Securities under Rule 144;

(l) provide to each Holder and its representatives, if requested, the opportunity to conduct a reasonable inquiry of the Company's financial and other records during normal business hours and make available its officers, directors and employees for questions regarding information which such Holder may reasonably request in order to fulfill any due diligence obligation on its part;

(m) permit a single counsel for the Holders to review any Registration Statement and all amendments and supplements thereto, within two Business Days prior to the filing thereof with the SEC;

provided that, in the case of clauses (l) and (m) above, the Company shall not be required (A) to delay the filing of any Registration Statement or any amendment or supplement thereto as a result of any ongoing diligence inquiry by or on behalf of a Holder or to incorporate any comments to any Registration Statement or any amendment or supplement

thereto by or on behalf of a Holder if such inquiry or comments would require a delay in the filing of such Registration Statement, amendment or supplement, as the case may be, or (B) to provide, and shall not provide, any Holder or its representatives with material, non-public information unless such Holder agrees to receive such information and enters into a written confidentiality agreement with the Company in a form reasonably acceptable to the Company; and

(n) cooperate with the Holders to facilitate the timely preparation and delivery of certificates or book entry positions representing Registrable Securities to be delivered to a transferee pursuant to the Registration Statements, which certificates or book entry positions shall be free, to the extent permitted by the Purchase Agreement, of all restrictive legends, and to enable such Registrable Securities to be in such denominations and registered in such names as any such Holders may request.

7.5 The Holders shall have no right to take any action to restrain, enjoin or otherwise delay any registration pursuant to Section 7.1 hereof as a result of any controversy that may arise with respect to the interpretation or implementation of this Agreement.

7.6 (a) To the fullest extent permitted by applicable law, the Company shall indemnify each Holder and each Person controlling such Holder within the meaning of Section 15 of the Securities Act, with respect to which any registration that has been effected pursuant to this Agreement, against all claims, losses, damages, liabilities and costs (including, without limitation, reasonable costs of preparation and reasonable attorneys' fees) (or action in respect thereof) (collectively, "Losses"), including any of the foregoing incurred in settlement of any litigation, commenced or threatened (subject to Section 7.6 (c) below), arising out of or based on any

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untrue statement (or alleged untrue statement) of a material fact contained in any Registration Statement, prospectus, any amendment or supplement thereof, or other document incident to any such registration, qualification or compliance or based on any omission (or alleged omission) to state therein a material fact required to be stated therein or necessary to make the statements therein not misleading, in light of the circumstances in which they were made, or any violation by the Company of any rule or regulation promulgated by the Securities Act applicable to the Company and relating to any action or inaction required of the Company in connection with any such registration, qualification or compliance, and will reimburse each Holder and each Person controlling such Holder, for reasonable legal and other out-of-pocket expenses reasonably incurred in connection with investigating or defending any such Losses; provided that the Company will not be liable in any such case to the extent that any untrue statement or omission or allegation thereof are based is made in reliance upon and in conformity with written information furnished to the Company by or on behalf of such Holder for use in preparation of any Registration Statement, prospectus, amendment or supplement and expressly approved in writing by such Holder expressly for use in the Registration Statement, such prospectus or such form of prospectus or in any amendment or supplement thereto; provided further, that the Company will not be liable in any such case where the Losses arise out of or are related to the failure of such Holder to comply with the covenants and agreements contained in this Agreement respecting sales of Registrable Securities, and except that the foregoing indemnity agreement is subject to the condition that, insofar as it relates to any such untrue statement or alleged untrue statement or omission or alleged omission made in any preliminary prospectus but eliminated or remedied in the amended prospectus on file with the SEC at the time any Registration Statement becomes effective or in an amended prospectus filed with the SEC pursuant to Rule 424(b) which meets the requirements of Section 10(a) of the Securities Act (each, a "Final Prospectus"), such indemnity shall not inure to the benefit of any such Holder or any such controlling person, if a copy of a Final Prospectus furnished by the Company to the Holder for delivery was not furnished to the Person asserting the Losses at or prior to the time such furnishing is required by the Securities Act and a Final Prospectus would have cured the defect giving rise to such Losses.

(b) Each Holder will severally, and not jointly, indemnify the Company, each of its directors and officers, and each Person who controls the Company within the meaning of Section 15 of the Securities Act, against all claims, losses, damages and liabilities (or actions in respect thereof), including any of the foregoing incurred in settlement of any litigation, commenced or threatened (subject to Section 7.6 (c) below), arising out of or based on any untrue statement (or alleged untrue statement) of a material fact contained in any Registration Statement, prospectus, or any amendment or supplement thereof, incident to any such registration, or based on any omission (or alleged omission) to state therein a material fact required to be stated therein or necessary to make the statements therein not misleading, in light of the circumstances in which they were made where such material misstatement or omission is based upon and in conformity with written information furnished in writing to the Company by or on behalf of such Holder for use in preparation of any Registration Statement, prospectus, amendment or supplement, and expressly approved in writing by such Holder expressly for use in the Registration Statement, such prospectus or such form of prospectus or in any amendment or supplement thereto, and will reimburse the Company, such directors and officers, and each Person controlling the Company for reasonable legal and any other expenses reasonably incurred in connection with investigating or defending any such claim, loss, damage, liability or action as incurred, in each case to the extent, but only to the extent, that such untrue statement or omission or allegation thereof is made in reliance upon and in conformity with such written information furnished to the Company by or on behalf of the Holder for use in preparation of any Registration Statement, prospectus, amendment or supplement; provided that the indemnity shall not apply to the extent that such claim, loss, damage or liability results from the fact that a current copy of a prospectus was not made available to the Person asserting the loss, liability, claim or damage at or prior to the time such furnishing is required by the Securities Act and a Final Prospectus would have cured the defect giving rise to such loss, claim, damage or liability. Notwithstanding the foregoing, a Holder's aggregate liability pursuant to this subsection (b) and subsection (d) shall be limited to the net amount received by the Holder from the sale of the Registrable Securities.

(c) Each party entitled to indemnification under this Section 7.6 (the “Indemnified Party”) shall give notice to the party required to provide indemnification (the “Indemnifying Party”) promptly after such Indemnified Party has actual knowledge of any claim as to which indemnity may be sought, and shall permit the Indemnifying Party (at its expense) to assume the defense of any such claim or any litigation resulting therefrom, provided that counsel for the Indemnifying Party, who shall conduct the defense of such claim or litigation, shall be approved by the Indemnified Party (whose approval shall not unreasonably be withheld), and the Indemnified Party may participate in such defense, and provided further that the failure of any Indemnified Party to give notice as provided herein shall not relieve the Indemnifying Party of its obligations under this Agreement, unless such failure is materially prejudicial to the Indemnifying Party in defending such claim or litigation. An Indemnified Party shall have the right to employ separate counsel in any such proceeding and to participate in the defense thereof, but the fees and expenses of such counsel shall be at the expense of such Indemnified Party or Parties unless: (1) the Indemnifying Party has agreed in writing to pay such fees and expenses; (2) the Indemnifying Party shall have failed promptly to assume the defense of such proceeding and to employ counsel reasonably satisfactory to such Indemnified Party in any such proceeding; or (3) the named parties to any such proceeding (including any impleaded parties) include both such Indemnified Party and the Indemnifying Party, and such Indemnified Party shall have been advised by counsel that a conflict of interest is likely to exist if the same counsel were to represent such Indemnified Party and the Indemnifying Party (in which case, if such Indemnified Party notifies the Indemnifying Party in writing that it elects to employ separate counsel at the expense of the Indemnifying Party, the Indemnifying Party shall not have the right to assume the defense thereof and such counsel shall be at the expense of the Indemnifying Party); provided, that the Indemnifying Party shall not be liable for the fees and expenses of more than one separate firm of attorneys at any time for all Indemnified Parties pursuant to this Section

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7.6(c). An Indemnifying Party shall not be liable for any settlement of an action or claim effected without its written consent (which consent will not be unreasonably withheld). No Indemnifying Party, in its defense of any such claim or litigation, shall, except with the consent of each Indemnified Party, consent to entry of any judgment or enter into any settlement which does not include as an unconditional term thereof the giving by the claimant or plaintiff to such Indemnified Party of a release from all liability in respect to such claim or litigation. Each Indemnified Party shall furnish such information regarding itself or the claim in question as an Indemnifying Party may reasonably request in writing and as shall be reasonably required in connection with defense of such claim and litigation resulting therefrom.

All fees and expenses of the Indemnified Party (including reasonable fees and expenses to the extent incurred in connection with investigating or preparing to defend such proceeding in a manner not inconsistent with this Section) shall be paid to the Indemnified Party, as incurred, within ten (10) Business Days of written notice thereof to the Indemnifying Party (regardless of whether it is ultimately determined that an Indemnified Party is not entitled to indemnification hereunder; provided, that the Indemnifying Party may require such Indemnified Party to undertake to reimburse all such fees and expenses to the extent it is finally judicially determined that such Indemnified Party is not entitled to indemnification hereunder).

(d) If the indemnification provided for in this Section 7.6 is held by a court of competent jurisdiction to be unavailable to an Indemnified Party with respect to any Losses referred to therein, then the Indemnifying Party, in lieu of indemnifying such Indemnified Party thereunder, shall contribute to the amount paid or payable by such Indemnified Party as a result of such loss, liability, claim, damage or expense in such proportion as is appropriate to reflect the relative fault of the Indemnifying Party on the one hand and of the Indemnified Party on the other in connection with the statements or omissions which resulted in such Losses as well as any other relevant equitable considerations. The relative fault of the Indemnifying Party and of the Indemnified Party shall be determined by reference to, among other things, whether the untrue or alleged untrue statement of a material fact or the omission to state a material fact relates to information supplied by the Indemnifying Party or by the Indemnified Party and the parties' relative intent, knowledge, access to information and opportunity to correct or prevent such statement or omission. Notwithstanding the provisions of this Section 7.6(d), no Holder shall be required to contribute, in the aggregate, any amount in excess of the amount by which the net proceeds actually received by such Holder from the sale of the Registrable Securities subject to the indemnification hereunder exceeds the amount of any damages that such Holder has otherwise been required to pay by reason of such untrue or alleged untrue statement or omission or alleged omission. No person guilty of fraudulent misrepresentation (within the meaning of Section 11(f) of the Securities Act) shall be entitled to contribution from any person who was not guilty of such fraudulent misrepresentation.

The indemnity and contribution agreements contained in this Article 7 are in addition to any liability that the Indemnifying Parties may have to the Indemnified Parties and are not in diminution or limitation of the indemnification provisions under the Purchase Agreement.

7.7 (a) Each Holder agrees that, upon receipt of any notice from the Company of the happening of any event requiring the preparation of a supplement or amendment to a prospectus relating to Registrable Securities so that, as thereafter delivered to the Holders, such prospectus shall not contain an 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, each Holder will forthwith discontinue disposition of Registrable Securities pursuant to a Registration Statement and prospectus contemplated by Section 7.1 until its receipt of copies of the supplemented or amended prospectus from the Company and, if so directed by the Company, each Holder shall deliver to the Company all copies, other than permanent file copies then in such Holder's possession, of the prospectus covering such Registrable Securities current at the time of receipt of such notice.

(b) Each Holder shall suspend, upon request of the Company, any disposition of Registrable Securities pursuant to any Registration Statement and prospectus contemplated by Section 7.1 during no more than two periods of no more than 30 calendar days each during any 12-month period to the extent that the board of directors of the Company determines in good faith that the sale of Registrable Securities under any such Registration Statement would be reasonably likely to cause a violation of the Securities Act or Exchange Act.

(c) As a condition to the inclusion of its Registrable Securities, each Holder shall furnish to the Company such information regarding such Holder and the distribution proposed by such Holder as the Company may reasonably request in writing, including completing a Registration Statement Questionnaire in the form provided by the Company, or as shall be required in connection with any registration referred to in this Article 7.

(d) Each Holder hereby covenants with the Company not to make any sale of the Registrable Securities without effectively causing the prospectus delivery requirements under the Securities Act to be satisfied.

(e) Each Holder agrees not to take any action with respect to any distribution deemed to be made pursuant to a Registration Statement which would constitute a violation of Regulation M under the Exchange Act or any other applicable rule, regulation or law.

(f) At the end of the Registration Period the Holders shall discontinue sales of shares pursuant to any Registration Statement upon receipt of notice from the Company of its intention to remove from registration the shares covered by any such Registration Statement

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which remain unsold, and such Holders shall notify the Company of the number of shares registered which remain unsold immediately upon receipt of such notice from the Company.

7.8 With a view to making available to the Holders the benefits of certain rules and regulations of the SEC which at any time permit the sale of the Registrable Securities to the public without registration, so long as the Holders still own Registrable Securities, the Company shall use its reasonable best efforts to:

(a) make and keep public information available, as those terms are understood and defined in Rule 144 under the Securities Act, at all times;

(b) file with the SEC in a timely manner all reports and other documents required of the Company under the Exchange Act; and

(c) so long as a Holder owns any Registrable Securities, furnish to such Holder, upon any reasonable request, a written statement by the Company as to its compliance with Rule 144 under the Securities Act, and of the Exchange Act, a copy of the most recent annual or quarterly report of the Company, and such other reports and documents of the Company as such Holder may reasonably request in availing itself of any rule or regulation of the SEC allowing a Holder to sell any such securities without registration.

7.9 The rights to cause the Company to register Registrable Securities granted to the Holders by the Company under Section 7.1 may be assigned by a Holder in connection with a transfer by such Holder of all or a portion of its Registrable Securities, provided, however, that (i) such transfer must be effected in accordance with applicable securities laws; (ii) such Holder gives prior written notice to the Company at least ten (10) days prior to the proposed transfer; and (iii) such transferee agrees to comply with the terms and provisions of this Agreement, and such transfer is otherwise in compliance with this Agreement.

7.10 Prior to the time that Registration Statement(s) covering the resale of all Registrable Securities have been declared effective by the SEC, the Company shall not file with the SEC a registration statement under the Securities Act of any of its equity securities other than a registration statement required to be filed pursuant to this Agreement, a registration statement on Form S-8 or, in connection with an acquisition, a registration statement on Form S-4; provided, however, that the foregoing restrictions in this Section 7.10 shall terminate upon such time as all of the Registrable Securities (i) have been publicly sold by the Holders or (ii) may be sold under Rule 144 during any 90 day period.

