

ARCA biopharma, Inc.
Form S-3
February 11, 2013
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As filed with the Securities and Exchange Commission on February 11, 2013

Registration No. 333-_____

SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM S-3

REGISTRATION STATEMENT

UNDER

THE SECURITIES ACT OF 1933

ARCA BIOPHARMA, INC.

(Exact name of registrant as specified in its charter)

Delaware
(State of Incorporation)

36-3855489
(I.R.S. Employer

Identification No.)

8001 Arista Place, Suite 430

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Broomfield, Colorado 80021

(720) 940-2200

**(Address, including zip code, and telephone number, including
area code of Registrant's principal executive offices)**

Dr. Michael Bristow

President and Chief Executive Officer

8001 Arista Place, Suite 430

Broomfield, Colorado 80021

(720) 940-2200

**(Name, address, including zip code, and telephone number,
including area code, of agent for service)**

Copies to:

Brent D. Fassett

Cooley LLP

380 Interlocken Crescent, Suite 900

Broomfield, Colorado 80021

(720) 566-4000

Approximate date of commencement of proposed sale to the public:

From time to time after the effective date of this Registration Statement.

If the only securities being registered on this form are being offered pursuant to dividend or interest reinvestment plans, please check the following box.

If any of the securities being registered on this Form are to be offered on a delayed or continuous basis pursuant to Rule 415 under the Securities Act of 1933, other than securities offered only in connection with dividend or interest reinvestment plans, check the following box.

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

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

If this Form is a registration statement pursuant to General Instruction I.D. or a post-effective amendment thereto that shall become effective upon filing with the Commission pursuant to Rule 462(e) under the Securities Act, check the following box. "

If this Form is a post-effective amendment to a registration statement filed pursuant to General Instruction I.D. filed to register additional securities or additional classes of securities pursuant to Rule 413(b) under the Securities Act, check the following box. "

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

Large accelerated filer Accelerated filer
 Non-accelerated filer (Do not check if a smaller reporting company) Smaller reporting company

CALCULATION OF REGISTRATION FEE

| Title of Class of Securities to be Registered(1) | Number of Shares to be Registered (1)(2) | Proposed Maximum Offering Price Per Share(3) | Proposed Maximum Aggregate Offering Price (3) | Amount of Registration Fee |
|---|---|--|---|-------------------------------|
| COMMON STOCK, par value \$0.001 per share | 5,984,610 | \$0.59 | \$3,530,919.90 | \$481.62 |

- (1) Consists of an aggregate of 3,480,880 shares of common stock and 2,503,730 shares of common stock that may be issued upon the exercise of warrants, all of which were acquired by the selling stockholders in private placements.
- (2) Pursuant to Rule 416 under the Securities Act of 1933, as amended, the shares being registered hereunder include such indeterminate number of additional shares of common stock as may be issuable as a result of stock splits, stock dividends or similar transactions with respect to the shares being registered hereunder.
- (3) Estimated solely for the purpose of calculating the registration fee pursuant to Rule 457(c) under the Securities Act, based upon the average of the high and low prices for the common stock on February 5, 2013, as reported by the NASDAQ Capital Market.

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

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

SUBJECT TO COMPLETION, DATED FEBRUARY 11, 2013

PROSPECTUS

ARCA BIOPHARMA, INC.

3,480,880 SHARES OF COMMON STOCK

**2,503,730 SHARES OF COMMON STOCK ISSUABLE UPON EXERCISE OF
WARRANTS**

This prospectus relates to the disposition from time to time of up to 3,480,880 shares of our common stock, which includes 2,503,730 shares of our common stock issuable upon the exercise of warrants held by the selling stockholders named in this prospectus. The selling stockholders acquired the common stock and the warrants to purchase common stock from us in private placements that closed in October 2012, December 2012 and January 2013 that are more fully described in the section entitled "Prospectus Summary." We are not selling any common stock under this prospectus and will not receive any of the proceeds from the sale of shares by the selling stockholders. However, we will receive net proceeds of any warrants exercised for cash.

The selling stockholders may sell the shares of common stock described in this prospectus in a number of different ways and at varying prices. We provide more information about how the selling stockholders may sell their shares of common stock in the section entitled "Plan of Distribution" on page 10. The selling stockholders will bear all commissions and discounts, if any, attributable to the sale or disposition of the shares, or interests therein. We will bear all costs, expenses and fees in connection with the registration of the shares. We will not be paying any underwriting discounts or commissions in this offering.

Our common stock is traded on the NASDAQ Capital Market under the symbol "ABIO." On February 8, 2013, the last reported sale price of our common stock was \$0.66 per share.

AN INVESTMENT IN OUR COMMON STOCK INVOLVES A HIGH DEGREE OF RISK. YOU SHOULD CAREFULLY REVIEW THE RISKS AND UNCERTAINTIES REFERRED TO UNDER THE HEADING RISK FACTORS BEGINNING ON PAGE 5 OF THIS PROSPECTUS AND UNDER ANY SIMILAR HEADINGS IN ANY AMENDMENT OR SUPPLEMENT TO THIS PROSPECTUS OR IN ANY FILING WITH THE SECURITIES AND EXCHANGE COMMISSION THAT IS INCORPORATED BY REFERENCE HEREIN.

NEITHER THE SECURITIES AND EXCHANGE COMMISSION NOR ANY STATE SECURITIES COMMISSION HAS APPROVED OR DISAPPROVED OF THESE SECURITIES OR PASSED UPON THE ACCURACY OR ADEQUACY OF THIS PROSPECTUS. ANY REPRESENTATION TO THE CONTRARY IS A CRIMINAL OFFENSE.

The date of this Prospectus is _____, 2013

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ABOUT THIS PROSPECTUS

You should rely only on the information contained or incorporated by reference in this prospectus and any related prospectus supplement. We have not, and the selling stockholders have not, authorized anyone to provide you with different information. No one is making offers to sell or seeking offers to buy these securities in any jurisdiction where the offer or sale is not permitted. You should assume that the information contained in this prospectus and any prospectus supplement is accurate only as of the date on the front of this prospectus or the prospectus supplement, as applicable, and that any information incorporated by reference in this prospectus or any prospectus supplement is accurate only as of the date given in the document incorporated by reference, regardless of the time of delivery of this prospectus, any applicable prospectus supplement or any sale of our common stock. Our business, financial condition, results of operations and prospects may have changed since that date.

This prospectus contains summaries of certain provisions contained in some of the documents described herein, but reference is made to the actual documents for complete information. All of the summaries are qualified in their entirety by the actual documents. Copies of some of the documents referred to herein have been filed, will be filed or will be incorporated by reference as exhibits to the registration statement of which this prospectus is a part, and you may obtain copies of those documents as described below under the section entitled "Where You Can Find More Information."

