

ARCA biopharma, Inc.  
Form S-3  
January 12, 2012  
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As filed with the Securities and Exchange Commission on January 12, 2012

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)

8001 Arista Place, Suite 430

Broomfield, Colorado 80021

36-3855489  
(I.R.S. Employer Identification No.)

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**(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**

**Bryn P. Weaver**

**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	2,916,666	\$0.99	\$2,887,499.34	\$330.91

- (1) Consists of an aggregate of 1,666,666 shares of common stock and 1,250,000 shares of common stock that may be issued upon the exercise of warrants, all of which were acquired by the selling stockholders in a private placement.
- (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 January 5, 2012, 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 JANUARY 12, 2012**

**PROSPECTUS**

**ARCA BIOPHARMA, INC.**

**1,666,666 SHARES OF COMMON STOCK**

**1,250,000 SHARES OF COMMON STOCK ISSUABLE UPON EXERCISE OF WARRANTS**

This prospectus relates to the disposition from time to time of up to 2,916,666 shares of our common stock, which includes 1,250,000 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 a private placement that closed in December 2011 and that is 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. We will, however, 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 January 11, 2012, the last reported sale price of our common stock was \$1.02 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 4 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 \_\_\_\_\_, 2012**

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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 heart failure and other cardiovascular diseases. Our lead product candidate, Gencaro™ (bucindolol hydrochloride), a pharmacologically unique beta-blocker and mild vasodilator, is being developed for the treatment of chronic heart failure, or HF, and for the prevention of atrial fibrillation, or AF, in patients with HF. We have identified common genetic variations in the cardiovascular system that we believe interact with Gencaro's pharmacology and may predict patient response. We have collaborated with LabCorp to develop the Gencaro Test, a companion test for the genetic markers that identify these common genetic variations.

We have identified common genetic variations in the cardiovascular system that we believe interact with Gencaro's pharmacology and may predict patient response to Gencaro treatment. We currently hold worldwide rights to Gencaro and have been granted patents in the U.S. and Europe for methods of treating heart failure patients with bucindolol based on genetic testing, which we believe will provide market exclusivity for Gencaro into 2025 in those markets. In addition, we believe that if Gencaro is approved, one of the U.S. Gencaro patents, as well as the patent issued in Europe, will be eligible for patent term extension which, if granted in the U.S., could provide an additional period of market exclusivity in the U.S. of approximately three years, and if granted in Europe could provide an additional five years of market exclusivity.

Gencaro has been the subject of extensive clinical development, culminating in a Phase 3 heart failure study known as the BEST trial. In September 2008, the U.S. Food and Drug Administration, or FDA, formally accepted for filing the New Drug Application, or NDA, for Gencaro as a potential treatment for HF. In May 2009, the FDA notified us through a Complete Response Letter, or CRL, that our NDA for Gencaro was not approvable in its current form, and specified additional actions and information required for approval of the NDA including conducting an additional Phase 3 clinical trial. In May 2010, we reached agreement with the FDA on a Special Protocol Assessment, or SPA, for the design of an additional Phase 3 clinical trial to assess the safety and efficacy of Gencaro in approximately 3,200 patients with HF who have the genotype that appears to respond most favorably to Gencaro. We believe the SPA agreement would permit this trial, if successful, to serve as the clinical effectiveness basis for the approval of Gencaro for HF. In light of the substantial costs associated with the Phase 3 clinical HF trial, we do not plan to initiate the trial until such time as government funding, or a strategic transaction, such as a strategic combination or partnership is secured or the planned AF trial is completed.

We are planning to initiate a clinical study of Gencaro in AF patients with heart failure and left ventricular dysfunction. We believe AF is an attractive indication for Gencaro because data from the previously conducted Phase 3 HF trial of Gencaro in 2,708 HF patients, or the BEST HF trial, suggest that Gencaro may have a potentially significant effect in reducing or preventing AF. Based on the BEST trial we believe that Gencaro's prevention of AF in HF patients is pharmacogenetically regulated, similar to the effects on HF clinical endpoints. We plan to enroll approximately 200-400 patients with recent onset AF who have the genotype that appears to respond most favorably to Gencaro. We anticipate that the trial could begin approximately 6 months after we obtain sufficient funding.

Atrial fibrillation is a disorder in which the normally regular and coordinated contraction pattern of the heart's two small upper chambers (the atria) becomes irregular and uncoordinated. The irregular contraction pattern associated with AF causes blood to pool in the atria, predisposing the formation of clots. These clots may travel from the heart and become lodged in the arteries leading to the brain and other organs, thereby blocking necessary blood flow and potentially resulting in stroke. AF is considered an epidemic cardiovascular disease that affects approximately 2-3 million Americans, making it one of the most common heart rhythm disorders.