7.11 The rights of any Holder under any provision of this Article 7 may be waived (either generally or in a particular instance, either retroactively or prospectively and either for a specified period of time or indefinitely) or amended by an instrument in writing signed by such Holder.

7.12 The Notwithstanding anything to the contrary contained in this Agreement, in the event the staff of the SEC (the "Staff") or the SEC seeks to characterize any offering pursuant to a Registration Statement filed pursuant to this Agreement as constituting an offering of securities by, or on behalf of, the Company, or in any other manner, such that the Staff or the SEC do not permit such Registration Statement to become effective and used for resales in a manner that does not constitute such an offering and that permits the continuous resale at the market by the Holders participating therein (or as otherwise may be acceptable to each Holder) without being named therein as an "underwriter," then the Company shall reduce the number of shares to be included in such Registration Statement by all Holders until such time as the Staff and the SEC shall so permit such Registration Statement to become effective as aforesaid. In making such reduction, the Company shall reduce the number of shares to be included by all Holders on a pro rata basis (based upon the number of Registrable Securities otherwise required to be included for each Holder) unless the inclusion of shares by a particular Holder or a particular set of Holders are resulting in the Staff or the SEC's

“by or on behalf of the Company” offering position, in which event the shares held by such Holder or set of Holders shall be the only shares subject to reduction (and if by a set of Holders on a pro rata basis by such Holders or on such other basis as would result in the exclusion of the least number of shares by all such Holders). In addition, in the event that the Staff or the SEC requires any Holder seeking to sell securities under a Registration Statement filed pursuant to this Agreement to be specifically identified as an “underwriter” in order to permit such Registration Statement to become effective, and such Holder does not consent to being so named as an underwriter in such Registration Statement, then, in each such case, the Company shall reduce the total number of Registrable Securities to be registered on behalf of such Holder, until such time as the Staff or the SEC does not require such identification or until such Holder accepts such identification and the manner thereof. Any reduction pursuant to this paragraph will first reduce all securities that are not Registrable Securities and then to the Holders pro rata in accordance with the number of such Registrable Securities sought to be included in such Registration Statement by reference to the amount of Registrable Securities set forth opposite such Holder’s name on Exhibit A (and in the case of a subsequent transfer, the initial Holder’s) relative to the aggregate amount of all Registrable Securities. In the event of any reduction in Registrable Securities pursuant to this paragraph, an affected Holder shall have the right to require, upon delivery of a written request to the Company signed by such Holder, the Company to file a registration statement within 30 days of such request (subject to any restrictions imposed by Rule 415 or required by the Staff or the SEC) for resale by such Holder in a manner acceptable to such Holder, and the Company shall following such request cause to be and keep effective such registration statement in the same manner as otherwise contemplated in this Agreement for registration statements hereunder, in each case until such time as: (i) all Registrable Securities held by such Holder have been registered and sold pursuant to an effective Registration Statement in a manner acceptable to such Holder; or (ii) all Registrable Securities may be resold by such Holder without restriction (including, without limitation, volume

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limitations) pursuant to Rule 144 (taking account of any Staff position with respect to “affiliate” status) and without the need for current public information required by Rule 144(c)(1) (or Rule 144(i)(2), if applicable); or (iii) such Holder agrees to be named as an underwriter in any such Registration Statement in a manner acceptable to such Holder as to all Registrable Securities held by such Holder and that have not theretofore been included in a Registration Statement under this Agreement (it being understood that the special demand right under this sentence may be exercised by an Holder multiple times and with respect to limited amounts of Registrable Securities in order to permit the resale thereof by such Holder as contemplated above). Any reduction made to securities included in a Registration Statement in accordance with this Section 7.12 shall not constitute a Registration Default and shall not be subject to the payment requirements under Section 7.3.

## ARTICLE 8

### DEFINITIONS

8.1 “Agreement” has the meaning set forth in the preamble.

8.2 “Affiliate” means, with respect to any Person (as defined below), any other Person controlling, controlled by or under direct or indirect common control with such Person (for the purposes of this definition “control,” when used with respect to any specified Person, shall mean the power to direct the management and policies of such person, directly or indirectly, whether through ownership of voting securities, by contract or otherwise; and the terms “controlling” and “controlled” shall have meanings correlative to the foregoing).

8.2 “Applicable Laws” has the meaning set forth in Section 2.30.

8.3 “Authorizations” has the meaning set forth in Section 2.30.

8.4 “Business Day” means a day Monday through Friday on which banks are generally open for business in New York City.

8.5 “Bylaws” has the meaning set forth in Section 2.3.

8.6 “Certificate of Incorporation” has the meaning set forth in Section 2.3.

8.7 “Closing” has the meaning set forth in Section 1.3.

8.8 “Closing Date” has the meaning set forth in Section 1.3.

8.9 “Common Stock” means the common stock, par value \$0.001 per share, of the Company.

8.10 “Company” has the meaning set forth in the preamble.

8.11 “Company Product” has the meaning set forth in Section 2.30.

8.11 “Disqualification Event” has the meaning set forth in Section 3.13.

8.12 “DTC” has the meaning set forth in Section 3.8(b).

8.13 “Effective Deadline” has the meaning set forth in Section 7.1.

8.14 “Environmental Laws” has the meaning set forth in section 2.32.

8.15 “ERISA” has the meaning set forth in Section 2.34.

8.16 “Evaluation Date” has the meaning set forth in Section 2.7.

8.17 “Exchange Act” means the Securities Exchange Act of 1934, as amended.

8.18 “FCPA” has the meaning set forth in Section 2.18.

8.19 “FDA” has the meaning set forth in Section 2.30.

8.20 “Filing Date” has the meaning set forth in Section 7.1.

8.21 “Final Prospectus” has the meaning set forth in Section 7.6(a).

8.22 “Financial Statements” means the financial statements of the Company included in the SEC Documents.

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8.23 “Financing” has the meaning set forth in Section 8.14.

8.24 “Holders” means any person holding Registrable Securities or any person to whom the rights under Article 7 have been transferred in accordance with Section 7.9 hereof.

8.25 “Indemnified Party” has the meaning set forth in Section 7.6(c).

8.26 “Indemnifying Party” has the meaning set forth in Section 7.6(c).

8.27 “Initial Registration Statement” has the meaning set forth in Section 7.1.

8.28 “Intellectual Property” has the meaning set forth in Section 2.10.

8.29 “Investment Company Act” has the meaning set forth in Section 2.12.

8.30 “Losses” has the meaning set forth in Section 7.6(a).

8.31 “Material Adverse Effect” means a material adverse effect on (a) the business, operations, assets or financial condition of the Company, taken as a whole, or (b) the ability of the Company to perform its obligations pursuant to the transactions contemplated by this Agreement.

8.27 “Material Agreements” has the meaning set forth in Section 2.6.

8.28 “Nasdaq” means The Nasdaq Stock Market LLC.

8.29 “New Registration Statement” has the meaning set forth in Section 7.1.

8.30 “Offering” means the private placement of the Company’s Securities contemplated by this Agreement.

8.31 “Penalty Period” has the meaning set forth in Section 7.3.

8.32 “Person” means any person, individual, corporation, limited liability company, partnership, trust or other nongovernmental entity or any governmental agency, court, authority or other body (whether foreign, federal, state, local or otherwise).

8.33 “Placement Agent” means MTS Health Partners.

8.34 “Preferred Stock” means the preferred stock, par value \$0.001 per share, of the Company.

8.35 “Purchasers” has the meaning set forth in the preamble.

8.36 “Purchase Price” has the meaning set forth in Section 1.1.

8.37 The terms “register,” “registered” and “registration” refer to the registration effected by preparing and filing a registration statement in compliance with the Securities Act, and the declaration or ordering of the effectiveness of such registration statement.

8.38 “Registrable Securities” means (i) the Shares and (ii) the Exercise Shares; provided, however, that securities shall only be treated as Registrable Securities if and only for so long as they (A) have not been disposed of pursuant to a

registration statement declared effective by the SEC, (B) have not been sold in a transaction exempt from the registration and prospectus delivery requirements of the Securities Act so that all transfer restrictions and restrictive legends with respect thereto are removed upon the consummation of such sale or (C) are held by a Holder or a permitted transferee pursuant to Section 7.9.

8.39 “Registration Default” has the meaning set forth in Section 7.3.

8.40 “Registration Expenses” has the meaning set forth in Section 7.2.

8.41 “Registration Statement” means any one or more registration statements of the Company filed under the Securities Act that covers the resale of any of the Registrable Securities pursuant to the provisions of this Agreement (including without limitation the Initial Registration Statement, the New Registration Statement and any Remainder Registration Statements) and amendments and supplements to such Registration Statements, including post-effective amendments.

8.42 “Registration Period” has the meaning set forth in Section 7.4(a).

8.43 “Remainder Registration Statement” has the meaning set forth in Section 7.1.

8.44 “Rule 144” means Rule 144 promulgated under the Securities Act, or any successor rule.

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8.45 “Rule 415” means Rule 415 promulgated under the Securities Act, or any successor rule.

8.46 “Rule 506(d) Related Party” shall have the meaning set forth in Section 3.13.

8.47 “SEC” means the United States Securities and Exchange Commission.

8.48 “SEC Documents” has the meaning set forth in Section 2.6.

8.49 “Securities” has the meaning set forth in Section 1.1.

8.50 “Securities Act” means the Securities Act of 1933, as amended, and the rules and regulations thereunder, or any similar successor statute.

8.51 “Selling Expenses” has the meaning set forth in Section 7.2.

8.52 “Shares” has the meaning set forth in Section 1.1.

8.53 “Staff” has the meaning set forth in Section 7.12.

8.54 “Stock Purchase Price” has the meaning set forth in Section 1.1.

8.55 “Subsidiary” of any person shall mean any corporation, partnership, limited liability company, joint venture or other legal entity of which such Person (either above or through or together with any other subsidiary) owns, directly or indirectly, more than 50% of the stock or other equity interests the holders of which are generally entitled to vote for the election of the board of directors or other governing body of such corporation or other legal entity.

8.56 “U.S. GAAP” has the meaning set forth in Section 2.6.

8.57 “Venrock” has the meaning set forth in Section 4.7.

8.58 “Venrock Director” has the meaning set forth in Section 4.7.

8.59 “Exercise Shares” has the meaning set forth in Section 2.4.

8.60 “Warrants” has the meaning set forth in Section 1.1.

## ARTICLE 9

### GOVERNING LAW; MISCELLANEOUS

9.1 Governing Law; Jurisdiction. This Agreement will be governed by and interpreted in accordance with the laws of the State of New York without regard to the principles of conflict of laws.

9.2 Counterparts; Signatures by Facsimile. This Agreement may be executed in two or more counterparts, all of which are considered one and the same agreement and will become effective when counterparts have been signed by each party and delivered to the other parties. This Agreement, once executed by a party, may be delivered to the other parties hereto by facsimile or e-mail transmission of a copy of this Agreement bearing the signature of the party so delivering this Agreement.

9.3 Headings. The headings of this Agreement are for convenience of reference only, are not part of this Agreement and do not affect its interpretation.

9.4 Severability. If any provision of this Agreement is invalid or unenforceable under any applicable statute or rule of law, then such provision will be deemed modified in order to conform with such statute or rule of law. Any provision hereof that may prove invalid or unenforceable under any law will not affect the validity or enforceability of any other provision hereof.

9.5 Entire Agreement; Amendments. This Agreement (including all schedules and exhibits hereto) constitutes the entire agreement 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 or therein. This Agreement supersedes all prior agreements and understandings among the parties hereto with respect to the subject matter hereof. No provision of this Agreement may be waived or amended other than by an instrument in writing signed by the party to be charged with enforcement. Any amendment or waiver by a party effected in accordance with this Section 9.5 shall be binding upon such party, including with respect to any Securities purchased under this Agreement at the time outstanding and held by such party (including securities into which such Securities are convertible and for which such Securities are exercisable) and each future holder of all such securities.

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9.6 Notices. All notices required or permitted hereunder shall be in writing and shall be deemed effectively given: (a) upon personal delivery to the party to be notified, (b) when sent by confirmed email, telex or facsimile if sent during normal business hours of the recipient, if not, then on the next Business Day, (c) five days after having been sent by registered or certified mail, return receipt requested, postage prepaid, or (d) one Business Day after deposit with a nationally recognized overnight courier, specifying next day delivery, with written verification of receipt. The addresses for such communications are:

If to the Company: ARCA biopharma, Inc.  
11080 CirclePoint Rd., Suite 140  
Westminster, CO 80020  
Facsimile: (720) 208-9261  
Attn: Chief Accounting Officer  
cc: General Counsel

With a copy to: Cooley LLP  
380 Interlocken Crescent, Suite 900  
Broomfield, CO 80021  
Attn: Brent Fassett

If to a Purchaser: To the address set forth immediately below such Purchaser's name on the signature pages hereto. Each party will provide 10 days' advance written notice to the other parties of any change in its address.

9.7 Successors and Assigns. This Agreement is binding upon and inures to the benefit of the parties and their successors and assigns. The Company will not assign this Agreement or any rights or obligations hereunder without the prior written consent of the Purchasers, and no Purchaser may assign this Agreement or any rights or obligations hereunder without the prior written consent of the Company, except as permitted in accordance with Section 6.9 hereof.

9.8 Third-Party Beneficiaries. This Agreement is intended for the benefit of the parties hereto, their respective permitted successors and assigns and the Placement Agent, and is not for the benefit of, nor may any provision hereof be enforced by, any other Person.

9.9 Further Assurances. Each party will do and perform, or cause to be done and performed, all such further acts and things, and will execute and deliver all other agreements, certificates, instruments and documents, as another 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.

9.10 No Strict Construction. The language used in this Agreement is 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.

9.11 Equitable Relief. The Company recognizes that, if it fails to perform or discharge any of its obligations under this Agreement, any remedy at law may prove to be inadequate relief to the Purchasers. The Company therefore agrees that the Purchasers are entitled to seek temporary and permanent injunctive relief in any such case. Each Purchaser also recognizes that, if it fails to perform or discharge any of its obligations under this Agreement, any remedy at law may prove to be inadequate relief to the Company. Each Purchaser therefore agrees that the Company is entitled to seek temporary and permanent injunctive relief in any such case.