This prospectus and the information incorporated herein by reference includes trademarks, service marks and trade names owned by us or others. All trademarks, service marks and trade names included or incorporated by reference into this prospectus or any applicable prospectus supplement are the property of their respective owners.

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PROSPECTUS SUMMARY

This summary highlights selected information contained elsewhere or incorporated by reference in this prospectus. This summary may not contain all the information that you should consider before investing in our common stock. You should read the entire prospectus carefully, including the Risk Factors section contained in this prospectus, any prospectus supplement and the documents incorporated by reference herein, before making an investment decision.

Unless we have indicated otherwise, or the context otherwise requires, references in this to ARCA, the Company, we, us and our refer to ARCA biopharma, Inc. and our subsidiaries.

Overview

We are a biopharmaceutical company whose principal focus is developing genetically-targeted therapies for cardiovascular diseases. Our lead product candidate is Gencaro (bucindolol hydrochloride), a pharmacologically unique beta-blocker and mild vasodilator that we plan to study in a new clinical trial for the treatment of atrial fibrillation, or AF, in patients with heart failure. We have identified common genetic variations in receptors in the cardiac nervous system that we believe interact with Gencaro's pharmacology and may enhance patient response.

We have been granted patents in the U.S., Europe, and other jurisdictions for methods of treating patients who have these genetic variations with Gencaro. We believe that if Gencaro is approved, the Gencaro patents may provide market exclusivity into 2029 or 2030 in the US and in Europe.

We believe that that Gencaro has potential efficacy in reducing or preventing AF, and this efficacy may be genetically regulated. We plan to test this hypothesis in a clinical trial of Gencaro, known as GENETIC-AF. This trial is planned to be genetically enriched by enrolling only those patients who possess the cardiac beta-1 adrenergic receptor genotype 389 arginine homozygous, which in the Beta Blocker Evaluation of Survival Trial (BEST) was associated with an enhanced response to Gencaro in preventing atrial fibrillation. A retrospective analysis of data from the prior Phase 3 clinical trial of Gencaro shows that patients with this genotype had a 74% reduction in the risk of AF compared to placebo ($p = 0.0003$). These same patients experienced a 38% reduction in the risk of all cause mortality ($p < 0.05$) and statistically significant improvements on other major clinical efficacy endpoints. We estimate that this genotype is present in about 50% of the US general population.

We have created an adaptive design for GENETIC-AF, under which the trial is intended to be initiated as a Phase 2B study in approximately 200 HFREF patients. Depending on the results of the Phase 2B portion, the trial may then be expanded to a Phase 3 study by enrolling an estimated additional 420 patients, depending on the results of the Phase 2B portion. We anticipate that GENETIC-AF could begin approximately 6 months after we obtain sufficient funding, and we believe the study would take approximately two and one half to three years to complete.

AF is considered an epidemic cardiovascular disease with an estimated prevalence of at least 2.7 million Americans in 2010. The approved therapies for the treatment or prevention of AF have disadvantages in HFREF patients, such as toxic or cardiovascular adverse effects, and most of the approved drugs for AF are contra-indicated or have warnings in their prescribing information for such patients. ARCA believes there is an unmet medical need for new AF treatments that are safe and more effective in the HFREF population at risk for AF.

To support the continued development of Gencaro, including the planned AF clinical trial and our ongoing operations, we will need to raise substantial additional funding through public or private debt or equity transactions or a strategic combination or partnership, or government funding. If we are delayed in obtaining funding or are unable to complete a strategic transaction, we may discontinue our development activities on Gencaro or discontinue our operations. We believe our cash and cash equivalents balance as of December 31, 2012, along with the approximately \$850,000 of net proceeds from our January 25, 2013 financing and the net proceeds from the February 5, 2013 Registered Direct offering of approximately \$630,000, will be sufficient to fund our operations, at our current cost structure, through September 30, 2013. We are unable to assert that our current cash and cash equivalents are sufficient to fund operations beyond that date, and as a result, there is substantial doubt about our ability to continue as a going concern beyond September 30, 2013. Changing circumstances may cause us to consume capital significantly faster or slower than we currently anticipate. We have based these estimates on assumptions that may prove to be wrong, and we could exhaust our available financial resources sooner than we currently anticipate.

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Other Information

We were originally incorporated as Hyseq, Inc. in Illinois in 1992 and reincorporated in Nevada in 1993. On January 31, 2003, we merged with Variagenics, Inc., a publicly traded Delaware corporation based in Massachusetts, and, in connection with the merger, changed our name to Nuvelo, Inc. On March 25, 2004, we reincorporated in Delaware. On January 27, 2009, our wholly owned subsidiary merged with ARCA biopharma, Inc., a privately held Delaware corporation based in Colorado, and, in connection with the merger, we changed our name to ARCA biopharma, Inc. Our principal offices are located at 8001 Arista Place, Suite 430, Broomfield, Colorado 80021. Our telephone number is (720) 940-2200. Our internet address is <http://www.arcabiopharma.com>. We do not incorporate the information on our website into this prospectus, and you should not consider it part of this prospectus. For further information regarding us and our financial information, you should refer to our recent filings with the Securities and Exchange Commission (SEC). See [Where You Can Find More Information](#) and [Incorporation of Certain Documents by Reference](#).

Each of ARCA, ARCA biopharma, Gencaro and Gencaro Test is a registered trademark of ARCA biopharma, Inc. Each of the other trademarks, trade names or service marks appearing in this prospectus belongs to its respective holder.

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The Offering

Common stock offered by selling stockholders 5,984,610 shares(1)

Use of proceeds We will not receive any proceeds from the sale of the shares of common stock covered by this prospectus. A portion of the shares covered by this prospectus are issuable upon exercise of warrants to purchase our common stock. Upon exercise of any of the warrants for cash, the applicable selling stockholder would pay us the exercise price set forth in the warrants. We expect to use any such proceeds for general working capital purposes.

NASDAQ Capital Market trading symbol for common ABIO stock

(1) includes 2,503,730 shares of common stock that may be issued upon the exercise of warrants held by selling stockholders. The selling stockholders named in this prospectus may offer and sell up to 5,984,610 shares of our common stock, including 2,503,730 shares of our common stock issuable upon exercise of warrants. Throughout this prospectus, when we refer to the share of our common stock being registered on behalf of the selling stockholders, we are referring to the shares of common stock that have been issued pursuant to the subscription agreements in the private placement described below, or that may be issuable upon the exercise of the warrants issued in such private placement. When we refer to the selling stockholders in this prospectus, we are referring to the investors in the private placement who are named in this prospectus as the selling stockholders and, as applicable, any donees, pledgees, transferees or other successors-in-interest selling shares received after the date of this prospectus from the selling stockholders as a gift, pledge or other non-sale transfer.