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The AF clinical trial is designed to be a multi-center, randomized, double-blind clinical trial to assess the safety and efficacy of Gencaro in AF patients with left ventricular dysfunction/HF, with the primary endpoint being time to recurrent symptomatic AF after direct current cardioversion. The planned AF trial is designed to compare Gencaro to the beta-blocker metoprolol CR/XL in the genotype (homozygous arginine position 389 of the beta-1 adrenergic receptor), or the genotype the Company believes responds most favorably to Gencaro. Metoprolol CR/XL does not appear to be enhanced in patients with this genotype. Data from the BEST trial indicate that Gencaro may have a potentially significant effect in reducing or preventing AF, and this effect may be one that is regulated genetically, similar to the effect we believe Gencaro has on HF. The entire cohort of patients in the BEST trial that were treated with Gencaro had a 41% reduction in the risk of new onset AF (time-to-event) compared to placebo ( $p = 0.0004$ ), based on an analysis of adverse events and surveillance ECGs. In the DNA sub study, patients with the most favorable genotype for Gencaro experienced a 74% ( $p = 0.0003$ ) reduction in risk of AF, based on the same analysis. This most favorable genotype was present in about 47% of the patients in the sub study, and we estimate it is present in about 50% of the US general population. We believe the AF study would take approximately two and one half years from enrollment of the first patient through completion. We believe there is an unmet medical need for new AF treatments that have fewer side effects than currently available therapies and are more effective, particularly in patients with HF where most of the approved drugs are contra-indicated or have warnings in their prescribing information.

To support the continued development of Gencaro, including the additional proposed clinical trials, 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 completing or are unable to complete additional funding, we may discontinue our development activities on Gencaro or discontinue our operations. We believe our cash and cash equivalents balance as of December 31, 2011 will be sufficient to fund our operations, at our current cost structure, through June 2012. 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 June 2012. We may not be able to raise sufficient capital on acceptable terms or at all to continue development of Gencaro or to otherwise continue operations and may not be able to execute any additional funding transactions.

We have exclusive patent rights to other compounds that have potential indications in cardiovascular disease, oncology and other therapeutic areas, some of which are in early stages of development and others of which are in later stages of development. We are seeking partners to assist us in the development of these compounds or who may license them. For example, we hold exclusive rights to rNAPc2, a single-chain, small recombinant protein. rNAPc2 is a potent, long acting, selective inhibitor of signaling by tissue factor, the protein responsible for initiating the extrinsic coagulation pathway, the primary coagulation mechanism in humans. rNAPc2 was originally developed as a cardiovascular therapy for thrombosis and other indications. As a result, it has an extensive human clinical record, and has been safely tested in over 700 human patients in nine Phase 1 and Phase 2 clinical trials. Previously, pilot studies of rNAPc2 conducted in non-human primates showed evidence of potential efficacy against lethal hemorrhagic viruses.

## **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 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	2,916,666 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 stock	ABIO

(1) includes 1,250,000 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 2,916,666 shares of our common stock, including 1,250,000 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 Placement**

On December 21, 2011, we entered into separate subscription agreements with certain investors named in the table in the section entitled Selling Stockholders, pursuant to which we agreed to sell 1,666,666 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 warrants have an exercise price of \$1.485, become exercisable on June 22, 2012 and expire five years after becoming exercisable, unless earlier terminated. In connection with the closing of the private placement, on December 22, 2011, 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 December 22, we closed the private placement and received gross proceeds of approximately \$1.75 million before deduction of placement agent fees and other offering expenses.

The issuance of shares of common stock and warrants sold in the private placement 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 required under the complete response letter received from the FDA, 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 warrants is \$1.485 per share. We expect to use any such proceeds for general working capital purposes. The 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 December 22, 2011, we issued to the selling stockholders named below an aggregate of 1,666,666 shares of common stock and warrants to purchase an additional 1,250,000 shares of common stock in a private placement. 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 Placement 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 have not had any material relationship with us within the past three years, except for the ownership of the common stock and the warrants issued (i) pursuant to the subscription agreements in the private transaction and (ii) with respect to Cranshire Capital Master Fund, Ltd., Freestone Advantage Partners, LP and Iroquois Master Fund Ltd., pursuant to the separate subscription agreements entered into on April 18, 2011.

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 January 11, 2012, 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 12,182,999 shares of our common stock outstanding as of January 11, 2012, 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 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%. The number of shares in the second column reflects 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	Maximum Number of Shares of Common Stock to be Sold Pursuant to this Prospectus	Common Stock Owned After Offering	
			Number	Percent
Cranshire Capital Master Fund, Ltd. (1)	600,510	775,002	640,235	4.57%
Empery Asset Master, LTD (2)	190,476	333,333		*
Hartz Capital Investments, LLC (3)	190,476	333,333		*
Iroquois Master Fund Ltd. (4)	641,540	749,999	588,235	4.20%
Kingsbrook Opportunities Master Fund LP (5)	380,952	666,666		*
Freestone Advantage Partners II, LP (6)	600,510	58,333	640,235	4.57%

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

(1) 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 (i) of Cranshire Capital, L.P. ( Cranshire Capital ) and (ii) for managed accounts for Freestone Advantage Partners, LP ( Freestone ) and Freestone Advantage Partners II, LP ( Freestone II ), and CCA has voting control and investment discretion over securities held by Cranshire Capital and in the managed accounts for 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 Freestone and Freestone II.