9.12 Survival of Representations and Warranties. Notwithstanding any investigation made by any party to this Agreement, all representations and warranties made by the Company and the Purchasers herein shall survive for a period of one year following the date hereof.

9.13 Independent Nature of Purchasers' Obligations and Rights. The obligations of each Purchaser under this Agreement are several and not joint with the obligations of any other Purchaser, and no Purchaser shall be responsible in any way for the performance of the obligations of any other Purchaser under this Agreement. Nothing contained herein and no action taken by any Purchaser pursuant thereto, shall be deemed to constitute the Purchasers as a partnership, an association, a joint venture or any other kind of entity, or create a presumption that the Purchasers are in any way acting in concert or as a group, or are deemed affiliates with respect to such obligations or the transactions contemplated by this Agreement. Each Purchaser shall be entitled to independently protect and enforce its rights, including without limitation the rights arising out of this Agreement, and it shall not be necessary for any other Purchaser to be joined as an additional party in any proceeding for such purpose.

9.14 Waiver of Conflicts. Each Purchaser acknowledges that Cooley LLP, outside general counsel to the Company, has in the past performed and is or may now or in the future represent one or more Purchasers or their affiliates in matters unrelated to the transactions contemplated by this Agreement (the "Financing"), including representation of such Purchasers or their affiliates in matters of a similar nature to the Financing. The applicable rules of professional conduct require that Cooley LLP inform the

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Purchasers hereunder of this representation and obtain their consent. Cooley LLP has served as outside general counsel to the Company and has negotiated the terms of the Financing solely on behalf of the Company. Each Purchaser hereby (a) acknowledges that they have had an opportunity to ask for and have obtained information relevant to such representation, including disclosure of the reasonably foreseeable adverse consequences of such representation; (b) acknowledges that with respect to the Financing, Cooley LLP has represented solely the Company, and not any Purchaser or any stockholder, director or employee of the Company or any Purchaser; and (c) gives its informed consent to Cooley LLP's representation of the Company in the Financing.

9.15 Replacement of Shares or Warrants. If the Shares are certificated and any certificate or instrument evidencing any Shares or Warrants is mutilated, lost, stolen or destroyed, the Company shall issue or cause to be issued in exchange and substitution for and upon cancellation thereof, or in lieu of and substitution therefor, a new certificate or instrument, but only upon receipt of evidence reasonably satisfactory to the Company and the Company's transfer agent of such loss, theft or destruction and the execution by the holder thereof of a customary lost certificate affidavit of that fact and an agreement to indemnify and hold harmless the Company and the Company's transfer agent for any losses in connection therewith or, if required by the transfer agent, a bond in such form and amount as is required by the transfer agent. The applicants for a new certificate or instrument under such circumstances shall also pay any reasonable third-party costs associated with the issuance of such replacement Shares or Warrant. If a replacement certificate or instrument evidencing any Shares or Warrant is requested due to a mutilation thereof, the Company may require delivery of such mutilated certificate or instrument as a condition precedent to any issuance of a replacement.

[Signature Page Follows]

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IN WITNESS WHEREOF, the undersigned Purchasers and the Company have caused this Agreement to be duly executed as of the date first above written.

ARCA biopharma, Inc.

By: /s/ Michael R. Bristow  
Name: Michael R. Bristow  
Title: Chief Executive Officer

[Signature Page to Securities Purchase Agreement]

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VENROCK HEALTHCARE CAPITAL PARTNERS II, L.P.

530 Fifth Avenue, 22nd Floor

New York, NY 10036

By: VHCP Management II, LLC

Its: General Partner

By: /s/ David L. Stepp

Authorized Signatory

VHCP CO-INVESTMENT HOLDINGS II, LLC

530 Fifth Avenue, 22nd Floor

New York, NY 10036

By: VHCP Management II, LLC

Its: Manager

By: /s/ David L. Stepp

Authorized Signatory

VENROCK HEALTHCARE CAPITAL PARTNERS, L.P.

530 Fifth Avenue, 22nd Floor

New York, NY 10036

By: VHCP Management, LLC

Its: General Partner

By: /s/ David L. Stepp

Authorized Signatory

VHCP CO-INVESTMENT HOLDINGS, LLC

530 Fifth Avenue, 22nd Floor

New York, NY 10036

By: VHCP Management, LLC  
Its: Manager

By: /s/ David L. Stepp  
Authorized Signatory

[Signature Page to Securities Purchase Agreement]

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GROWTH EQUITY OPPORTUNITIES FUND IV, LLC

By: New Enterprise Associates 15, L.P., its sole member

By: NEA Partners 15, L.P., its general partner

By: NEA 15 GP, LLC, its general partner

By: /s/ Sasha Keough

Name: Sasha Keough

Title: Vice President

Address: c/o New Enterprise Associates, Inc.

Attn: Sasha Keough, Esq.

1954 Greenspring Drive, Suite 600

Timonium, Maryland 21093

Facsimile: (410) 842-4100

[Signature Page to Securities Purchase Agreement]

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FRANKLIN STRATEGIC SERIES –  
FRANKLIN BIOTECHNOLOGY DISCOVERY  
FUND

By: Franklin Advisers, Inc., its investment manager

By: /s/ Evan McCulloch  
Name: Evan McCulloch  
Title: Vice President

Address: One Franklin Parkway  
San Mateo, CA 94403

Facsimile:

[Signature Page to Securities Purchase Agreement]

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FRANKLIN TEMPLETON INVESTMENT

FUNDS – FRANKLIN BIOTECHNOLOGY

DISCOVERY FUND

By:Franklin Advisers, Inc., its investment manager

By:/s/ Evan McCulloch

Name: Evan McCulloch

Title: Vice President

Address: One Franklin Parkway  
San Mateo, CA 94403

Facsimile:

[Signature Page to Securities Purchase Agreement]

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RA Capital Healthcare Fund, L.P.

20 Park Plaza; Suite 1200

Boston, MA 02116

By: RA Capital Management, LLC

Its: General Partner

By: /s/ Rajeev Shah

Authorized Signatory

Blackwell Partners LLC – Series A

20 Park Plaza; Suite 1200

Boston, MA 02116

By:

Its: Authorized Signatory

By:

Its: Authorized Signatory

[Signature Page to Securities Purchase Agreement]

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RA Capital Healthcare Fund, L.P.

20 Park Plaza; Suite 1200

Boston, MA 02116

By: RA Capital Management, LLC

Its: General Partner

By:

Authorized Signatory

Blackwell Partners LLC – Series A

20 Park Plaza; Suite 1200

Boston, MA 02116

By: /s/ Jannine Lall

Its: Authorized Signatory

By: /s/ Justin B. Nixon

Its: Authorized Signatory

[Signature Page to Securities Purchase Agreement]

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TEKLA LIFE SCIENCES INVESTORS

By: /s/ Laura Woodward  
Name: Laura Woodward  
Title: Treasurer

Address: 100 Federal St, 19<sup>th</sup> Floor  
Boston, MA 02110

The name Tekla Life Sciences Investors is the designation of the Trustees for the time being under a Declaration of Trust dated February 20, 1992, as amended, and all persons dealing with Tekla Life Sciences Investors must look solely to the trust property for the enforcement of any claim against Tekla Life Sciences Investors, as neither the Trustees, officers nor shareholders assume any personal liability for the obligations entered into on behalf of Tekla Life Sciences Investors.

[Signature Page to Securities Purchase Agreement]

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Capital Ventures International

by: Heights Capital Management, Inc.

its authorized agent

By: /s/ Martin Kobinger

Name: Martin Kobinger

Title: Investment Manager

Address: c/o Heights Capital Management  
101 California Street, Suite 3250  
San Francisco, CA 94111

Facsimile: (415) 403-6525

[Signature Page to Securities Purchase Agreement]

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DAFNA LIFESCIENCE,  
L.P.

By: /s/ Fariba Ghodsian

Name: Fariba Ghodsian

Title: C.I.O.

Address: DAFNA Capital Mgmt  
10990 Wilshire Blvd Suite 1400  
Los Angeles, CA 90024

Facsimile: (310) 445-6594

[Signature Page to Securities Purchase Agreement]

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DAFNA LIFESCIENCE  
MARKET NEUTRAL, L.P.

By: /s/ Fariba Ghodsian

Name: Fariba Ghodsian

Title: C.I.O.

Address: DAFNA Capital Mgmt  
10990 Wilshire Blvd Suite 1400  
Los Angeles, CA 90024

Facsimile: (310) 445-6594

[Signature Page to Securities Purchase Agreement]

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DAFNA LIFESCIENCE  
SELECT, L.P.

By: /s/ Fariba Ghodsian

Name: Fariba Ghodsian

Title: C.I.O.

Address: DAFNA Capital Mgmt  
10990 Wilshire Blvd Suite 1400  
Los Angeles, CA 90024

Facsimile: (310) 445-6594

[Signature Page to Securities Purchase Agreement]

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## EXHIBIT A

## SCHEDULE OF PURCHASERS

Purchaser	Shares	Warrants	Aggregate Purchase Price
Venrock Healthcare Capital Partners II, L.P.	5,373,623	2,149,449	\$ 4,731,475.05
VHCP Co-Investment Holdings II, LLC	2,178,904	871,562	\$ 1,918,524.97
Venrock Healthcare Capital Partners, L.P.	2,736,388	1,094,555	\$ 2,409,389.63
VHCP Co-Investment Holdings, LLC	500,409	200,164	\$ 440,610.12
Growth Equity Opportunities Fund IV, LLC	10,221,465	4,088,586	\$ 8,999,999.93
Franklin Strategic Series – Franklin Biotechnology Discovery Fund	3,346,547	1,338,619	\$ 2,946,634.63
Franklin Templeton Investment Funds – Franklin Biotechnology Discovery Fund	5,171,341	2,068,536	\$ 4,553,365.75
RA Capital Healthcare Fund, L.P.	4,673,481	1,869,392	\$ 4,115,000.02
Blackwell Partners LLC – Series A	1,005,111	402,044	\$ 885,000.24
Tekla Life Sciences Investors	5,678,592	2,271,437	\$ 5,000,000.26
Capital Ventures International	567,859	227,144	\$ 499,999.85
DAFNA LifeScience L.P.	323,680	129,472	\$ 285,000.24
DAFNA LifeScience Market Neutral L.P.	22,714	9,086	\$ 19,999.68
DAFNA LifeScience Select L.P.	221,465	88,586	\$ 194,999.93
Total	42,021,579	16,808,632	\$ \$37,000,000.30

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EXHIBIT B-1

FORM OF WARRANT FOR PURCHASERS OVER 10%

THIS WARRANT AND THE UNDERLYING SECURITIES HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED, OR THE SECURITIES LAWS OF ANY STATE OF THE UNITED STATES. THE SECURITIES MAY NOT BE SOLD, OFFERED FOR SALE, PLEDGED, HYPOTHECATED, TRANSFERRED OR ASSIGNED IN THE ABSENCE OF AN EFFECTIVE REGISTRATION STATEMENT FOR THE SECURITIES UNDER APPLICABLE SECURITIES LAWS OR UNLESS OFFERED, SOLD, PLEDGED, HYPOTHECATED OR TRANSFERRED PURSUANT TO AN AVAILABLE EXEMPTION FROM THE REGISTRATION REQUIREMENTS OF THOSE LAWS. THE COMPANY SHALL BE ENTITLED TO REQUIRE AN OPINION OF COUNSEL SATISFACTORY TO THE COMPANY THAT SUCH REGISTRATION IS NOT REQUIRED TO THE EXTENT THAT AN OPINION IS REQUIRED PURSUANT TO THE AGREEMENT UNDER WHICH THE SECURITIES WERE ISSUED.

ARCA BIOPHARMA, INC.

WARRANT TO PURCHASE COMMON STOCK

No. CW June 16, 2015

Void After June 16, 2022

THIS CERTIFIES THAT, for value received, \_\_\_\_\_, with its principal office at \_\_\_\_\_, or its assigns (the "Holder"), is entitled to subscribe for and purchase at the Exercise Price (defined below) from ARCA biopharma, Inc., a Delaware corporation, with its principal office at 11080 CirclePoint Rd., Suite 140, Westminster, CO 80020 (the "Company") up to \_\_\_\_\_ shares of the Company's common stock, par value \$0.001 per share (the "Common Stock"), subject to adjustment as provided herein. This Warrant is one of a series of Warrants being issued pursuant to the terms of the Securities Purchase Agreement, dated June 10, 2015, by and among the Company and the original Holder of this Warrant and the other parties named therein (the "Purchase Agreement"). Capitalized terms not otherwise defined herein shall have the respective meanings ascribed to such terms in the Purchase Agreement.

1. DEFINITIONS. As used herein, the following terms shall have the respective meanings:

(a) "Exercise Period" shall mean the period commencing December 13, 2015, 180 days after the Closing Date, and ending June 16, 2022, unless sooner terminated as provided below.

(b) "Exercise Price" shall mean \$0.8716 per share, subject to adjustment pursuant to Section 5 below.

(c) "Exercise Shares" shall mean the shares of the Company's Common Stock issued upon exercise of this Warrant, subject to adjustment pursuant to the terms herein, including but not limited to pursuant to Sections 5 and 6 below.

2. EXERCISE OF WARRANT.

2.1 Method of Exercise. The rights represented by this Warrant may be exercised in whole or in part at any time during the Exercise Period, by delivery of the following to the Company at its address set forth above (or at such other address as it may designate by notice in writing to the Holder):

- (a) An executed Notice of Exercise in the form attached hereto;
- (b) Payment of the Exercise Price either (i) in cash or by check or wire transfer of immediately available funds, or (ii) pursuant to a cashless exercise, as described below; and
- (c) This Warrant.

Upon the exercise of the rights represented by this Warrant, Exercise Shares shall be issued and registered in the name of the Holder or persons affiliated with the Holder, if the Holder so designates, within a reasonable time after the rights represented by this Warrant shall have been so exercised. The Exercise Shares shall be issued in certificate form if so requested.