The Private Placements

On October 22, 2012, we entered into a subscription agreement with certain investors named in the table in the section entitled Selling Stockholders, pursuant to which we agreed to sell 825,184 units, with each unit consisting of one share of our common stock and a warrant to purchase 0.75 shares of our common stock (the October Private Placement). The warrants (the October Warrants) have an exercise price of \$0.3001, became exercisable on October 25, 2012 and expire five years after becoming exercisable, unless earlier terminated. In connection with the closing of the private placement on October 25, 2012, we also entered into a registration rights agreement with the investors, pursuant to which we agreed to file this registration statement with the Securities Exchange Commission to register for resale the shares issued in the private placement and the shares issuable upon exercise of the warrants issued in the private placement. On October 25, 2012, we closed the private placement and received gross proceeds of approximately \$325,000, before deduction of offering expenses.

On December 18, 2012, we entered into a subscription agreement with an investor named in the table in the section entitled Selling Stockholders, pursuant to which we agreed to sell 517,116 units, with each unit consisting of one share of our common stock and a warrant to purchase 0.75 shares of our common stock (the December Private Placement). The warrants (the December Warrants) have an exercise price of \$0.3897, became exercisable on December 20, 2012 and expire five years after becoming exercisable, unless earlier terminated. In connection with the closing of the private placement, on December 20, 2012, we also entered into a registration rights agreement with the investor, pursuant to which we agreed to file this registration statement with the Securities Exchange Commission to register for resale the shares issued in the private placement and the shares issuable upon exercise of the warrants issued in the private placement. On December 20, 2012, we closed the private placement and received gross proceeds of approximately \$250,000, before deduction of offering expenses.

On January 22, 2013, we entered into a subscription agreement with certain investors named in the table in the section entitled Selling Stockholders, pursuant to which we agreed to sell 2,138,580 units, with each unit consisting of one share of our common stock and a warrant to purchase 0.70 shares of our common stock (the January Private Placement). The warrants (the January Warrants) have an exercise price of \$0.3801, became exercisable on January 25, 2013 and expire seven years after becoming exercisable, unless

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earlier terminated. In connection with the closing of the private placement, on January 25, 2013, we also entered into a registration rights agreement with the investors, pursuant to which we agreed to file this registration statement with the Securities Exchange Commission to register for resale the shares issued in the private placement and the shares issuable upon exercise of the warrants issued in the private placement. On January 25, 2013, we closed the private placement and received gross proceeds of approximately \$1.0 million before deduction of placement agent fees and other offering expenses.

The issuance of shares of common stock and warrants sold in these private placements were exempt from registration under the Securities Act of 1933, as amended, or the Securities Act, pursuant to the exemption for transactions by an issuing not involving a public offering under Section 4(2) of the Securities Act and Regulation D promulgated under the Securities Act.

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RISK FACTORS

An investment in our common stock involves a high degree of risk. Prior to making a decision about investing in our common stock, you should consider carefully the specific risk factors discussed in the sections entitled "Risk Factors" contained in our most recent Annual Report on Form 10-K and subsequent Quarterly Reports on Form 10-Q, as filed with the SEC, which are incorporated in this prospectus by reference in their entirety, as well as any amendment or updates to our risk factors reflected in subsequent filings with the SEC, including any prospectus supplement hereto. These risks and uncertainties are not the only risks and uncertainties we face. Additional risks and uncertainties not presently known to us, or that we currently view as immaterial, may also impair our business. If any of the risks or uncertainties described in our SEC filings or any additional risks and uncertainties actually occur, our business, financial condition, results of operations and cash flow could be materially and adversely affected. In that case, the trading price of our common stock could decline and you might lose all or part of your investment.

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CAUTIONARY NOTE REGARDING FORWARD LOOKING INFORMATION

This prospectus and the documents that we have filed with the SEC that are incorporated by reference in this prospectus contain forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, amended, or the Securities Act, and Section 21E of the Securities Exchange Act of 1934, as amended, or the safe harbor created by those sections. In some cases, you can identify forward-looking statements by the following words: may, will, could, would, should, expect, intend, plan, anticipate, believe, estimate, continue, ongoing or the negative of these terms or other comparable terminology, although not all forward-looking statements contain these words. Discussions containing these forward-looking statements may be found, among other places, in Business and Management's Discussion and Analysis of Financial Condition and Results of Operations incorporated by reference from our most recent Annual Report on Form 10-K and our Quarterly Reports on Form 10-Q, as well as any amendments thereto reflected in subsequent filings with the SEC. These forward-looking statements involve known and unknown risks, uncertainties and other factors that may cause our actual results, levels of activity, performance or achievements to be materially different from the information expressed or implied by these forward-looking statements. While we believe that we have a reasonable basis for each forward-looking statement contained in this prospectus, we caution you that these statements are based on a combination of facts and factors currently known by us and our projections of the future, about which we cannot be certain. As a result of these factors, we cannot assure you that the forward-looking statements in this prospectus or documents incorporated by reference will prove to be accurate. Furthermore, if our forward-looking statements prove to be inaccurate, the inaccuracy may be material. In light of the significant uncertainties in these forward-looking statements, you should not regard these statements as a representation or warranty by us or any other person that we will achieve our objectives and plans in any specified time frame, or at all. You should not place undue reliance on these forward-looking statements, which apply only as of the date of this prospectus. You should read this prospectus, any accompanying prospectus supplement and the documents incorporated by reference completely and with the understanding that our actual future results may be materially different from what we expect.

Examples of these statements include, but are not limited to, statements regarding the following: the timing and results of any clinical trials, including the planned additional trial regarding Gencaro, our ability to obtain additional funding or enter into a strategic or other transaction, the extent to which our issued and pending patents may protect our products and technology, the potential of such product candidates to lead to the development of safe or effective therapies, our ability to enter into collaborations, our ability to maintain listing of our common stock on a national exchange, our future operating expenses, our future losses, our future expenditures, and the sufficiency of our cash resources to maintain operations. These statements involve known and unknown risks, uncertainties and other factors that may cause our actual results, levels of activity, performance or achievements to be materially different from the information expressed or implied by these forward-looking statements. While we believe that we have a reasonable basis for each forward-looking statement contained in this Annual Report, we caution you that these statements are based on a combination of facts and factors currently known by us and our projections of the future, about which we cannot be certain.

We undertake no obligation to publicly update any forward-looking statements, whether as a result of new information, future events or otherwise. You are advised, however, to consult any further disclosures we make on related subjects in our Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, and our website.