Such 600,510 shares of common stock includes (i) 492,858 shares of common stock held by Cranshire Master Fund, (ii) 2,000 shares of common stock held by Freestone, (iii) 33,333 shares of common stock held by Freestone II and (iv) 72,319 shares of common stock issuable upon exercise of a warrant held by Cranshire Capital. Excludes (I) 457,092 shares of common stock issuable upon exercise of a warrant held by Cranshire Capital because such warrant contains a blocker provision under which the holder thereof does not have the right to exercise such warrant to the extent (but only to the extent) that such exercise would result in beneficial ownership by the holder thereof or any of its affiliates, of more than 4.9% of the common stock, (II) 332,144 shares of common stock issuable upon exercise of a warrant held by Cranshire Master Fund because such warrant is not exercisable until the six month anniversary of the issuance thereof and contains a blocker provision under which the holder thereof does not have the right to exercise such warrant to the extent (but only to the extent) that such exercise would result in beneficial ownership by the holder thereof or any of its affiliates, of more than 4.9% of the common stock, (III) 58,824 shares of common stock issuable upon exercise of a warrant held in the managed accounts by Freestone because such warrant contains a blocker provision under which the holder thereof does not have the right to exercise such

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warrant to the extent (but only to the extent) that such exercise would result in beneficial ownership by the holder thereof or any of its affiliates, of more than 4.9% of the common stock and (IV) 25,000 shares of common stock issuable upon exercise of a warrant held in the managed accounts by Freestone II because such warrant is not exercisable until the six month anniversary of the issuance thereof and contains a blocker provision under which the holder thereof does not have the right to exercise such warrant to the extent (but only to the extent) that such exercise would result in beneficial ownership by the holder thereof or any of its affiliates, of more than 4.9% of the common stock. Without such 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 1,473,570 shares of common stock.

- (2) Empery Asset Management LP, the authorized agent of Empery Asset Master Ltd ( EAM ), has discretionary authority to vote and dispose of the shares held by EAM and may be deemed to be the beneficial owner of these shares. Martin Hoe and Ryan Lane, in their capacity as investment managers of Empery Asset Management LP, may also be deemed to have investment discretion and voting power over the shares held by EAM. Mr. Hoe and Mr. Lane disclaim any beneficial ownership of these shares.
- (3) Empery Asset Management LP, the authorized agent of Hartz Capital Investments, LLC ( HCI ), has discretionary authority to vote and dispose of the shares held by HCI and may be deemed to be the beneficial owner of these shares. Martin Hoe and Ryan Lane, in their capacity as investment managers of Empery Asset Management LP, may also be deemed to have investment discretion and voting power over the shares held by HCI. Mr. Hoe and Mr. Lane disclaim any beneficial ownership of these shares.
- (4) Iroquois Capital Management L.L.C. ( Iroquois Capital ) is the investment manager of Iroquois Master Fund, Ltd ( IMF ). Consequently, Iroquois Capital has voting control and investment discretion over securities held by IMF. As managing members of Iroquois Capital, Joshua Silverman and Richard Abbe make voting and investment decisions on behalf of Iroquois Capital in its capacity as investment manager to IMF. As a result of the foregoing, Mr. Silverman and Mr. Abbe 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 IMF. Notwithstanding the foregoing, Mr. Silverman and Mr. Abbe disclaim such beneficial ownership.
- (5) Kingsbrook Partners LP ( Kingsbrook Partners ) is the investment manager of Kingsbrook Opportunities Master Fund LP ( Kingsbrook Opportunities ) and consequently has voting control and investment discretion over securities held by Kingsbrook Opportunities. Kingsbrook Opportunities GP LLC ( Opportunities GP ) is the general partner of Kingsbrook Opportunities and may be considered the beneficial owner of any securities deemed to be beneficially owned by Kingsbrook Opportunities. KB GP LLC ( GP LLC ) is the general partner of Kingsbrook Partners and may be considered the beneficial owner of any securities deemed to be beneficially owned by Kingsbrook Partners. Ari J. Storch, Adam J. Chill and Scott M. Wallace are the sole managing members of Opportunities GP and GP LLC and as a result may be considered beneficial owners of any securities deemed beneficially owned by Opportunities GP and GP LLC. Each of Kingsbrook Partners, Opportunities GP, GP LLC and Messrs. Storch, Chill and Wallace disclaim beneficial ownership of these securities.
- (6) Cranshire Capital Advisors, LLC ( CCA ) is the investment manager of a managed account for Freestone Advantage Partners II, LP ( Freestone II ) and has voting control and investment discretion over securities held by Freestone II in such managed account. 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 Freestone II in such managed account. CCA is also the investment manager (i) of Cranshire Capital, L.P. ( Cranshire Capital ), (ii) of Cranshire Capital Master Fund, Ltd. ( Cranshire Master Fund ) and (iii) for a managed account for Freestone Advantage Partners, LP ( Freestone ), and CCA has voting control and investment discretion over securities held by Cranshire Capital, Cranshire Master Fund and in such managed account for Freestone. 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 Capital, Cranshire Master Fund and Freestone that are described in footnote (1).