The person in whose name any Exercise Shares are to be issued upon exercise of this Warrant shall be deemed to have become the holder of record of such shares on the date on which this Warrant was surrendered and payment of the Exercise Price was made, irrespective of the date of issuance of the shares of Common Stock, except that, if the date of such surrender and payment is a date

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when the stock transfer books of the Company are closed, such person shall be deemed to have become the holder of such shares at the close of business on the next succeeding date on which the stock transfer books are open.

2.2 Cashless Exercise. Notwithstanding any provisions herein to the contrary, if, at any time during the Exercise Period, the Current Market Price (as defined below) of one share of Common Stock is greater than the Exercise Price (at the date of calculation as set forth below), in lieu of exercising this Warrant by payment of cash, the Holder may exercise this Warrant by a cashless exercise by surrender of this Warrant at the principal office of the Company together with the properly endorsed Notice of Exercise, and the date of receipt by the Company of the foregoing shall be deemed the date of exercise of this Warrant. On such date of exercise, the Company shall issue to the Holder a number of shares of Common Stock computed using the following formula:

$$X = \frac{Y(B-A)}{B}$$

Where: X = the number of shares of Common Stock to be issued to the Holder.

Y = the number of shares of Common Stock purchasable upon exercise of all of the Warrant or, if only a portion of the Warrant is being exercised, the portion of the Warrant being exercised.

A = the Exercise Price.

B = the Current Market Price of one share of Common Stock (on the date of calculation).

“Current Market Price” means on any particular date:

(a) if the Common Stock is traded on The Nasdaq Global Market or The Nasdaq Capital Market, the closing price of the Common Stock of the Company on such market on the day prior to the date of exercise of the Warrant as reported by Bloomberg Financial Markets (“Bloomberg”) (or comparable reporting service if Bloomberg is not then reporting sales prices of such security);

(b) if the Common Stock is traded on any registered national stock exchange but is not traded on The Nasdaq Global Market or The Nasdaq Capital Market, the closing price of the Common Stock of the Company on such exchange on the day prior to the date of exercise of the Warrant as reported by Bloomberg (or comparable reporting service if Bloomberg is not then reporting sales prices of such security);

(c) if the Common Stock is traded over-the-counter, but not on The Nasdaq Global Market, The Nasdaq Capital Market or a registered national stock exchange, the last sales price of the Common Stock of the Company on the day prior to the date of exercise of the Warrant as reported by Bloomberg (or comparable reporting service if Bloomberg is not then reporting sales prices of such security), or, if no sales price is so reported, the last bid price of the Common Stock of the Company on the day prior to the date of exercise of the Warrant as reported by Bloomberg (or comparable reporting service if Bloomberg is not then reporting sales prices of such security); and

(d) if there is no active public market for the Common Stock, the value thereof, as determined in good faith by the board of directors of the Company as of the date of exercise of the Warrant.

2.3 Partial Exercise. If this Warrant is exercised in part only, the Company shall, upon surrender of this Warrant, execute and deliver, within 10 days of the date of exercise, a new Warrant evidencing the rights of the Holder, or such

other person as shall be designated in the Notice of Exercise, to purchase the balance of the Exercise Shares purchasable hereunder. In no event shall this Warrant be exercised for a fractional Exercise Share, and the Company shall not distribute a Warrant exercisable for a fractional Exercise Share. Fractional Exercise Shares shall be treated as provided in Section 6 hereof.

2.4 No Settlement for Cash. The Warrant cannot be settled with the Company for cash.

2.5 Exercise Limitation. Notwithstanding any provisions herein to the contrary, the Holder shall not be entitled to exercise this Warrant for a number of Exercise Shares in excess of that number of Exercise Shares which, upon giving effect to such exercise, would cause the aggregate number of shares of Common Stock beneficially owned by the Holder to exceed 19.9% of the outstanding shares of the Common Stock following such exercise. For purposes of the foregoing provision, the aggregate number of shares of Common Stock beneficially owned by the Holder shall include the number of shares of Common Stock issuable upon exercise of this Warrant with respect to which determination of such provision is being made, but shall exclude the shares of Common Stock which would be issuable upon (i) exercise of the remaining, unexercised Warrants beneficially owned by the Holder and (ii) exercise or conversion of the unexercised or unconverted portion of any other securities of the Company beneficially owned by the Holder subject to a limitation on conversion or exercise analogous to the limitation contained herein. Except as set forth in the preceding sentence, for purposes of this Section 2.5, beneficial ownership shall be calculated in accordance with Section 13(d) of the Exchange Act. For purposes of this Section 2.5, in determining the number of outstanding shares of Common Stock, the Holder may rely on the number

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of outstanding shares of Common Stock as reflected in (x) the Company's most recent Form 10-Q or Form 10-K, as the case may be, filed with the SEC on the date thereof, (y) a more recent public announcement by the Company or (z) any other notice by the Company or its transfer agent setting forth the number of shares of Common Stock outstanding. Upon the written request of the Holder, the Company shall within three trading days confirm in writing or by electronic mail to the Holder the number of shares of Common Stock then outstanding. In any case, the number of outstanding shares of Common Stock shall be determined after giving effect to the conversion or exercise of securities of the Company, including this Warrant, by the Holder since the date as of which such number of outstanding shares of Common Stock was reported.

### 3. COVENANTS OF THE COMPANY.

3.1 Covenants as to Exercise Shares. The Company covenants and agrees that all Exercise Shares that may be issued upon the exercise of the rights represented by this Warrant will, upon issuance, be validly issued and outstanding, fully paid and nonassessable, and free from all taxes, liens and charges with respect to the issuance thereof. The Company further covenants and agrees that the Company will at all times during the Exercise Period, have authorized and reserved, free from preemptive rights, a sufficient number of shares of its Common Stock to provide for the exercise of the rights represented by this Warrant. If at any time during the Exercise Period the number of authorized but unissued shares of Common Stock shall not be sufficient to permit exercise of this Warrant, the Company will take such corporate action as may, in the opinion of its counsel, be necessary to increase its authorized but unissued shares of Common Stock (or other securities as provided herein) to such number of shares as shall be sufficient for such purposes.

3.2 No Impairment. Except and to the extent as waived or consented to by the Holder or otherwise in accordance with Section 11 hereof, the Company will not, by amendment of its Certificate of Incorporation (as such may be amended from time to time), or through any means, avoid or seek to avoid the observance or performance of any of the terms to be observed or performed hereunder by the Company, but will at all times in good faith assist in the carrying out of all the provisions of this Warrant and in the taking of all such action as may be necessary or appropriate in order to protect the exercise rights of the Holder against impairment.

3.3 Notices of Record Date. In the event of any taking by the Company of a record of the holders of any class of securities for the purpose of determining the holders thereof who are entitled to receive any dividend (other than a cash dividend which is the same as cash dividends paid in previous quarters) or other distribution, the Company shall mail to the Holder, at least 10 days prior to the date specified herein, a notice specifying the date on which any such record is to be taken for the purpose of such dividend or distribution.

3.4 Notice of Expiration. In the event this Warrant is still outstanding, the Company shall provide written notice to the Holder of the impending expiration of this Warrant no more than 90 days and no less than 60 days prior to June 16, 2022 (the "Expiration Date"). In the event that immediately prior to the close of business on the Expiration Date, the Current Market Price of one share of Common Stock (as determined in accordance with Section 2.2 above) is greater than the then applicable Exercise Price, this Warrant shall be deemed to be automatically exercised on a net exercise issue basis pursuant to Section 2.2 above, and the Company shall deliver the applicable number of shares of Common Stock to the Holder pursuant to the provisions of Section 2.2 above and this Section 3.4.

### 4. REPRESENTATIONS OF HOLDER.

4.1 Acquisition of Warrant for Personal Account. The Holder represents and warrants that it is acquiring the Warrant and the Exercise Shares solely for its account for investment and not with a present view toward the public distribution of said Warrant or Exercise Shares or any part thereof and has no intention of selling or distributing said Warrant or Exercise Shares or any arrangement or understanding with any other persons regarding the sale or



distribution of said Warrant or, except in accordance with the provisions of Article 6 of the Purchase Agreement, the Exercise Shares, and except as would not result in a violation of the Securities Act. The Holder will not, directly or indirectly, offer, sell, pledge, transfer or otherwise dispose of (or solicit any offers to buy, purchase or otherwise acquire or take a pledge of) the Warrant except in accordance with the Securities Act and will not, directly or indirectly, offer, sell, pledge, transfer or otherwise dispose of (or solicit any offers to buy, purchase or otherwise acquire or take a pledge of) the Exercise Shares except in accordance with the provisions of Article 6 of the Purchase Agreement or pursuant to and in accordance with the Securities Act.

#### 4.2 Securities Are Not Registered.

(a) The Holder understands that the offer and sale of the Warrant or the Exercise Shares have not been registered under the Securities Act on the basis that no distribution or public offering of the stock of the Company is to be effected. The Holder realizes that the basis for the exemption may not be present if, notwithstanding its representations, the Holder has a present intention of acquiring the Warrant and the Exercise Shares for a fixed or determinable period in the future, selling (in connection with a distribution or otherwise), granting any participation in, or otherwise distributing the securities. The Holder has no such present intention.

(b) The Holder recognizes that the Warrant and the Exercise Shares must be held indefinitely unless they are subsequently registered under the Securities Act or an exemption from such registration is available. The Holder recognizes that the Company has no obligation to register the Warrant or, except as provided in the Purchase Agreement, the Exercise Shares of the Company, or to comply with any exemption from such registration.

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(c) The Holder is aware that neither the Warrant nor the Exercise Shares may be sold pursuant to Rule 144 adopted under the Securities Act unless certain conditions are met, including, among other things, the existence of a public market for the shares, the availability of certain current public information about the Company, the resale following the required holding period under Rule 144 and the number of shares being sold during any three month period not exceeding specified limitations. Holder is aware that any such sale made in reliance on Rule 144, if Rule 144 is available, may be made only in accordance with the terms of Rule 144.

#### 4.3 Disposition of Warrant and Exercise Shares.

(a) The Holder further agrees not to make any disposition of all or any part of the Warrant or Exercise Shares in any event unless and until:

(i) The Company shall have received a letter secured by the Holder from the SEC stating that no action will be recommended to the SEC with respect to the proposed disposition;

(ii) There is then in effect a registration statement under the Securities Act covering such proposed disposition and such disposition is made in accordance with said registration statement; or

(iii) The Holder shall have notified the Company of the proposed disposition and shall have furnished the Company with a detailed statement of the circumstances surrounding the proposed disposition, and if reasonably requested by the Company, the Holder shall have furnished the Company with an opinion of counsel, reasonably satisfactory to the Company, for the Holder to the effect that such disposition will not require registration of such Warrant or Exercise Shares under the Securities Act or any applicable state securities laws; provided, that no opinion shall be required for any disposition made or to be made in accordance with the provisions of Rule 144.

(b) The Holder understands and agrees that all certificates evidencing the Exercise Shares to be issued to the Holder may bear a legend in substantially the following form; provided, that such legend shall be removed (or such Exercise Shares shall be issued without such legend upon exercise of this Warrant) as required pursuant to Section 3.8(b) of the Purchase Agreement:

THE SECURITIES REPRESENTED BY THIS CERTIFICATE HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED, OR THE SECURITIES LAWS OF ANY STATE OF THE UNITED STATES. THE SECURITIES MAY NOT BE SOLD, OFFERED FOR SALE, PLEDGED, HYPOTHECATED, TRANSFERRED OR ASSIGNED IN THE ABSENCE OF AN EFFECTIVE REGISTRATION STATEMENT FOR THE SECURITIES UNDER APPLICABLE SECURITIES LAWS, OR UNLESS OFFERED, SOLD, PLEDGED, HYPOTHECATED OR TRANSFERRED PURSUANT TO AN AVAILABLE EXEMPTION FROM THE REGISTRATION REQUIREMENTS OF THOSE LAWS. THE COMPANY SHALL BE ENTITLED TO REQUIRE AN OPINION OF COUNSEL SATISFACTORY TO THE COMPANY THAT SUCH REGISTRATION IS NOT REQUIRED TO THE EXTENT THAT AN OPINION IS REQUIRED PURSUANT TO THE AGREEMENT UNDER WHICH THE SECURITIES WERE ISSUED.

5. ADJUSTMENT OF EXERCISE SHARES AND EXERCISE PRICE. In the event of changes in the outstanding Common Stock of the Company by reason of stock dividends, split-ups, recapitalizations, reclassifications, combinations or exchanges of shares, separations, reorganizations, liquidations, or the like, the number and class of shares available under the Warrant in the aggregate and the Exercise Price shall be appropriately and proportionately adjusted to give the Holder of the Warrant, on exercise for the same aggregate Exercise Price, the total number, class, and kind of shares as the Holder would have owned had the Warrant been exercised prior to the event and had the Holder continued to hold such shares until after the event requiring adjustment. The form of this Warrant need not be changed because of any adjustment in the number, class, and kind of shares subject to this Warrant. The Company

shall promptly provide all Holders a certificate from its Chief Accounting Officer notifying such Holders in writing of any adjustment in the Exercise Price and/or the total number, class, and kind of shares issuable upon exercise of this Warrant, which certificate shall specify the Exercise Price and number, class and kind of shares under this Warrant after giving effect to such adjustment.

6. **FRACTIONAL SHARES.** No fractional shares shall be issued upon the exercise of this Warrant. All Exercise Shares (including fractions) issuable upon exercise of this Warrant may be aggregated for purposes of determining whether the exercise would result in the issuance of any fractional share. If, after aggregation, the exercise would result in the issuance of a fractional share, the Company shall, in lieu of issuance of any fractional share, pay the Holder otherwise entitled to such fraction a sum in cash equal to the product resulting from multiplying the then Current Market Price of an Exercise Share by such fraction.