USE OF PROCEEDS

We will not receive any of the proceeds from the sale of shares of our common stock by the selling stockholders pursuant to this prospectus. A portion of the shares covered by this prospectus are issuable upon exercise of warrants to purchase our common stock. Upon exercise of any of the warrants for cash, the applicable selling stockholder would pay us the exercise price set forth in the warrants. The cash exercise price of the October 2012 Warrants is \$0.3001 per share, the cash exercise price of the December 2012 Warrants is \$0.3897 per share, and the cash exercise price of the January 2013 Warrants is \$0.3801 per share. We expect to use any such proceeds for general working capital purposes. The October, December and January Warrants are also exercisable on a cashless basis under certain circumstances. If any of the warrants are exercised on a cashless basis, we would not receive any cash payment from the applicable selling stockholder upon any such exercise of the warrants.

Each selling stockholder will pay any underwriting discounts and commissions or agent's commissions incurred by such selling stockholder in disposing of the shares covered by this prospectus.

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SELLING STOCKHOLDERS

On October 25, 2012, December 20, 2012, and January 24, 2013, we issued to the selling stockholders named below an aggregate of 3,480,880 shares of common stock and warrants to purchase an additional 2,503,730 shares of common stock in three private placements. The shares of common stock being offered by the selling stockholders are those issued to the selling stockholders and those issuable to the selling stockholders upon exercise of the warrants. For additional information regarding the issuance of the common stock and the warrants, see Prospectus Summary Private Placements above. We are registering the shares of common stock in order to permit the selling stockholders to offer the shares for resale from time to time. The selling stockholders include Dr. Michael Bristow, who is also our President and Chief Executive Officer and one of our Directors, Atlas Venture Fund VII, L.P., which is affiliated with another of our Directors, Dr. John-Francois Formela, Lansing Brown Investments, LLC, which is affiliated with another of our Directors, Dr. John Zabriskie and Christopher Ozeroff, our Senior Vice President, Secretary and General Counsel.

The table below, including the footnotes, lists the selling stockholders and other information regarding the beneficial ownership (as determined under Section 13(d) of the Securities Exchange Act of 1934, as amended, or the Exchange Act, and the rules and regulations thereunder) of the shares of common stock held by each of the selling stockholders based in part on information provided to us by the selling stockholders. The second column lists the number of shares of common stock beneficially owned by the selling stockholders, based on their respective ownership of shares of common stock and warrants, as of February 5, 2013, assuming exercise of the warrants held by each such selling stockholder on that date but taking account of any limitations on exercise set forth therein.

The third column lists the shares of common stock being offered by this prospectus by the selling stockholders and does not take into account any limitations on exercise of the warrants set forth therein.

In accordance with the terms of a registration rights agreement with the holders of the common stock and the warrants, this prospectus generally covers the resale of the sum of (i) the shares of common stock issued to the selling stockholders and (ii) the maximum number of shares of common stock issuable upon exercise of the warrants determined as if the outstanding warrants were exercised in full (without regard to any limitations on exercise contained therein) as of the trading day immediately preceding the date this registration statement was initially filed with the SEC. Because the exercise price of the warrants may be adjusted, the number of shares that will actually be issued may be more or less than the number of shares being offered by this prospectus.

The fourth column assumes the sale of all of the shares offered by the selling stockholders pursuant to this prospectus. However, because the selling stockholders may sell all or some of their shares under this prospectus from time to time, or in another permitted manner, we cannot assure you as to the actual number of shares that will be sold by the selling stockholders. The percentage of shares owned after the offering are based on 19,088,298 shares of our common stock outstanding as of February 5, 2013, which includes the outstanding shares of common stock offered by this prospectus, plus the maximum number of shares of our common stock issuable upon exercise in full, for cash, of the warrants held by the applicable selling stockholder.

Under the terms of the October Warrants and December Warrants, a selling stockholder may not exercise the warrants to the extent (but only to the extent) such selling stockholder or any of its affiliates would beneficially own a number of shares of our common stock which would exceed 4.9%. Under the terms of the January Warrants, a selling stockholder may not exercise the warrants to the extent (but only to the extent) such selling stockholder or any of its affiliates would beneficially own a number of shares of our common stock which would exceed 9.9%. The number of shares in the second column does not reflect these limitations. The selling stockholders may sell all, some or none of their shares in this offering. See Plan of Distribution.

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| Name of Selling Stockholder | Number of Shares of Common Stock Owned Prior to Offering(1)(2) | Maximum Number of Shares of Common Stock to be Sold Pursuant to this Prospectus(2) | Common Stock Owned After Offering | |
|---|--|--|-----------------------------------|---------|
| | | | Number(3) | Percent |
| Cranshire Capital Master Fund, Ltd (4) | 1,819,036 | 418,092 | 1,400,944 | 6.8% |
| Sphinx Trading, LP (5) | 60,332 | 36,356 | 23,976 | * |
| Atlas Venture Fund VII, L.P. (6) | 1,911,191 | 555,413 | 1,355,778 | 7.0% |
| Sabby Healthcare Volatility Master Fund, Ltd. (7) | 1,548,283 | 908,896 | 639,387 | 3.2% |
| Michael R. Bristow, M.D., Ph.D. (8) | 3,617,610 | 3,278,159 | 339,451 | 1.8% |
| Anson Investments Master Fund LP | 454,449 | 454,449 | | |
| Lansing Brown Investments, LLC | 289,059 | 222,164 | 66,895(9) | * |
| Christopher D. Ozeroff | 171,461 | 111,081 | 60,380(10) | * |

* Represents beneficial ownership of less than one percent of the outstanding shares of our common stock.