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Such 600,510 shares of common stock includes (i) 492,858 shares of common stock held by Cranshire Master Fund, (ii) 2,000 shares of common stock held by Freestone, (iii) 33,333 shares of common stock held by Freestone II and (iv) 72,319 shares of common stock issuable upon exercise of a warrant held by Cranshire Capital. Excludes (I) 457,092 shares of common stock issuable upon exercise of a warrant held by Cranshire Capital because such warrant contains a blocker provision under which the holder thereof does not have the right to exercise such warrant to the extent (but only to the extent) that such exercise would result in beneficial ownership by the holder thereof or any of its affiliates, of more than 4.9% of the common stock, (II) 332,144 shares of common stock issuable upon exercise of a warrant held by Cranshire Master Fund because such warrant is not exercisable until the six month anniversary of the issuance thereof and contains a blocker provision under which the holder thereof does not have the right to exercise such warrant to the extent (but only to the extent) that such exercise would result in beneficial ownership by the holder thereof or any of its affiliates, of more than 4.9% of the common stock, (III) 58,824 shares of common stock issuable upon exercise of a warrant held in the managed accounts by Freestone because such warrant contains a blocker provision under which the holder thereof does not have the right to exercise such warrant to the extent (but only to the extent) that such exercise would result in beneficial ownership by the holder thereof or any of its affiliates, of more than 4.9% of the common stock and (IV) 25,000 shares of common stock issuable upon exercise of a warrant held in the managed accounts by Freestone II because such warrant is not exercisable until the six month anniversary of the issuance thereof and contains a blocker provision under which the holder thereof does not have the right to exercise such warrant to the extent (but only to the extent) that such exercise would result in beneficial ownership by the holder thereof or any of its affiliates, of more than 4.9% of the common stock. Without such 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 1,473,570 shares of common stock.

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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).

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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 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 \$65,331 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, 2010 and 2009, and for each of the years in the two year period ended December 31, 2010, and for the period from Inception (December 17, 2001) through December 31, 2010, 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, 2010, 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 18, 2011, January 26, 2011, February 17, 2011, March 3, 2011, March 28, 2011, April 5, 2011 and April 18, 2011, May 3, 2011, May 23, 2011, May 24, 2011, May 26, 2011, June 20, 2011, June 24, 2011, November 14, 2011, November 17, 2011, December 22, 2011, as amended on December 27, 2011, and December 30, 2011.

Our Quarterly Reports on Form 10-Q filed with the SEC on May 16, 2011, August 15, 2011 and November 14, 2011.

Our Annual Report on Form 10-K for the fiscal year ended December 31, 2010 filed with the SEC on March 9, 2011 (the 2010 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	\$ 331
Accounting fees and expenses	\$ 10,000
Legal fees and expenses	\$ 50,000
Printing and miscellaneous expenses	\$ 5,000
<b>Total</b>	<b>\$ 65,331</b>

**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.

<b>Exhibit Number</b>	<b>Description of Document</b>
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 January 12, 2012.

**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.

<b>Signature</b>	<b>Title</b>	<b>Date</b>
/s/ Michael R. Bristow	President and Chief Executive Officer	January 12, 2012
<b>Michael R. Bristow</b>	and Director  (Principal Executive Officer)	
/s/ Patrick M. Wheeler	Chief Financial Officer (Principal Financial Officer)	January 12, 2012
<b>Patrick M. Wheeler</b>		
/s/ Richard B. Brewer	Director	January 12, 2012
<b>Richard B. Brewer</b>		
/s/ Jean-Francois Formela	Director	January 12, 2012
<b>Jean-Francois Formela</b>		
/s/ Linda Grais	Director	January 12, 2012
<b>Linda Grais</b>		
/s/ Brian E. Sobel	Director	January 12, 2012
<b>Brian E. Sobel</b>		

**Burton E. Sobel**

/s/ John L. Zabriskie

**John L. Zabriskie**

Director

January 12, 2012

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**INDEX TO EXHIBITS**

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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.