7. **CERTAIN EVENTS.** In the event of, at any time during the Exercise Period, any capital reorganization, or any reclassification of the capital stock of the Company (other than a change in par value or from par value to no par value or no par value to par value or as a result of a stock dividend or subdivision, split-up or combination of shares), or the consolidation or merger of the Company with or into another corporation (other than a merger solely to effect a reincorporation of the Company into another state), in each case, in which the stockholders of the Company immediately prior to such capital reorganization, reclassification, consolidation or merger, will hold less than a majority of the outstanding shares of the Company or resulting corporation immediately after such capital reorganization, reclassification, consolidation or merger, or the sale or other disposition of all or substantially all of the properties and

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assets of the Company and its subsidiaries, taken as a whole, in its entirety to any other person, other than sales or other dispositions that do not require stockholder approval (each, an “Event”), the Company shall provide to the Holder 15 days’ advance written notice of such Event, and the Holder shall have the option, in its sole discretion, to allow any unexercised portion of the Warrant to be deemed automatically exercised pursuant to Section 2.2. This Warrant will be binding upon the successors and assigns of the Company upon an Event.

8. NO STOCKHOLDER RIGHTS. This Warrant in and of itself shall not entitle the Holder to any voting rights or other rights as a stockholder of the Company.

9. TRANSFER OF WARRANT. Subject to applicable laws and compliance with Section 4.3 hereof, this Warrant and all rights hereunder are transferable, by the Holder in person or by duly authorized attorney, upon delivery of this Warrant and the form of assignment attached hereto to any transferee designated by Holder. The transferee shall sign an investment letter in form and substance satisfactory to the Company.

10. LOST, STOLEN, MUTILATED OR DESTROYED WARRANT. If this Warrant is lost, stolen, mutilated or destroyed, the Company may, on such terms as to indemnity or otherwise as it may reasonably impose (which shall, in the case of a mutilated Warrant, include the surrender thereof), issue a new Warrant of like denomination and tenor as the Warrant so lost, stolen, mutilated or destroyed. Any such new Warrant shall constitute an original contractual obligation of the Company, whether or not the allegedly lost, stolen, mutilated or destroyed Warrant shall be at any time enforceable by anyone.

11. MODIFICATIONS AND WAIVER. This Warrant and any provision hereof may be changed, waived, discharged or terminated only by an instrument in writing signed by the Company and (i) Purchasers holding Warrants representing at least a majority of the number of Exercise Shares then issuable upon exercise of the Warrants sold in the Offering, provided, however, that such modification, amendment or waiver is made with respect to all Warrants issued in the Offering and does not adversely affect the Holder without adversely affecting all holders of Warrants in a similar manner; or (ii) the Holder.

12. NOTICES, ETC. All notices required or permitted hereunder shall be in writing and shall be deemed effectively given: (a) upon personal delivery to the party to be notified; (b) when sent by confirmed email, telex or facsimile if sent during normal business hours of the recipient, if not, then on the next business day; (c) five days after having been sent by registered or certified mail, return receipt requested, postage prepaid; or (d) one business day after deposit with a nationally recognized overnight courier, specifying next day delivery, with written verification of receipt. All communications shall be sent to the Company at the address listed on the signature page and to the Holders at the addresses in the Company’s records, or at such other address as the Company or Holder may designate by ten days’ advance written notice to the other party hereto.

13. ACCEPTANCE. Receipt of this Warrant by the Holder shall constitute acceptance of and agreement to all of the terms and conditions contained herein.

14. GOVERNING LAW. This Warrant and all rights, obligations and liabilities hereunder shall be governed by the laws of the State of New York without regard to the principles of conflict of laws.

15. DESCRIPTIVE HEADINGS. The descriptive headings of the several paragraphs of this Warrant are inserted for convenience only and do not constitute a part of this Warrant. The language in this Warrant shall be construed as to its fair meaning without regard to which party drafted this Warrant.

16. SEVERABILITY. The invalidity or unenforceability of any provision of this Warrant in any jurisdiction shall not affect the validity or enforceability of such provision in any other jurisdiction, or affect any other provision of this

Warrant, which shall remain in full force and effect.

17. ENTIRE AGREEMENT. This Warrant constitutes the entire agreement between the parties pertaining to the subject matter contained in it and supersedes all prior and contemporaneous agreements, representations, and undertakings of the parties, whether oral or written, with respect to such subject matter.

[Signature Page Follows]

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IN WITNESS WHEREOF, the Company has caused this Warrant to be executed by its duly authorized officer as of June 16, 2015.

ARCA biopharma, INC.

By:

Name: Michael R. Bristow

Title: Chief Executive Officer

Address: 11080 CirclePoint Rd., Suite 140  
Westminster, CO 80020  
Attention: Chief Accounting Officer  
Facsimile: (720) 208-9261

NOTICE OF EXERCISE

TO: ARCA biopharma, Inc.

(1) The undersigned hereby elects to (check one box only):

purchase \_\_\_\_\_ shares of the Common Stock of ARCA biopharma, Inc. (the "Company") pursuant to the terms of the attached Warrant, and tenders herewith payment of the exercise price in full for such shares, together with all applicable transfer taxes, if any.

purchase the number of shares of Common Stock of the Company by cashless exercise pursuant to the terms of the Warrant as shall be issuable upon cashless exercise of the portion of the Warrant relating to \_\_\_\_\_ shares, and shall tender payment of all applicable transfer taxes, if any.

(2) Please issue a certificate or certificates representing said shares of Common Stock in the name of the undersigned or in such other name as is specified below:

(Name)

(Address)

(3) The undersigned represents that: (i) the aforesaid shares of Common Stock are being acquired for the account of the undersigned for investment and not with a view to, or for resale in connection with, the distribution thereof and that the undersigned has no present intention of distributing or reselling such shares; (ii) the undersigned is aware of the Company's business affairs and financial condition and has acquired sufficient information about the Company to reach an informed and knowledgeable decision regarding its investment in the Company; (iii) the undersigned is experienced in making investments of this type and has such knowledge and background in financial and business matters that the undersigned is capable of evaluating the merits and risks of this investment and protecting the undersigned's own interests; (iv) the undersigned understands that the shares of Common Stock issuable upon exercise of this Warrant have not been registered under the Securities Act of 1933, as amended (the "Securities Act"), by reason of a specific exemption from the registration provisions of the Securities Act, which exemption depends upon, among other things, the bona fide nature of the investment intent as expressed herein, and, because such securities have not been registered under the Securities Act, they must be held indefinitely unless subsequently registered under the Securities Act or an exemption from such registration is available; (v) the undersigned is aware that the aforesaid shares of Common Stock may not be sold pursuant to Rule 144 adopted under the Securities Act unless certain conditions are met and until the undersigned has held the shares for the time period prescribed by Rule 144, that among the conditions for use of the Rule is the availability of current information to the public about the Company and that the Company has not made such information available and has no present plans to do so; and (vi) the undersigned agrees not to make any disposition of all or any part of the aforesaid shares of Common Stock unless and until there is then in effect a registration statement under the Securities Act covering such proposed disposition and such disposition is made in accordance with said registration statement, or the undersigned has furnished the Company with an opinion of counsel, reasonably satisfactory to the Company, to the effect that such disposition is not required to be registered pursuant to the Securities Act or any applicable state securities laws; provided, that no opinion shall be required for any disposition made or to be made in accordance with the provisions of Rule 144.

(Date) (Signature)

(Print name)

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ASSIGNMENT FORM

(To assign the foregoing Warrant, subject to compliance with section 4.3 hereof, execute this form and supply required information. Do not use this form to purchase shares.)

FOR VALUE RECEIVED, the foregoing Warrant and all rights evidenced thereby are hereby assigned to

Name:

(Please Print)

Address:

(Please Print)

Dated:           , 20

Holder's  
Signature:

Holder's  
Address:

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

EXHIBIT B-2

FORM OF WARRANT FOR PURCHASERS UNDER 10%

THIS WARRANT AND THE UNDERLYING SECURITIES HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED, OR THE SECURITIES LAWS OF ANY STATE OF THE UNITED STATES. THE SECURITIES MAY NOT BE SOLD, OFFERED FOR SALE, PLEDGED, HYPOTHECATED, TRANSFERRED OR ASSIGNED IN THE ABSENCE OF AN EFFECTIVE REGISTRATION STATEMENT FOR THE SECURITIES UNDER APPLICABLE SECURITIES LAWS OR UNLESS OFFERED, SOLD, PLEDGED, HYPOTHECATED OR TRANSFERRED PURSUANT TO AN AVAILABLE EXEMPTION FROM THE REGISTRATION REQUIREMENTS OF THOSE LAWS. THE COMPANY SHALL BE ENTITLED TO REQUIRE AN OPINION OF COUNSEL SATISFACTORY TO THE COMPANY THAT SUCH REGISTRATION IS NOT REQUIRED TO THE EXTENT THAT AN OPINION IS REQUIRED PURSUANT TO THE AGREEMENT UNDER WHICH THE SECURITIES WERE ISSUED.

ARCA BIOPHARMA, INC.

WARRANT TO PURCHASE COMMON STOCK

No. CW June 16, 2015

Void After June 16, 2022

THIS CERTIFIES THAT, for value received, \_\_\_\_\_, with its principal office at \_\_\_\_\_, or its assigns (the "Holder"), is entitled to subscribe for and purchase at the Exercise Price (defined below) from ARCA biopharma, Inc., a Delaware corporation, with its principal office at 11080 CirclePoint Rd., Suite 140, Westminster, CO 80020 (the "Company") up to \_\_\_\_\_ shares of the Company's common stock, par value \$0.001 per share (the "Common Stock"), subject to adjustment as provided herein. This Warrant is one of a series of Warrants being issued pursuant to the terms of the Securities Purchase Agreement, dated June 10, 2015, by and among the Company and the original Holder of this Warrant and the other parties named therein (the "Purchase Agreement"). Capitalized terms not otherwise defined herein shall have the respective meanings ascribed to such terms in the Purchase Agreement.

1. DEFINITIONS. As used herein, the following terms shall have the respective meanings:

- (a) "Exercise Period" shall mean the period commencing December 13, 2015, 180 days after the Closing Date, and ending June 16, 2022, unless sooner terminated as provided below.
- (b) "Exercise Price" shall mean \$0.8716 per share, subject to adjustment pursuant to Section 5 below.
- (c) "Exercise Shares" shall mean the shares of the Company's Common Stock issued upon exercise of this Warrant, subject to adjustment pursuant to the terms herein, including but not limited to pursuant to Sections 5 and 6 below.

2. EXERCISE OF WARRANT.

2.1 Method of Exercise. The rights represented by this Warrant may be exercised in whole or in part at any time during the Exercise Period, by delivery of the following to the Company at its address set forth above (or at such other address as it may designate by notice in writing to the Holder):

- (a) An executed Notice of Exercise in the form attached hereto;
- (b) Payment of the Exercise Price either (i) in cash or by check or wire transfer of immediately available funds, or (ii) pursuant to a cashless exercise, as described below; and
- (c) This Warrant.

Upon the exercise of the rights represented by this Warrant, Exercise Shares shall be issued and registered in the name of the Holder or persons affiliated with the Holder, if the Holder so designates, within a reasonable time after the rights represented by this Warrant shall have been so exercised. The Exercise Shares shall be issued in certificate form if so requested.

The person in whose name any Exercise Shares are to be issued upon exercise of this Warrant shall be deemed to have become the holder of record of such shares on the date on which this Warrant was surrendered and payment of the Exercise Price was made, irrespective of the date of issuance of the shares of Common Stock, except that, if the date of such surrender and payment is a date

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when the stock transfer books of the Company are closed, such person shall be deemed to have become the holder of such shares at the close of business on the next succeeding date on which the stock transfer books are open.

2.2 Cashless Exercise. Notwithstanding any provisions herein to the contrary, if, at any time during the Exercise Period, the Current Market Price (as defined below) of one share of Common Stock is greater than the Exercise Price (at the date of calculation as set forth below), in lieu of exercising this Warrant by payment of cash, the Holder may exercise this Warrant by a cashless exercise by surrender of this Warrant at the principal office of the Company together with the properly endorsed Notice of Exercise, and the date of receipt by the Company of the foregoing shall be deemed the date of exercise of this Warrant. On such date of exercise, the Company shall issue to the Holder a number of shares of Common Stock computed using the following formula:

$$X = \frac{Y(B-A)}{B}$$

B

Where: X = the number of shares of Common Stock to be issued to the Holder.

Y = the number of shares of Common Stock purchasable upon exercise of all of the Warrant or, if only a portion of the Warrant is being exercised, the portion of the Warrant being exercised.

A = the Exercise Price.

B = the Current Market Price of one share of Common Stock (on the date of calculation).

“Current Market Price” means on any particular date:

(a) if the Common Stock is traded on The Nasdaq Global Market or The Nasdaq Capital Market, the closing price of the Common Stock of the Company on such market on the day prior to the date of exercise of the Warrant as reported by Bloomberg Financial Markets (“Bloomberg”) (or comparable reporting service if Bloomberg is not then reporting sales prices of such security);

(b) if the Common Stock is traded on any registered national stock exchange but is not traded on The Nasdaq Global Market or The Nasdaq Capital Market, the closing price of the Common Stock of the Company on such exchange on the day prior to the date of exercise of the Warrant as reported by Bloomberg (or comparable reporting service if Bloomberg is not then reporting sales prices of such security);

(c) if the Common Stock is traded over-the-counter, but not on The Nasdaq Global Market, The Nasdaq Capital Market or a registered national stock exchange, the last sales price of the Common Stock of the Company on the day prior to the date of exercise of the Warrant as reported by Bloomberg (or comparable reporting service if Bloomberg is not then reporting sales prices of such security), or, if no sales price is so reported, the last bid price of the Common Stock of the Company on the day prior to the date of exercise of the Warrant as reported by Bloomberg (or comparable reporting service if Bloomberg is not then reporting sales prices of such security); and

(d) if there is no active public market for the Common Stock, the value thereof, as determined in good faith by the board of directors of the Company as of the date of exercise of the Warrant.

2.3 Partial Exercise. If this Warrant is exercised in part only, the Company shall, upon surrender of this Warrant, execute and deliver, within 10 days of the date of exercise, a new Warrant evidencing the rights of the Holder, or such other person as shall be designated in the Notice of Exercise, to purchase the balance of the Exercise Shares purchasable hereunder. In no event shall this Warrant be exercised for a fractional Exercise Share, and the Company shall not distribute a Warrant exercisable for a fractional Exercise Share. Fractional Exercise Shares shall be treated as provided in Section 6 hereof.