- (1) Beneficial ownership is determined in accordance with the rules of the SEC and generally includes voting or investment power with respect to securities. Shares of common stock that can be acquired under options or warrants that are currently exercisable, or which will become exercisable no later than 60 days after February 5, 2013, are deemed outstanding for the purposes of computing the percentage of the person holding such options or warrants, but not deemed outstanding for the purposes of computing the percentage of any other person. Except as indicated by footnote and subject to community property laws where applicable, the persons named in the table have sole voting and investment power with respect to all shares of common stock shown beneficially owned by them.
- (2) Includes all shares issuable upon the exercise of warrants without regard to restrictions on exercise.
- (3) Assumes sale of all shares available for sale under this prospectus and no further acquisitions of shares by the selling stockholders.
- (4) Cranshire Capital Advisors, LLC (CCA) is the investment manager of Cranshire Capital Master Fund, Ltd. (Cranshire Master Fund) and has voting control and investment discretion over securities held by Cranshire Master Fund. Mitchell P. Kopin (Mr. Kopin), the president, the sole member and the sole member of the Board of Managers of CCA, has voting control over CCA. As a result, each of Mr. Kopin and CCA may be deemed to have beneficial ownership (as determined under Section 13(d) of the Securities Exchange Act of 1934, as amended) of the securities held by Cranshire Master Fund. CCA is also the investment manager for managed accounts for Sphinx Trading, LP (Sphinx), Freestone Advantage Partners, LP (Freestone) and Freestone Advantage Partners II, LP (Freestone II), and CCA has voting control and investment discretion over securities held in the managed accounts for Sphinx, Freestone and Freestone II. Mr. Kopin, the president, the sole member and the sole member of the Board of Managers of CCA, has voting control over CCA. As a result, each of Mr. Kopin and CCA also may be deemed to have beneficial ownership (as determined under Section 13(d) of the Securities Exchange Act of 1934, as amended) of the securities held in the managed accounts by Sphinx, Freestone and Freestone II. Such 1,819,036 shares of common stock includes (i) 1,489,276 shares of common stock issuable upon exercise of warrants held by Cranshire Master Fund (including (a) 1,317,120 shares that may not be exercised to the extent (but only to the extent) such selling stockholder or any of its affiliates would beneficially own a number of shares of our common stock that would

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- exceed 4.9% (the 4.9% blocker) and (b) 172,156 shares that may not be exercised to the extent (but only to the extent) such selling stockholder or any of its affiliates would beneficially own a number of shares of our common stock that would exceed 9.9% (the 9.9% blocker), (ii) 58,824 shares of common stock issuable upon exercise of a warrant held in the managed accounts by Freestone (subject to the 4.9% blocker) and (iii) 25,000 shares of common stock issuable upon exercise of a warrant held in the managed accounts by Freestone II (subject to the 4.9% blocker), and excludes 23,976 shares of common stock issuable upon exercise of a warrant held by Pyramid Trading, LP that are described in footnote (5) below. Without the blocker provisions and assuming that all such warrants were currently exercisable, each of CCA and Mr. Kopin may be deemed to have beneficial ownership of 1,879,368 shares of common stock.
- (5) Includes 23,976 shares of common stock issuable upon exercise of a warrant that is currently exercisable that is held by Pyramid Trading, LP. CCA is the investment manager of a managed account for Sphinx and has voting control and investment discretion over securities held in by Pyramid Trading, LP in such managed account. Mr. Kopin, the president, the sole member and the sole member of the Board of Managers of CCA, has voting control over CCA. As a result, each of Mr. Kopin and CCA may be deemed to have beneficial ownership (as determined under Section 13(d) of the Securities Exchange Act of 1934, as amended) of the securities held by Freestone II in such managed account. CCA is also the investment manager of Cranshire Master Fund, Cranshire Capital, LP, Freestone and Freestone II. Mr. Kopin, the president, the sole member and the sole member of the Board of Managers of CCA, has voting control over CCA. As a result, each of Mr. Kopin and CCA may be deemed to have beneficial ownership (as determined under Section 13(d) of the Securities Exchange Act of 1934, as amended) of the securities held by Cranshire Master Fund, Freestone and Freestone II that are described in footnote (4) above. Sphinx is a broker-dealer. Sphinx acquired the shares being registered hereunder in the ordinary course of business, and at the time of the acquisition of the shares and warrants described herein, Sphinx did not have any arrangements or understandings with any person to distribute such securities.
- (6) Includes the following owned directly by Atlas Venture Fund VII, L.P. (AV VII): (a) 1,579,542 shares of common stock and (b) 313,483 shares of common stock issuable upon exercise of warrants held by AV VII (including 238,034 shares of common stock which are subject to the 4.9% blocker). Atlas Venture Associates VII, L.P. (AVA VII LP) is the general partner of AV VII. Atlas Venture Associates VII, Inc (AVA VII Inc.) is the general partner of AVA VII LP. Each AVA VII LP and AVA VII Inc. may also be deemed to beneficially own these shares. Dr. Jean-Francois Formela, a director at AV VII Inc., who has served as one of the Company s directors since 2009, may be deemed to beneficially own these shares. Dr. Formela disclaims beneficial ownership of these shares except to the extent of his pecuniary interest therein. Each of AV VII, AVA VII LP and AVA VII Inc. disclaims beneficial ownership of the shares except to the extent of its pecuniary interest therein. Also includes options to purchase 18,166 shares that are exercisable within 60 days of February 5, 2013. These options were granted to Dr. Formela and the proceeds of any sale of the Company s Common Stock issued to Dr. Formela upon the exercise of this option will be transferred to Atlas Venture Advisors, Inc. (Atlas Advisors) and therefore Dr. Formela disclaims beneficial ownership of such shares which belong to Atlas Advisors.
- (7) Includes warrants to purchase 639,387 shares of common stock (including 374,251 shares of common stock which are subject to the 9.9% blocker). Hal Mintz, in his capacity as manager of Sabby Management, LLC has voting and dispositive powers over the shares held by Sabby Healthcare Volatility Master Fund, Ltd. Each of Hal Mintz and Sabby Management, LLC disclaims beneficial ownership over the Company s securities except to the extent of its pecuniary interest therein.
- (8) Includes (i) 280,071 shares of common stock, (ii) options to purchase 59,380 shares of common stock that are exercisable within 60 days of February 5, 2013 that are held directly by Michael R. Bristow, M.D., Ph.D., (iii) 1,069,290 shares of common stock and 748,503 shares of common stock issuable upon exercise of a warrant that is subject to the 4.9% blocker held by NFS as Custodian for Michael Bristow s IRA and (iv) 834,495 shares of common stock and 625,871 shares of common stock issuable upon exercise of a warrant that is subject to the 4.9% blocker held by Investocor Trust. Dr. Bristow is the sole trustee of Investocor Trust. Dr. Bristow has been the Company s President, Chief Executive Officer and a member of our board since January 2009.
- (9) Includes options to purchase 37,715 shares of common stock that are exercisable within 60 days of February 5, 2013 that are held by John L. Zabriskie, Ph.D. Dr. Zabriskie, who has served as one of the Company s directors since 2009, is the President of Lansing Brown Investments, LLC (Lansing). Dr. Zabriskie has shares voting and dispositive powers over the shares held by Lansing. Dr. Zabriskie disclaims beneficial ownership of the shares held by Lansing, except to the extent of his pecuniary interest in them.
- (10) Includes options to purchase 18,622 shares of common stock that are exercisable within 60 days of February 5, 2013. Mr. Ozeroff has served as our Senior Vice President and General Counsel since December 2009.