2.4 No Settlement for Cash. The Warrant cannot be settled with the Company for cash.

2.5 Exercise Limitation. Notwithstanding any provisions herein to the contrary, the Holder shall not be entitled to exercise this Warrant for a number of Exercise Shares in excess of that number of Exercise Shares which, upon giving effect to such exercise, would cause the aggregate number of shares of Common Stock beneficially owned by the Holder to exceed 9.9% of the outstanding shares of the Common Stock following such exercise. For purposes of the foregoing provision, the aggregate number of shares of Common Stock beneficially owned by the Holder shall include the number of shares of Common Stock issuable upon exercise of this Warrant with respect to which determination of such provision is being made, but shall exclude the shares of Common Stock which would be issuable upon (i) exercise of the remaining, unexercised Warrants beneficially owned by the Holder and (ii) exercise or conversion of the unexercised or unconverted portion of any other securities of the Company beneficially owned by the Holder subject to a limitation on conversion or exercise analogous to the limitation contained herein. Except as set forth in the preceding sentence, for

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purposes of this Section 2.5, beneficial ownership shall be calculated in accordance with Section 13(d) of the Exchange Act. The Holder may waive the foregoing limitation by written notice to the Company upon not less than 61 days prior written notice (with such waiver taking effect only upon the expiration of such 61 day notice period and applying only to the Holder and not to any other holder of Warrants sold in the Offering). For purposes of this Section 2.5, in determining the number of outstanding shares of Common Stock, the Holder may rely on the number of outstanding shares of Common Stock as reflected in (x) the Company's most recent Form 10-Q or Form 10-K, as the case may be, filed with the SEC on the date thereof, (y) a more recent public announcement by the Company or (z) any other notice by the Company or its transfer agent setting forth the number of shares of Common Stock outstanding. Upon the written request of the Holder, the Company shall within three trading days confirm in writing or by electronic mail to the Holder the number of shares of Common Stock then outstanding. In any case, the number of outstanding shares of Common Stock shall be determined after giving effect to the conversion or exercise of securities of the Company, including this Warrant, by the Holder since the date as of which such number of outstanding shares of Common Stock was reported.

### 3. COVENANTS OF THE COMPANY.

3.1 Covenants as to Exercise Shares. The Company covenants and agrees that all Exercise Shares that may be issued upon the exercise of the rights represented by this Warrant will, upon issuance, be validly issued and outstanding, fully paid and nonassessable, and free from all taxes, liens and charges with respect to the issuance thereof. The Company further covenants and agrees that the Company will at all times during the Exercise Period, have authorized and reserved, free from preemptive rights, a sufficient number of shares of its Common Stock to provide for the exercise of the rights represented by this Warrant. If at any time during the Exercise Period the number of authorized but unissued shares of Common Stock shall not be sufficient to permit exercise of this Warrant, the Company will take such corporate action as may, in the opinion of its counsel, be necessary to increase its authorized but unissued shares of Common Stock (or other securities as provided herein) to such number of shares as shall be sufficient for such purposes.

3.2 No Impairment. Except and to the extent as waived or consented to by the Holder or otherwise in accordance with Section 11 hereof, the Company will not, by amendment of its Certificate of Incorporation (as such may be amended from time to time), or through any means, avoid or seek to avoid the observance or performance of any of the terms to be observed or performed hereunder by the Company, but will at all times in good faith assist in the carrying out of all the provisions of this Warrant and in the taking of all such action as may be necessary or appropriate in order to protect the exercise rights of the Holder against impairment.

3.3 Notices of Record Date. In the event of any taking by the Company of a record of the holders of any class of securities for the purpose of determining the holders thereof who are entitled to receive any dividend (other than a cash dividend which is the same as cash dividends paid in previous quarters) or other distribution, the Company shall mail to the Holder, at least 10 days prior to the date specified herein, a notice specifying the date on which any such record is to be taken for the purpose of such dividend or distribution.

3.4 Notice of Expiration. In the event this Warrant is still outstanding, the Company shall provide written notice to the Holder of the impending expiration of this Warrant no more than 90 days and no less than 60 days prior to June 16, 2022 (the "Expiration Date"). In the event that immediately prior to the close of business on the Expiration Date, the Current Market Price of one share of Common Stock (as determined in accordance with Section 2.2 above) is greater than the then applicable Exercise Price, this Warrant shall be deemed to be automatically exercised on a net exercise issue basis pursuant to Section 2.2 above, and the Company shall deliver the applicable number of shares of Common Stock to the Holder pursuant to the provisions of Section 2.2 above and this Section 3.4.

### 4. REPRESENTATIONS OF HOLDER.

4.1 Acquisition of Warrant for Personal Account. The Holder represents and warrants that it is acquiring the Warrant and the Exercise Shares solely for its account for investment and not with a present view toward the public distribution of said Warrant or Exercise Shares or any part thereof and has no intention of selling or distributing said Warrant or Exercise Shares or any arrangement or understanding with any other persons regarding the sale or distribution of said Warrant or, except in accordance with the provisions of Article 6 of the Purchase Agreement, the Exercise Shares, and except as would not result in a violation of the Securities Act. The Holder will not, directly or indirectly, offer, sell, pledge, transfer or otherwise dispose of (or solicit any offers to buy, purchase or otherwise acquire or take a pledge of) the Warrant except in accordance with the Securities Act and will not, directly or indirectly, offer, sell, pledge, transfer or otherwise dispose of (or solicit any offers to buy, purchase or otherwise acquire or take a pledge of) the Exercise Shares except in accordance with the provisions of Article 6 of the Purchase Agreement or pursuant to and in accordance with the Securities Act.

4.2 Securities Are Not Registered.

(a) The Holder understands that the offer and sale of the Warrant or the Exercise Shares have not been registered under the Securities Act on the basis that no distribution or public offering of the stock of the Company is to be effected. The Holder realizes that the basis for the exemption may not be present if, notwithstanding its representations, the Holder has a present intention of acquiring the Warrant and the Exercise Shares for a fixed or determinable period in the future, selling (in connection with a distribution or otherwise), granting any participation in, or otherwise distributing the securities. The Holder has no such present intention.

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(b) The Holder recognizes that the Warrant and the Exercise Shares must be held indefinitely unless they are subsequently registered under the Securities Act or an exemption from such registration is available. The Holder recognizes that the Company has no obligation to register the Warrant or, except as provided in the Purchase Agreement, the Exercise Shares of the Company, or to comply with any exemption from such registration.

(c) The Holder is aware that neither the Warrant nor the Exercise Shares may be sold pursuant to Rule 144 adopted under the Securities Act unless certain conditions are met, including, among other things, the existence of a public market for the shares, the availability of certain current public information about the Company, the resale following the required holding period under Rule 144 and the number of shares being sold during any three month period not exceeding specified limitations. Holder is aware that any such sale made in reliance on Rule 144, if Rule 144 is available, may be made only in accordance with the terms of Rule 144.

#### 4.3 Disposition of Warrant and Exercise Shares.

(a) The Holder further agrees not to make any disposition of all or any part of the Warrant or Exercise Shares in any event unless and until:

(i) The Company shall have received a letter secured by the Holder from the SEC stating that no action will be recommended to the SEC with respect to the proposed disposition;

(ii) There is then in effect a registration statement under the Securities Act covering such proposed disposition and such disposition is made in accordance with said registration statement; or

(iii) The Holder shall have notified the Company of the proposed disposition and shall have furnished the Company with a detailed statement of the circumstances surrounding the proposed disposition, and if reasonably requested by the Company, the Holder shall have furnished the Company with an opinion of counsel, reasonably satisfactory to the Company, for the Holder to the effect that such disposition will not require registration of such Warrant or Exercise Shares under the Securities Act or any applicable state securities laws; provided, that no opinion shall be required for any disposition made or to be made in accordance with the provisions of Rule 144.

(b) The Holder understands and agrees that all certificates evidencing the Exercise Shares to be issued to the Holder may bear a legend in substantially the following form; provided, that such legend shall be removed (or such Exercise Shares shall be issued without such legend upon exercise of this Warrant) as required pursuant to Section 3.8(b) of the Purchase Agreement:

THE SECURITIES REPRESENTED BY THIS CERTIFICATE HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED, OR THE SECURITIES LAWS OF ANY STATE OF THE UNITED STATES. THE SECURITIES MAY NOT BE SOLD, OFFERED FOR SALE, PLEDGED, HYPOTHECATED, TRANSFERRED OR ASSIGNED IN THE ABSENCE OF AN EFFECTIVE REGISTRATION STATEMENT FOR THE SECURITIES UNDER APPLICABLE SECURITIES LAWS, OR UNLESS OFFERED, SOLD, PLEDGED, HYPOTHECATED OR TRANSFERRED PURSUANT TO AN AVAILABLE EXEMPTION FROM THE REGISTRATION REQUIREMENTS OF THOSE LAWS. THE COMPANY SHALL BE ENTITLED TO REQUIRE AN OPINION OF COUNSEL SATISFACTORY TO THE COMPANY THAT SUCH REGISTRATION IS NOT REQUIRED TO THE EXTENT THAT AN OPINION IS REQUIRED PURSUANT TO THE AGREEMENT UNDER WHICH THE SECURITIES WERE ISSUED.

5. ADJUSTMENT OF EXERCISE SHARES AND EXERCISE PRICE. In the event of changes in the outstanding Common Stock of the Company by reason of stock dividends, split-ups, recapitalizations, reclassifications, combinations or exchanges of shares, separations, reorganizations, liquidations, or the like, the number and class of



shares available under the Warrant in the aggregate and the Exercise Price shall be appropriately and proportionately adjusted to give the Holder of the Warrant, on exercise for the same aggregate Exercise Price, the total number, class, and kind of shares as the Holder would have owned had the Warrant been exercised prior to the event and had the Holder continued to hold such shares until after the event requiring adjustment. The form of this Warrant need not be changed because of any adjustment in the number, class, and kind of shares subject to this Warrant. The Company shall promptly provide all Holders a certificate from its Chief Accounting Officer notifying such Holders in writing of any adjustment in the Exercise Price and/or the total number, class, and kind of shares issuable upon exercise of this Warrant, which certificate shall specify the Exercise Price and number, class and kind of shares under this Warrant after giving effect to such adjustment.

6. **FRACTIONAL SHARES.** No fractional shares shall be issued upon the exercise of this Warrant. All Exercise Shares (including fractions) issuable upon exercise of this Warrant may be aggregated for purposes of determining whether the exercise would result in the issuance of any fractional share. If, after aggregation, the exercise would result in the issuance of a fractional share, the Company shall, in lieu of issuance of any fractional share, pay the Holder otherwise entitled to such fraction a sum in cash equal to the product resulting from multiplying the then Current Market Price of an Exercise Share by such fraction.

7. **CERTAIN EVENTS.** In the event of, at any time during the Exercise Period, any capital reorganization, or any reclassification of the capital stock of the Company (other than a change in par value or from par value to no par value or no par value to par value or as a result of a stock dividend or subdivision, split-up or combination of shares), or the consolidation or merger of the Company with or

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into another corporation (other than a merger solely to effect a reincorporation of the Company into another state), in each case, in which the stockholders of the Company immediately prior to such capital reorganization, reclassification, consolidation or merger, will hold less than a majority of the outstanding shares of the Company or resulting corporation immediately after such capital reorganization, reclassification, consolidation or merger, or the sale or other disposition of all or substantially all of the properties and assets of the Company and its subsidiaries, taken as a whole, in its entirety to any other person, other than sales or other dispositions that do not require stockholder approval (each, an “Event”), the Company shall provide to the Holder 15 days’ advance written notice of such Event, and the Holder shall have the option, in its sole discretion, to allow any unexercised portion of the Warrant to be deemed automatically exercised pursuant to Section 2.2. This Warrant will be binding upon the successors and assigns of the Company upon an Event.

8. NO STOCKHOLDER RIGHTS. This Warrant in and of itself shall not entitle the Holder to any voting rights or other rights as a stockholder of the Company.

9. TRANSFER OF WARRANT. Subject to applicable laws and compliance with Section 4.3 hereof, this Warrant and all rights hereunder are transferable, by the Holder in person or by duly authorized attorney, upon delivery of this Warrant and the form of assignment attached hereto to any transferee designated by Holder. The transferee shall sign an investment letter in form and substance satisfactory to the Company.

10. LOST, STOLEN, MUTILATED OR DESTROYED WARRANT. If this Warrant is lost, stolen, mutilated or destroyed, the Company may, on such terms as to indemnity or otherwise as it may reasonably impose (which shall, in the case of a mutilated Warrant, include the surrender thereof), issue a new Warrant of like denomination and tenor as the Warrant so lost, stolen, mutilated or destroyed. Any such new Warrant shall constitute an original contractual obligation of the Company, whether or not the allegedly lost, stolen, mutilated or destroyed Warrant shall be at any time enforceable by anyone.

11. MODIFICATIONS AND WAIVER. This Warrant and any provision hereof may be changed, waived, discharged or terminated only by an instrument in writing signed by the Company and (i) Purchasers holding Warrants representing at least a majority of the number of Exercise Shares then issuable upon exercise of the Warrants sold in the Offering, provided, however, that such modification, amendment or waiver is made with respect to all Warrants issued in the Offering and does not adversely affect the Holder without adversely affecting all holders of Warrants in a similar manner; or (ii) the Holder.

12. NOTICES, ETC. All notices required or permitted hereunder shall be in writing and shall be deemed effectively given: (a) upon personal delivery to the party to be notified; (b) when sent by confirmed email, telex or facsimile if sent during normal business hours of the recipient, if not, then on the next business day; (c) five days after having been sent by registered or certified mail, return receipt requested, postage prepaid; or (d) one business day after deposit with a nationally recognized overnight courier, specifying next day delivery, with written verification of receipt. All communications shall be sent to the Company at the address listed on the signature page and to the Holders at the addresses in the Company’s records, or at such other address as the Company or Holder may designate by ten days’ advance written notice to the other party hereto.

13. ACCEPTANCE. Receipt of this Warrant by the Holder shall constitute acceptance of and agreement to all of the terms and conditions contained herein.

14. GOVERNING LAW. This Warrant and all rights, obligations and liabilities hereunder shall be governed by the laws of the State of New York without regard to the principles of conflict of laws.

15. **DESCRIPTIVE HEADINGS.** The descriptive headings of the several paragraphs of this Warrant are inserted for convenience only and do not constitute a part of this Warrant. The language in this Warrant shall be construed as to its fair meaning without regard to which party drafted this Warrant.

16. **SEVERABILITY.** The invalidity or unenforceability of any provision of this Warrant in any jurisdiction shall not affect the validity or enforceability of such provision in any other jurisdiction, or affect any other provision of this Warrant, which shall remain in full force and effect.

17. **ENTIRE AGREEMENT.** This Warrant constitutes the entire agreement between the parties pertaining to the subject matter contained in it and supersedes all prior and contemporaneous agreements, representations, and undertakings of the parties, whether oral or written, with respect to such subject matter.

[Signature Page Follows]

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IN WITNESS WHEREOF, the Company has caused this Warrant to be executed by its duly authorized officer as of June 16, 2015.

ARCA biopharma, INC.

By:

Name: Michael R. Bristow

Title: Chief Executive Officer

Address: 11080 CirclePoint Rd., Suite 140  
Westminster, CO 80020  
Attention: Chief Accounting Officer  
Facsimile: (720) 208-9261

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NOTICE OF EXERCISE

TO: ARCA biopharma, Inc.

(1) The undersigned hereby elects to (check one box only):

purchase \_\_\_\_\_ shares of the Common Stock of ARCA biopharma, Inc. (the “Company”) pursuant to the terms of the attached Warrant, and tenders herewith payment of the exercise price in full for such shares, together with all applicable transfer taxes, if any.

purchase the number of shares of Common Stock of the Company by cashless exercise pursuant to the terms of the Warrant as shall be issuable upon cashless exercise of the portion of the Warrant relating to \_\_\_\_\_ shares, and shall tender payment of all applicable transfer taxes, if any.

(2) Please issue a certificate or certificates representing said shares of Common Stock in the name of the undersigned or in such other name as is specified below:

(Name)

(Address)

(3) The undersigned represents that: (i) the aforesaid shares of Common Stock are being acquired for the account of the undersigned for investment and not with a view to, or for resale in connection with, the distribution thereof and that the undersigned has no present intention of distributing or reselling such shares; (ii) the undersigned is aware of the Company’s business affairs and financial condition and has acquired sufficient information about the Company to reach an informed and knowledgeable decision regarding its investment in the Company; (iii) the undersigned is experienced in making investments of this type and has such knowledge and background in financial and business matters that the undersigned is capable of evaluating the merits and risks of this investment and protecting the undersigned’s own interests; (iv) the undersigned understands that the shares of Common Stock issuable upon exercise of this Warrant have not been registered under the Securities Act of 1933, as amended (the “Securities Act”), by reason of a specific exemption from the registration provisions of the Securities Act, which exemption depends upon, among other things, the bona fide nature of the investment intent as expressed herein, and, because such securities have not been registered under the Securities Act, they must be held indefinitely unless subsequently registered under the Securities Act or an exemption from such registration is available; (v) the undersigned is aware that the aforesaid shares of Common Stock may not be sold pursuant to Rule 144 adopted under the Securities Act unless certain conditions are met and until the undersigned has held the shares for the time period prescribed by Rule 144, that among the conditions for use of the Rule is the availability of current information to the public about the Company and that the Company has not made such information available and has no present plans to do so; and (vi) the undersigned agrees not to make any disposition of all or any part of the aforesaid shares of Common Stock unless and until there is then in effect a registration statement under the Securities Act covering such proposed disposition and such disposition is made in accordance with said registration statement, or the undersigned has furnished the Company with an opinion of counsel, reasonably satisfactory to the Company, to the effect that such disposition is not required to be registered pursuant to the Securities Act or any applicable state securities laws; provided, that no opinion shall be required for any disposition made or to be made in accordance with the provisions of Rule 144.

(Date) (Signature)

(Print name)

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ASSIGNMENT FORM

(To assign the foregoing Warrant, subject to compliance with section 4.3 hereof, execute this form and supply required information. Do not use this form to purchase shares.)

FOR VALUE RECEIVED, the foregoing Warrant and all rights evidenced thereby are hereby assigned to

Name:

(Please Print)

Address:

(Please Print)

Dated:           , 20

Holder's  
Signature:

Holder's  
Address:

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

EXHIBIT C

FORM OF LEGAL OPINION

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Brent D. Fassett

T: +1 720 566 4025

fassettbd@cooley.com

June \_\_, 2015

To the Purchasers Set Forth on Schedule A Hereto

Ladies and Gentlemen:

We have acted as counsel for ARCA biopharma, Inc., a Delaware corporation (the “Company”), in connection with the issuance and sale of an aggregate of (i) [\_\_\_\_\_] shares of the Company’s Common Stock (the “Shares”) and (ii) warrants (the “Warrants”) to purchase up to an aggregate of [\_\_\_\_\_] shares of the Company’s Common Stock (the “Warrant Shares”) to the Purchasers under that certain Securities Purchase Agreement, dated as of June \_\_, 2015 (the “Purchase Agreement”). We are rendering this opinion pursuant to Section 5.2(d) of the Purchase Agreement. Except as otherwise defined herein, capitalized terms used but not defined herein have the respective meanings given to them in the Purchase Agreement.

In connection with this opinion, we have examined and relied upon the representations and warranties as to factual matters contained in and made pursuant to the Purchase Agreement and the Warrants by the various parties and originals or copies certified to our satisfaction, of such records, documents, certificates, opinions, memoranda and other instruments as in our judgment are necessary or appropriate to enable us to render the opinion expressed below.

As to certain factual matters, we have relied upon a certificate of an officer of the Company and have not sought independently to verify such matters. Where we render an opinion “to our knowledge” or concerning a matter “known to us” or our opinion otherwise refers to our knowledge, it is based solely upon (i) an inquiry of attorneys within this firm who have represented the Company in this transaction, (ii) receipt of a certificate executed by an officer of the Company covering such matters, and (iii) such other investigation, if any, that we specifically set forth herein. We have conducted no further investigation.

In rendering this opinion, we have assumed: the authenticity of all documents submitted to us as originals; the conformity to originals of all documents submitted to us as copies; the accuracy, completeness and authenticity of certificates of public officials; the due authorization, execution and delivery of all documents (except the due authorization, execution and delivery by the Company of the Purchase Agreement and the Warrants (together, the “Transaction Documents”)), where authorization, execution and delivery are prerequisites to the effectiveness of such documents; and the genuineness and authenticity of all signatures on original documents (except the signatures on behalf of the Company on the Transaction Agreements). We have also assumed: that all individuals executing and delivering documents had the legal capacity to so execute and deliver; that the Transaction Documents are obligations binding upon the parties thereto other than the Company; and that there are no extrinsic agreements or understandings among the parties to the Transaction Documents or to the Material Agreements (as defined below) that would modify or interpret the terms of any such Transaction Documents or the respective rights or obligations of the parties thereunder.

Our opinion is expressed only with respect to the federal securities laws of the United States, the laws of the State of New York and the General Corporation Law of the State of Delaware (the “DGCL”). We express no opinion as to whether the laws of any other jurisdiction apply, and we express no opinion to the extent that the laws of any jurisdiction other than those identified above are applicable to the subject matter hereof.

We are not rendering any opinion as to any statute, rule, regulation, ordinance, decree or decisional law relating to antitrust, banking, land use, environmental, pension, employee benefit, tax, fraudulent conveyance, usury, laws governing the legality of investments for regulated entities, Regulations T, U or X of the Board of Governors of the Federal Reserve System or local law or regulations. Furthermore, we express no opinion with respect to compliance with antifraud laws, rules or regulations relating to securities or the offer and sale thereof; compliance with fiduciary duties by the Board of Directors; compliance with safe harbors for disinterested Board of Director approvals; compliance with state securities or blue sky laws; compliance with the Investment Company Act of 1940; or compliance with laws that place limitations on corporate distributions.

We have further assumed, that none of the Company, its affiliates or any person acting on their behalf has engaged in any form of “general solicitation or general advertising” within the meaning contemplated by Rule 502(c) of Regulation D promulgated under the Securities Act of 1933, as amended (the “Securities Act”). We have further assumed, that the Company is not disqualified from relying on Regulation D under the Securities Act by reason of the “bad actor” disqualification provisions in Rule 506(d) of Regulation D and that the Company is not required to make any disclosure of “bad actor” events to the purchasers of the Securities under Rule 506(e) of Regulation D.

With regard to our opinion in paragraphs 1 and 2 below with respect to the good standing of the Company, we have relied solely upon certificates of the Secretaries of State of the indicated jurisdictions as of a recent date.

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With regard to our opinion in paragraph 2 below with respect to the Company's qualification to do business as a foreign corporation, we have based our opinion solely upon an examination of the certificates issued by the office of the Secretary of State of the indicated jurisdictions as of a recent date.

With regard to our opinion in paragraph 4 below concerning the Transaction Documents constituting valid and binding obligations of the Company:

(i)Our opinion is subject to, and may be limited by, (a) applicable bankruptcy, reorganization, insolvency, moratorium, fraudulent conveyance, debtor and creditor, and similar laws which relate to or affect creditors' rights generally, and (b) general principles of equity (including, without limitation, concepts of materiality, reasonableness, good faith and fair dealing) regardless of whether considered in a proceeding in equity or at law;

(ii)Our opinion is subject to the qualification that (a) the enforceability of provisions for indemnification or limitations on liability may be limited by applicable law and by public policy considerations, and (b) the availability of specific performance, an injunction or other equitable remedies is subject to the discretion of the court before which the request is brought;

(iii)We express no opinion with respect to any provision of the Transaction Documents that: (a) requires the Company to make payment upon breach or otherwise provides for liquidated damages, monetary penalties or other economic remedies; (b) purports to be severable in the event a provision determined by a court to be an essential part of the agreed exchange is determined to be invalid or unenforceable; (c) specifies provisions may be waived only in writing, to the extent that an oral agreement or implied agreement by trade practice or course of conduct has been created that modifies such provision; (d) contains a waiver of an inconvenient forum, (e) relates to advance waivers of claims, defenses, rights granted by law, or notice, opportunity for hearing, evidentiary requirements, statutes of limitations, trial by jury, service of process or procedural rights, (f) restricts non-written modifications and waivers, (g) provides for the payment of legal and other professional fees where such payment is contrary to law or public policy, (h) relates to exclusivity, election or accumulation of rights or remedies, or (i) specifies a party's waiver of any breach or any provision is not to be construed as a waiver by such party of any prior breach of such provision or of any other provision of the relevant agreement; and

(iv)We express no opinion as to whether a state court outside of the State of New York or a federal court of the United States would give effect to the choice of New York law provided for in the Transaction Documents. Our opinion, insofar as it relates to the enforceability of the choice of New York law assumes satisfaction of the requirements of Section 5-1401 of the New York General Obligations Law, which permits contracting parties to specify that the law of the State of New York is applicable if such requirements are satisfied. Our opinion, insofar as it relates to the enforceability of the submission to the jurisdiction of the courts of the State of New York and the federal courts situated therein assumes satisfaction of the requirements of Section 5-1402 of the New York General Obligations Law, which permits contracting parties to submit to the jurisdiction of the courts of the State of New York if such requirements are satisfied.

With regard to our opinion in paragraph 5 below with respect to securities of the Company to be issued after the date hereof, we express no opinion to the extent that (i) the Warrants by their terms become exercisable for securities or other property other than the Warrant Shares or cause the holders of such Warrants to receive any securities or rights to receive or acquire securities other than the Warrant Shares or (ii) notwithstanding the Company's current reservation of the Warrant Shares, future issuances of securities of the Company and/or antidilution adjustments to outstanding securities of the Company cause the Warrants to be exercisable for more shares of the Company's Common Stock than the number that then remain authorized but unissued. Further, with regard to our opinion in paragraph 4 and 5 below, we have assumed that any adjustments to the per share exercise price under the Warrants will not cause the per share

exercise price under the Warrants to be less than par value.

With regard to our opinion paragraph 6 below concerning defaults under and any material breaches of any agreement identified on Schedule B hereto, we have relied solely upon (i) inquiries of officers of the Company, (ii) a list supplied to us by the Company of material agreements to which the Company is a party, or by which it is bound, a copy of which is attached hereto as Schedule B hereto (the "Material Agreements"), and (iii) an examination of the Material Agreements in the form provided to us by the Company. We have made no further investigation. Further, with regard to our opinion in paragraph 6 below concerning Material Agreements, we express no opinion as to (i) financial covenants or similar provisions therein requiring financial calculations or determinations to ascertain compliance, (ii) provisions therein relating to the occurrence of a "material adverse event" or words of similar import, or (iii) any statement or writing that may constitute parol evidence bearing on interpretation or construction. We have assumed that the Material Agreements would be interpreted in accordance with their plain meaning.

With regard to our opinion in paragraph 7 below with respect to pending or overtly threatened litigation, we have made an inquiry of the attorneys within this firm who have represented the Company in this transaction, examined and relied upon a certificate executed by an officer of the Company covering such matters, and checked the records of this firm to ascertain that we are not acting as counsel of record for the Company in any such matter. We have made no further investigation.

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With regard to our opinion in paragraph 8 concerning exemption from registration, our opinion is expressed only with respect to the offer and sale of the Shares and the Warrants without regard to any offers or sales of other securities occurring prior to or subsequent to the date hereof.

With regard to our opinion in paragraph 9 below, we have based our opinion, to the extent we consider appropriate, on Rule 3a-8 under the Investment Company Act of 1940, as amended (the "Investment Company Act"), and a certificate of an officer of the Company as to factual matters relating to compliance with each of the requirements necessary to comply with Rule 3a-8. We have conducted no further investigation.