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PLAN OF DISTRIBUTION

We are registering the shares of common stock issued to the selling stockholders and the shares of common stock issuable upon exercise of the warrants to permit the resale of these shares of common stock by the selling stockholders from time to time after the date of this prospectus. We will not receive any of the proceeds from the sale by the selling stockholders of the shares of common stock. We will bear all fees and expenses incident to our obligation to register the shares of common stock.

The selling stockholders may sell all or a portion of the shares of common stock held by them and offered hereby from time to time directly or through one or more underwriters, broker-dealers or agents. If the shares of common stock are sold through underwriters or broker-dealers, the selling stockholders will be responsible for underwriting discounts or commissions or agent's commissions. The shares of common stock may be sold in one or more transactions at fixed prices, at prevailing market prices at the time of the sale, at varying prices determined at the time of sale or at negotiated prices. These sales may be effected in transactions, which may involve crosses or block transactions, pursuant to one or more of the following methods:

on any national securities exchange or quotation service on which the securities may be listed or quoted at the time of sale;

in the over-the-counter market;

in transactions otherwise than on these exchanges or systems or in the over-the-counter market;

through the writing or settlement of options, whether such options are listed on an options exchange or otherwise;

ordinary brokerage transactions and transactions in which the broker-dealer solicits purchasers;

block trades in which the broker-dealer will attempt to sell the shares as agent but may position and resell a portion of the block as principal to facilitate the transaction;

purchases by a broker-dealer as principal and resale by the broker-dealer for its account;

an exchange distribution in accordance with the rules of the applicable exchange;

privately negotiated transactions;

short sales made after the date this registration statement is declared effective by the SEC;

broker-dealers may agree with a selling securityholder to sell a specified number of such shares at a stipulated price per share;

a combination of any such methods of sale; and

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any other method permitted pursuant to applicable law.

The selling stockholders may also sell shares of common stock under Rule 144 promulgated under the Securities Act of 1933, as amended, if available, rather than under this prospectus. In addition, the selling stockholders may transfer the shares of common stock by other means not described in this prospectus. If the selling stockholders effect such transactions by selling shares of common stock to or through underwriters, broker-dealers or agents, such underwriters, broker-dealers or agents may receive commissions in the form of discounts, concessions or commissions from the selling stockholders or commissions from purchasers of the shares of common stock for whom they may act as agent or to whom they may sell as principal (which discounts, concessions or commissions as to particular underwriters, broker-dealers or agents may be in excess of those customary in the types of transactions involved).

In connection with sales of the shares of common stock or otherwise, the selling stockholders may enter into hedging transactions with broker-dealers, which may in turn engage in short sales of the shares of common stock in

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the course of hedging in positions they assume. The selling stockholders may also sell shares of common stock short and deliver shares of common stock covered by this prospectus to close out short positions and to return borrowed shares in connection with such short sales. The selling stockholders may also loan or pledge shares of common stock to broker-dealers that in turn may sell such shares.

The selling stockholders may pledge or grant a security interest in some or all of the warrants or shares of common stock owned by them and, if they default in the performance of their secured obligations, the pledgees or secured parties may offer and sell the shares of common stock from time to time pursuant to this prospectus or any amendment to this prospectus under Rule 424(b)(3) or other applicable provision of the Securities Act amending, if necessary, the list of selling stockholders to include the pledgee, transferee or other successors in interest as selling stockholders under this prospectus. The selling stockholders also may transfer and donate the shares of common stock in other circumstances in which case the transferees, donees, pledgees or other successors in interest will be the selling beneficial owners for purposes of this prospectus.

To the extent required by the Securities Act and the rules and regulations thereunder, the selling stockholders and any broker-dealer participating in the distribution of the shares of common stock may be deemed to be underwriters within the meaning of the Securities Act, and any commission paid, or any discounts or concessions allowed to, any such broker-dealer may be deemed to be underwriting commissions or discounts under the Securities Act. At the time a particular offering of the shares of common stock is made, a prospectus supplement, if required, will be distributed, which will set forth the aggregate amount of shares of common stock being offered and the terms of the offering, including the name or names of any broker-dealers or agents, any discounts, commissions and other terms constituting compensation from the selling stockholders and any discounts, commissions or concessions allowed or re-allowed or paid to broker-dealers.

Under the securities laws of some states, the shares of common stock may be sold in such states only through registered or licensed brokers or dealers. In addition, in some states the shares of common stock may not be sold unless such shares have been registered or qualified for sale in such state or an exemption from registration or qualification is available and is complied with.

There can be no assurance that any selling stockholder will sell any or all of the shares of common stock registered pursuant to the registration statement, of which this prospectus forms a part.

The selling stockholders and any other person participating in such distribution will be subject to applicable provisions of the Exchange Act and the rules and regulations thereunder, including, without limitation, to the extent applicable, Regulation M of the Exchange Act, which may limit the timing of purchases and sales of any of the shares of common stock by the selling stockholders and any other participating person. To the extent applicable, Regulation M may also restrict the ability of any person engaged in the distribution of the shares of common stock to engage in market-making activities with respect to the shares of common stock. All of the foregoing may affect the marketability of the shares of common stock and the ability of any person or entity to engage in market-making activities with respect to the shares of common stock.

We will pay all expenses of the registration of the shares of common stock pursuant to the registration rights agreement, estimated to be \$40,482 in total, including, without limitation, Securities and Exchange Commission filing fees and expenses of compliance with state securities or blue sky laws; provided, however, a selling stockholder will pay all underwriting discounts and selling commissions, if any. We will indemnify the selling stockholders against liabilities, including some liabilities under the Securities Act in accordance with the registration rights agreements or the selling stockholders will be entitled to contribution. We may be indemnified by the selling stockholders against civil liabilities, including liabilities under the Securities Act that may arise from any written information furnished to us by the selling stockholder specifically for use in this prospectus, in accordance with the related registration rights agreements or we may be entitled to contribution.

Once sold under the registration statement, of which this prospectus forms a part, the shares of common stock will be freely tradable in the hands of persons other than our affiliates.

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LEGAL MATTERS

The validity of the securities being offered hereby were passed upon for us by Cooley LLP, Broomfield, Colorado.

EXPERTS

The consolidated financial statements of ARCA biopharma, Inc. (a development stage enterprise) as of December 31, 2011 and 2010, and for each of the years in the two year period ended December 31, 2011, and for the period from Inception (December 17, 2001) through December 31, 2011, have been incorporated by reference herein and in the registration statement in reliance upon the report of KPMG LLP, independent registered public accounting firm, incorporated by reference herein, and upon the authority of said firm as experts in accounting and auditing. The audit report covering the December 31, 2011, consolidated financial statements contains an explanatory paragraph that states that the Company's recurring losses from operations and its dependence upon raising additional funds from strategic transactions, sales of equity, and/or issuance of debt raise substantial doubt about the entity's ability to continue as a going concern. The consolidated financial statements do not include any adjustments that might result from the outcome of that uncertainty.