On the basis of the foregoing, in reliance thereon and with the foregoing qualifications, we are of the opinion that:

1. The Company is validly existing as a corporation in good standing under the laws of the State of Delaware with the requisite corporate power to own its property and assets and to conduct its business as it is currently being conducted.
2. The Company is duly qualified to do business as a foreign corporation and is in good standing under the laws of the State of Colorado.
3. The Company's authorized capital stock consists of 100,000,000 shares of Common Stock and 5,000,000 shares of Preferred Stock, par value \$0.001 per share, none of which are designated.
4. Each of the Transaction Documents has been duly authorized by all necessary corporate action on the part of the Company and has been duly executed and delivered by the Company. Each of the Transaction Documents constitutes a valid and binding obligation of the Company enforceable in accordance with its terms.
5. The Shares have been duly authorized and, when issued and paid for by the Purchasers pursuant to the Purchase Agreement, will be validly issued, fully paid and nonassessable. The Warrant Shares have been duly authorized and reserved for issuance pursuant to the terms of the Warrants and, when issued and paid for by the Purchasers in accordance with the terms of the Warrants, will be validly issued, fully paid and nonassessable.
6. The execution and delivery of the Transaction Documents by the Company and the issuance of the Shares and Warrants pursuant thereto do not (i) violate any provision of the Company's Amended and Restated Certificate of Incorporation, as amended, or Amended and Restated Bylaws, (ii) do not constitute a default under or a material breach of any Material Agreement, and (iii) do not violate (a) any governmental statute, rule or regulation which in our experience is typically applicable to transactions of the nature contemplated by the Transaction Documents or (b) any order, writ, judgment, injunction, decree, determination or award which has been entered against the Company and of which we are aware, in each case to the extent the violation of which would materially and adversely affect the Company.
7. To our knowledge, there is no action, proceeding or investigation pending or overtly threatened against the Company before any court or administrative agency that questions the validity of the Transaction Documents or that could reasonably be expected to result, either individually or in the aggregate, in a material adverse effect on the Company.
8. The offer and sale of the Shares and the Warrants are exempt from the registration requirements of the Securities Act, subject to the timely filing of a Form D pursuant to Securities and Exchange Commission Regulation D.
9. No consent, approval, authorization or filing with or order of any U.S. Federal, Delaware (with respect to the DGCL) or New York court or governmental agency or body having jurisdiction over the Company is required for the

for the offer and sale of the Securities pursuant to the terms of the Subscription Agreements, except (a) for the filing of a Form D pursuant to Securities and Exchange Commission Regulation D and (b) for any necessary filings under applicable blue sky laws.

10. The Company is not, and, after giving effect to the offering and sale of the Shares and the Warrants, will not be required to be registered as an “investment company” as defined in the Investment Company Act.

This letter is furnished only to you as the Purchasers under the Purchase Agreement and is solely for your benefit in connection with the transactions referenced in the first paragraph. This letter may not be relied upon by you for any other purpose, or furnished to, assigned to, quoted to, or relied upon by any other person, firm or other entity for any purpose (including any person, firm or other entity that acquires Securities from or through you) without our prior written consent, which may be granted or withheld in our sole discretion.

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This letter is limited to the matters expressly set forth in this letter, and no opinion has been implied, or may be inferred, beyond the matters expressly stated. This letter speaks only as to law and facts in effect or existing as of the date hereof and we undertake no obligation or responsibility to update or supplement this letter to reflect any facts or circumstances that may hereafter come to our attention or any changes in any law that may hereafter occur.

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Very truly yours,

Cooley llp

By:

Brent D. Fassett

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SCHEDULE A

Schedule of Purchasers

Venrock Healthcare Capital Partners II, L.P.

VHCP Co-Investment Holdings II, LLC

Venrock Healthcare Capital Partners, L.P.

VHCP Co-Investment Holdings, LLC

Growth Equity Opportunities Fund IV, LLC

Franklin Strategic Series – Franklin Biotechnology Discovery Fund

Franklin Templton Investment Funds – Franklin Biotechnology Discovery Fund

RA Capital Healthcare Fund, L.P.

Blackwell Partners LLC – Series A

Tekla Life Sciences Investors

Capital Ventures International

Dafna Lifescience LP

Dafna Lifescience Market Neutral LP

Dafna Lifescience Select LP

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SCHEDULE B

Material Agreements

License and Sublicense Agreement, dated October 28, 2003, by and between ARCA Discovery, Inc. and CPEC, L.L.C.

Amendment to License and Sublicense Agreement, dated February 22, 2006, by and between ARCA Discovery, Inc. and CPEC L.L.C.

Manufacturing Agreement, dated September 11, 2006, by and between ARCA Discovery, Inc. and Patheon, Inc.

ARCA Discovery, Inc. 2004 Stock Incentive Plan.

Amendment No. 1 to the ARCA Discovery, Inc. 2004 Stock Incentive Plan.

Amendment No. 2 to the ARCA Discovery, Inc. 2004 Stock Incentive Plan.

Amendment No. 3 to the ARCA Discovery, Inc. 2004 Stock Incentive Plan.

Amendment No. 4 to the ARCA Discovery, Inc. 2004 Stock Incentive Plan.

Amendment No. 5 to the ARCA Discovery, Inc. 2004 Stock Incentive Plan.

Amendment No. 6 to the ARCA Discovery, Inc. 2004 Stock Incentive Plan.

ARCA biopharma, Inc. 2004 Stock Incentive Plan, Form of Executive Incentive Stock Option Agreement.

ARCA biopharma, Inc. 2004 Stock Incentive Plan, Form of Non-Executive Incentive Stock Option Agreement.

ARCA biopharma, Inc. 2004 Stock Incentive Plan, Form of Nonqualified Stock Option Agreement.

ARCA biopharma, Inc. 2004 Equity Incentive Plan (f/k/a Nuvelo, Inc. 2004 Equity Incentive Plan), Form of Partial Acceleration Stock Option Agreement.

ARCA biopharma, Inc. 2004 Equity Incentive Plan (f/k/a Nuvelo, Inc. 2004 Equity Incentive Plan), Form of No Acceleration Stock Option Agreement.

ARCA biopharma, Inc. 2004 Equity Incentive Plan (f/k/a Nuvelo, Inc. 2004 Equity Incentive Plan), Form of Director Stock Option Agreement.

ARCA biopharma, Inc. 2004 Equity Incentive Plan (f/k/a Nuvelo, Inc. 2004 Equity Incentive Plan), Form of Notice of Grant of Stock Option.

ARCA biopharma, Inc. 2004 Equity Incentive Plan (f/k/a Nuvelo, Inc. 2004 Equity Incentive Plan), Form of Notice of Director Grant of Stock Option.

Amended and Restated Employment and Retention Agreement, dated June 4, 2008, by and between ARCA biopharma, Inc. and Michael R. Bristow.

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Assignment and Assumption Agreement, dated January 26, 2009, by and between ARCA biopharma, Inc. and ARCA biopharma Colorado, Inc.

Amended and Restated Employment Agreement, dated June 12, 2008, by and between ARCA biopharma, Inc. and Christopher D. Ozeroff.

Assignment and Assumption Agreement, dated January 26, 2009, by and between ARCA biopharma, Inc. and ARCA biopharma Colorado, Inc.

Amended and Restated ARCA biopharma, Inc. 2004 Equity Incentive Plan.

Form of Option Amendment pursuant to ARCA biopharma, Inc. 2004 Equity Incentive Plan and ARCA biopharma, Inc. 2004 Stock Option Plan (change of control).

Form of Option Agreement and Grant Notice pursuant to ARCA biopharma, Inc. 2004 Equity Incentive Plan (NDA/change of control acceleration).

Employment Agreement, dated February 11, 2009, by and between ARCA biopharma, Inc. and Patrick Wheeler.

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Form of Indemnification Agreement between ARCA biopharma, Inc. and its directors and officers.

Form of Subscription Agreement.

License Agreement, dated April 15, 2011, by and between ARCA biopharma and the University of Cincinnati.

Amended and Restated Exclusive License Agreement, dated August 12, 2011, by and between the Regents of the University of Colorado and ARCA biopharma, Inc.

Subscription Agreement, dated April 18, 2011, by and between ARCA biopharma, Inc. and Freestone Advantage Partners, LP.

Subscription Agreement, dated April 18, 2011, by and between ARCA biopharma, Inc. and Cranshire Capital, L.P.

Subscription Agreement, dated April 18, 2011, by and between ARCA biopharma, Inc. and Iroquois Master Fund Ltd.

Subscription Agreement, dated December 19, 2011, by and between ARCA biopharma, Inc. and Cranshire Capital Master Fund, Ltd.

Subscription Agreement, dated December 19, 2011, by and between ARCA biopharma, Inc. and Freestone Advantage Partners II, LP

Subscription Agreement, dated December 19, 2011, by and between ARCA biopharma, Inc. and Iroquois Master Fund Ltd.

Subscription Agreement, dated December 19, 2011, by and between ARCA biopharma, Inc. and Kingsbrook Opportunities Master Fund LP

Subscription Agreement, dated December 19, 2011, by and between ARCA biopharma, Inc. and Empery Asset Master LTD

Subscription Agreement, dated December 19, 2011, by and between ARCA biopharma, Inc. and Hartz Capital Investments, LLC

Registration Rights Agreement, dated December 22, 2011, by and among ARCA biopharma, Inc. and Cranshire Capital Master Fund, Ltd., Freestone Advantage Partners II, LP, Iroquois Master Fund Ltd., Kingsbrook Opportunities Master Fund LP, Empery Asset Master LTD and Hartz Capital Investments, LLC.

Waiver and Amendment Agreement, dated March 30, 2012, by and between ARCA biopharma, Inc. and Michael Bristow.

Waiver and Amendment Agreement, dated March 30, 2012, by and between ARCA biopharma, Inc. and Patrick Wheeler.

Waiver and Amendment Agreement, dated March 30, 2012, by and between ARCA biopharma, Inc. and Christopher Ozeroff.

Subscription Agreement, dated August 2, 2012, by and between Arca biopharma, Inc. and Anson Investments Master Fund LP.

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Subscription Agreement, dated August 2, 2012, by and between Arca biopharma, Inc. and Cranshire Capital Master Fund, Ltd.

Subscription Agreement, dated August 2, 2012, by and between Arca biopharma, Inc. and Pyramid Trading, LP

Subscription Agreement, dated August 2, 2012, by and between Arca biopharma, Inc. and Sabby Volatility Warrant Master Fund, Ltd.

Subscription Agreement, dated August 2, 2012, by and between Arca biopharma, Inc. and Sabby Healthcare Volatility Master Fund, Ltd.

Subscription Agreement, dated October 22, 2012, by and between Arca biopharma, Inc. and Atlas Venture Fund VII, L.P

Subscription Agreement, dated October 22, 2012, by and between Arca biopharma, Inc. and Investocor Trust

Subscription Agreement, dated October 22, 2012, by and between Arca biopharma, Inc. and Lansing Brown Investments, LLC

Subscription Agreement, dated October 22, 2012, by and between Arca biopharma, Inc. and Christopher Ozeroff.

Registration Rights Agreement, dated October 25, 2012, by and among Arca biopharma, Inc. and Atlas Venture Fund VII, L.P, Investocor Trust, Lansing Brown Investments, LLC and Christopher Ozeroff.

Subscription Agreement, dated December 18, 2012, by and between Arca biopharma, Inc. and Atlas Ventures Fund VII, L.P.

Subscription Agreement, dated December 18, 2012, by and between Arca biopharma, Inc. and Michael Bristow

Registration Rights Agreement, dated December 20, 2012, by and among Arca biopharma, Inc. and Atlas Ventures Fund VII, L.P. and Michael Bristow

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Amendment to the Registration Rights Agreement, dated December 18, 2012, by and among Arca biopharma, Inc. and Atlas Venture Fund VII, L.P., Investocor Trust, Lansing Brown Investments, LLC and Christopher D. Ozeroff

Form of Subscription Agreement by and among the Company and the purchasers identified therein, dated January 22, 2013

Form of Registration Rights Agreement.

Subscription Agreement.

Clinical Trial Collaboration Agreement between ARCA biopharma, Inc. and Medtronic, Inc. dated as of April 18, 2013.

Placement Agency Agreement by and between ARCA biopharma, Inc. and Dawson James Securities, Inc., dated January 21, 2014.

Amendment No. 1 Placement Agency Agreement by and between ARCA biopharma, Inc. and Dawson James Securities, Inc., dated January 31, 2014.

Letter Agreement between ARCA biopharma, Inc. and Medtronic, Inc. dated as of July 26, 2013.

Office Lease Agreement by and between ARCA biopharma, Inc. and Circle Point Properties, LLC, effective August 1, 2013.

Amendment Agreement by and between ARCA biopharma, Inc. and Michael R. Bristow, effective as of June 13, 2013.

Amendment Agreement by and between ARCA biopharma, Inc. and Patrick M. Wheeler, effective as of June 13, 2013.

Amendment Agreement by and between ARCA biopharma, Inc. and Christopher Ozeroff, effective as of June 13, 2013.

ARCA biopharma, Inc. 2013 Equity Incentive Plan.

Form of Stock Option Agreement and Option Grant Notice under 2013 Equity Incentive Plan (Standard).

Form of Stock Option Agreement and Option Grant Notice under 2013 Equity Incentive Plan (Officer).

Form of Stock Option Agreement and Option Grant Notice under 2013 Equity Incentive Plan (Director).

Form of Restricted Stock Unit Award Agreement and Notice of Grant Award under 2013 Equity Incentive Plan (Standard).

Form of Restricted Stock Unit Award Agreement and Notice of Grant Award under 2013 Equity Incentive Plan (Officer).

Clinical Research Agreement by and between ARCA biopharma, Inc. and Duke University, dated November 5, 2013.

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Change Order No. 1 to Clinical Research Agreement between ARCA biopharma, Inc. and Duke University, dated November 12, 2014.

First Amendment to Clinical Trial Collaboration Agreement between ARCA biopharma, Inc. and Medtronic, Inc. dated July 28, 2014.

Second Amendment to Clinical Trial Collaboration Agreement between ARCA biopharma, Inc. and Medtronic, Inc. dated September 9, 2014.

Employment Agreement, dated December 29, 2014, by and between ARCA biopharma, Inc. and Brian Selby.

Amended and Restated Employment Agreement, dated December 29, 2014, by and between ARCA biopharma, Inc. and Thomas A. Keuer.

Canadian Addendum to Clinical Trial Collaboration Agreement between ARCA biopharma, Inc. and Medtronic, Inc. dated February 4, 2015.