WHERE YOU CAN FIND MORE INFORMATION

We are a reporting company and file our annual, quarterly and current reports, proxy statements and other information with the SEC. You may read and copies of our reports, proxy statements and other information we file with the SEC, at the SEC's public reference room at 100 F Street, N.E., Washington, D.C. 20549. Please call the SEC at 1-800-SEC-0330 for more information about the operation of the public reference room. Our SEC filings are also available at the SEC's web site at <http://www.sec.gov>.

INCORPORATION BY REFERENCE

The SEC allows us to incorporate by reference information that we file with it, which means that we can disclose important information to you by referring you to another document that we have filed separately with the SEC. You should read the information incorporated by reference because it is an important part of this prospectus. We incorporate by reference the following information or documents that we have filed with the SEC (Commission File No. 000-22873):

Our Current Reports on Form 8-K, as amended, filed with the SEC on January 19, 2012, March 26, 2012, March 30, 2012, April 16, 2012, May 30, 2012, August 3, 2012, August 17, 2012, October 16, 2012, October 23, 2012, December 12, 2012, December 19, 2012, January 3, 2013, January 23, 2013, January 30, 2013, February 1, 2013 and February 6, 2013.

Our Quarterly Reports on Form 10-Q filed with the SEC on May 14, 2012, August 13, 2012 and November 13, 2012.

Our Annual Report on Form 10-K for the fiscal year ended December 31, 2011 filed with the SEC on March 27, 2012 (the 2011 Form 10-K).

The description of common stock contained in our registration statement on Form 8-A, dated July 23, 1997 including any subsequent amendment or report filed for updating such description.

We also incorporate by reference into this prospectus all documents (other than Current Reports furnished under Item 2.02 or Item 7.01 of Form 8-K and exhibits filed on such form that are related to such items) that are subsequently filed by us with the SEC pursuant to Sections 13(a), 13(c), 14 or 15(d) of the Exchange Act prior to the termination of the offering of the securities made by this prospectus. These documents include periodic reports, such as Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q and Current Reports on Form 8-K, as well as proxy statements.

Any statement contained in this prospectus or in a document incorporated or deemed to be incorporated by reference into this prospectus will be deemed to be modified or superseded to the extent that a statement contained in this prospectus or any subsequently filed document that is deemed to be incorporated by reference into this prospectus modifies or supersedes the statement.

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We will furnish without charge to you, upon written or oral request, a copy of any or all of the documents incorporated by reference, including exhibits to those documents. You should direct any requests for documents to ARCA biopharma, Inc., Attention: Corporate Secretary, 8001 Arista Place, Suite 430, Broomfield, Colorado 80021. Our phone number is (720) 940-2200. In addition, all of the documents incorporated by reference into this prospectus may be accessed via the Internet at our website: <http://www.arcabiopharma.com>.

Table of Contents**PART II****INFORMATION NOT REQUIRED IN THE PROSPECTUS****Item 14. *Other Expenses of Issuance and Distribution.***

The following table sets forth the estimated costs and expenses payable by us in connection with the offering of the securities being registered. All of the amounts shown are estimates, except for the registration fee.

| | |
|-------------------------------------|------------------|
| SEC registration fee | \$ 482 |
| Accounting fees and expenses | \$ 10,000 |
| Legal fees and expenses | \$ 25,000 |
| Printing and miscellaneous expenses | \$ 5,000 |
| Total | \$ 40,482 |

Item 15. *Indemnification of Directors and Officers.*

Section 145 of the Delaware General Corporation Law permits indemnification of officers, directors and other corporate agents under certain circumstances and subject to certain limitations. Our amended and restated certificate of incorporation and amended and restated bylaws provide that we will indemnify its directors, officers, employees and agents to the full extent permitted by the Delaware General Corporation Law, including in circumstances in which indemnification is otherwise discretionary under Delaware law. In addition, we have entered into indemnification agreements with our directors and officers that require us, among other things, to indemnify them against certain liabilities that may arise by reason of their status or service (other than liabilities arising from willful misconduct of a culpable nature). The indemnification provisions in our amended and restated certificate of incorporation and amended and restated bylaws and the indemnification agreements entered into between us and our directors may be sufficiently broad to permit indemnification of our officers and directors for liabilities (including reimbursement of expenses incurred) arising under the Securities Act of 1933, as amended. We also maintain director and officer liability insurance to insure our directors and officers against the cost of defense, settlement or payment of a judgment under certain circumstances.

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Item 16. Exhibits.

| Exhibit Number | Description of Document |
|-----------------------|---|
| 3.1 | Amended and Restated Certificate of Incorporation, as amended (1) |
| 3.2 | Second Amended and Restated Bylaws, as amended (2) |
| 4.1 | Specimen Common Stock Certificate (3) |
| 4.2 | Reference is made to Exhibits 3.1 and 3.2 |
| 5.1 | Opinion of Cooley LLP |
| 23.1 | Consent of Independent Registered Public Accounting Firm |
| 23.2 | Consent of Cooley LLP (included in Exhibit 5.1) |
| 24.1 | Power of Attorney (included on signature page) |

- (1) Previously filed with the SEC as an Exhibit to and incorporated herein by reference from our Form 10-K, filed on March 27, 2009, File No. 000-22873.
- (2) Previously filed with the SEC as an Exhibit to and incorporated herein by reference from our Form 10-Q, filed on November 16, 2009, File No. 000-22873.
- (3) Previously filed with the SEC as an Exhibit to and incorporated herein by reference from our Form 8-K, filed on January 28, 2009, File No. 000-22873.

Item 17. Undertakings.

The undersigned Registrant hereby undertakes:

- (1) To file, during any period in which offers or sales are being made, a post-effective amendment to this registration statement:
 - (i) To include any prospectus required by Section 10(a)(3) of the Securities Act of 1933, as amended, or the Securities Act;
 - (ii) To reflect in the prospectus any facts or events arising after the effective date of the registration statement (or the most recent post-effective amendment thereof) which, individually or in the aggregate, represent a fundamental change in the information set forth in the registration statement. Notwithstanding the foregoing, any increase or decrease in volume of securities offered (if the total dollar value of securities offered would not exceed that which was registered) and any deviation from the low or high end of the estimated maximum offering range may be reflected in the form of prospectus filed with the SEC pursuant to Rule 424(b) if, in the aggregate, the changes in volume and price represent no more than a 20% change in the maximum aggregate offering price set forth in the Calculation of Registration Fee table in the effective registration statement.;
 - (iii) To include any material information with respect to the plan of distribution not previously disclosed in the registration statement or any material change to such information in the registration statement;

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provided, however, that subparagraphs (i), (ii) and (iii) above do not apply if the information required to be included in a post-effective amendment by those paragraphs is contained in reports filed with or furnished to the SEC by the Registrant pursuant to Section 13 or Section 15(d) of the Securities Exchange Act of 1934, as amended, or the Exchange Act, that are incorporated by reference in the registration statement, or is contained in a form of prospectus filed pursuant to Rule 424(b) that is part of the registration statement.

(2) That, for the purpose of determining any liability under the Securities Act, each such post-effective amendment shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

(3) To remove from registration by means of a post-effective amendment any of the securities being registered which remain unsold at the termination of the offering.

(4) That, for the purpose of determining liability under the Securities Act to any purchaser:

(i) If the Registrant is relying on Rule 430B:

(a) Each prospectus filed by the Registrant pursuant to Rule 424(b)(3) shall be deemed to be part of the registration statement as of the date the filed prospectus was deemed part of and included in the registration statement; and

(b) Each prospectus required to be filed pursuant to Rule 424(b)(2), (b)(5), or (b)(7) as part of a registration statement in reliance on Rule 430B relating to an offering made pursuant to Rule 415(a)(1)(i), (vii), or (x) for the purpose of providing the information required by Section 10(a) of the Securities Act shall be deemed to be part of and included in the registration statement as of the earlier of the date such form of prospectus is first used after effectiveness or the date of the first contract of sale of securities in the offering described in the prospectus. As provided in Rule 430B, for liability purposes of the issuer and any person that is at that date an underwriter, such date shall be deemed to be a new effective date of the registration statement relating to the securities in the registration statement to which that prospectus relates, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof. Provided, however, that no statement made in a registration statement or prospectus that is part of the registration statement or made in a document incorporated or deemed incorporated by reference into the registration statement or prospectus that is part of the registration statement will, as to a purchaser with a time of contract of sale prior to such effective date, supersede or modify any statement that was made in the registration statement or prospectus that was part of the registration statement or made in any such document immediately prior to such effective date; or

(ii) If the Registrant is subject to Rule 430C, each prospectus filed pursuant to Rule 424(b) as part of a registration statement relating to an offering, other than registration statements relying on Rule 430B or other than prospectuses filed in reliance on Rule 430A, shall be deemed to be part of and included in the registration statement as of the date it is first used after effectiveness. Provided, however, that no statement made in a registration statement or prospectus that is part of the registration statement or made in a document incorporated or deemed incorporated by reference into the registration statement or prospectus that is part of the registration statement will, as to a purchaser with a time of contract of sale prior to such first use, supersede or modify any statement that was made in the registration statement or prospectus that was part of the registration statement or made in any such document immediately prior to such date of first use.

(5) That, for the purpose of determining liability of the Registrant under the Securities Act to any purchaser in the initial distribution of the securities, the undersigned Registrant hereby undertakes that in a primary offering of securities of the undersigned Registrant pursuant to this registration statement, regardless of the underwriting method used to sell the securities to the purchaser, if the securities are offered or sold to such purchaser by means of any of the following communications, the undersigned Registrant will be a seller to the purchaser and will be considered to offer or sell such securities to such purchaser:

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- (i) any preliminary prospectus or prospectus of the undersigned Registrant relating to the offering required to be filed pursuant to Rule 424;
 - (ii) any free writing prospectus relating to the offering prepared by or on behalf of the undersigned Registrant or used or referred to by the undersigned Registrant;
 - (iii) the portion of any other free writing prospectus relating to the offering containing material information about the undersigned Registrant or its securities provided by or on behalf of the undersigned Registrant; and
 - (iv) any other communication that is an offer in the offering made by the undersigned Registrant to the purchaser.
- (6) That, for purposes of determining any liability under the Securities Act, each filing of the registrant's annual report pursuant to section 13(a) or section 15(d) of the Exchange Act (and, where applicable, each filing of an employee benefit plan's annual report pursuant to section 15(d) of the Exchange Act) that is incorporated by reference in the registration statement shall be deemed to be a new registration statement relating to the securities offered herein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers and controlling persons of the Registrant pursuant to the provisions of Item 15 above, or otherwise, the Registrant has been advised that in the opinion of the SEC such indemnification is against public policy as expressed in the Securities Act and is, therefore, unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the Registrant of expenses incurred or paid by a director, officer or controlling person of the Registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the Registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Securities Act and will be governed by the final adjudication of such issue.

Table of Contents**SIGNATURES**

Pursuant to the requirements of the Securities Act of 1933, the registrant certifies that it has reasonable grounds to believe that it meets all of the requirements for filing on Form S-3 and has duly caused this registration statement to be signed on its behalf by the undersigned, thereunto duly authorized, in the city of Broomfield, State of Colorado, on February 11, 2013.

ARCA biopharma, Inc.

By: /s/ Michael R. Bristow
Michael R. Bristow

President and Chief Executive Officer (Principal Executive Officer)

POWER OF ATTORNEY

Each person whose signature appears below constitutes and appoints Michael R. Bristow and Patrick M. Wheeler, and each of them, as his or her true and lawful attorney-in-fact and agent, each acting alone, with full power of substitution and resubstitution, for him or her and in his or her name, place and stead, in any and all capacities, to sign any or all amendments (including post-effective amendments) to the Registration Statement on Form S-3, and to file the same, with all exhibits thereto, and all documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorney-in-fact and agent, full power and authority to do and perform each and every act and thing requisite and necessary to be done in and about the premises, as fully to all intents and purposes as he or she might or could do in person, hereby ratifying and confirming all that said attorney-in-fact and agent, or his or her substitute or substitutes, may lawfully do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Act of 1933, this registration statement has been signed by the following persons in the capacities and on the dates indicated.

| Signature | Title | Date |
|---|---|-------------------|
| /s/ Michael R. Bristow Michael R. Bristow | President and Chief Executive Officer and Director (Principal Executive Officer) | February 11, 2013 |
| /s/ Patrick M. Wheeler Patrick M. Wheeler | Chief Financial Officer (Principal Financial Officer and Principal Accounting Officer) | February 11, 2013 |
| /s/ Jean-Francois Formela Jean-Francois Formela | Director | February 11, 2013 |
| /s/ Linda Grais Linda Grais | Director | February 11, 2013 |
| /s/ Brian E. Sobel Burton E. Sobel | Director | February 11, 2013 |
| /s/ John L. Zabriskie | Director | February 11, 2013 |

John L. Zabriskie

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