

Synthetic Biologics, Inc.  
Form 10-Q  
May 15, 2014

**UNITED STATES SECURITIES AND EXCHANGE COMMISSION**

**Washington, DC 20549**

**FORM 10-Q**

(Mark One)

**QUARTERLY REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

**For the quarterly period ended March 31, 2014**

**OR**

**TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES ACT OF 1934**

**For the transition period from \_\_\_\_\_ to \_\_\_\_\_**

**Commission File Number: 1-12584**

**SYNTHETIC BIOLOGICS, INC.**

*(Name of small business issuer in its charter)*

**Nevada**

*(State or other jurisdiction of incorporation or organization) (IRS Employer Identification Number)*

**13-3808303**

**155 Gibbs Street, Suite 412**

**Rockville, MD**

*(Address of principal executive offices)*

**20850**

*(Zip Code)*

**Registrant's telephone number, including area code:**

**(734) 332-7800**

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

**Common Stock, \$0.001 par value per share**

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

**None.**

*(Title of Class)*

Indicate by check mark whether the issuer: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes  No

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes  No

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. (Check one):

Large accelerated filer	<input type="checkbox"/>	Accelerated filer	<input type="checkbox"/>
Non-Accelerated filer	<input type="checkbox"/>	Smaller reporting company	<input checked="" type="checkbox"/>

(Do not check if a smaller reporting company)

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes  No

As of May 12, 2014 the registrant had 58,453,528 shares of common stock outstanding.



**SYNTHETIC BIOLOGICS, INC.**

**FORM 10-Q**

**TABLE OF CONTENTS**

	Page
<u>PART I. FINANCIAL INFORMATION</u>	
Item 1. <u>Financial Statements (Unaudited)</u>	3
<u>Consolidated Balance Sheets as of March 31, 2014 and December 31, 2013</u>	3
<u>Consolidated Statements of Operations for the three months ended March 31, 2014 and 2013</u>	4
<u>Consolidated Statements of Cash Flows for the three months ended March 31, 2014 and 2013</u>	5
<u>Notes to Consolidated Financial Statements</u>	6
Item 2. <u>Management's Discussion and Analysis of Financial Information and Results of Operations</u>	12
Item 3. <u>Quantitative and Qualitative Disclosures About Market Risks</u>	23
Item 4. <u>Controls and Procedures</u>	23
<u>PART II. OTHER INFORMATION</u>	
Item 1. <u>Legal Proceedings</u>	24
Item 1A. <u>Risk Factors</u>	24
Item 2. <u>Unregistered Sales of Equity Securities and Use of Proceeds</u>	25
Item 3. <u>Defaults Upon Senior Securities</u>	25
Item 4. <u>Mine Safety Disclosures</u>	25
Item 5. <u>Other Information</u>	25
Item 6. <u>Exhibits</u>	26
<u>SIGNATURES</u>	27
<u>GLOSSARY</u>	28

**PART I.-FINANCIAL INFORMATION****ITEM 1. FINANCIAL STATEMENTS****Synthetic Biologics, Inc. and Subsidiaries****Consolidated Balance Sheets****(In thousands except per share amounts)**

	March 31, 2014 (Unaudited)	December 31, 2013 (Audited)
Assets		
Current Assets		
Cash and cash equivalents	\$ 11,155	\$ 14,625
Prepaid expenses and other current assets	1,332	1,591
Total Current Assets	12,487	16,216
Property and equipment, net	38	37
Deposits and other assets	6	4
Total Assets	\$ 12,531	\$ 16,257
Liabilities and Stockholders' Equity		
Current Liabilities:		
Accounts payable	\$ 773	\$ 142
Accrued liabilities	-	885
Total Current Liabilities	773	1,027
Total Liabilities	773	1,027
Stockholders' Equity		
Preferred stock, \$0.001 par value; 10,000,000 shares authorized, none issued and outstanding	-	-
Common stock, \$0.001 par value; 100,000,000 shares authorized, 58,524,052 issued and 58,442,570 outstanding and 58,295,808 issued and 58,214,326 outstanding	58	58
Additional paid-in capital	96,796	96,430
Accumulated deficit	(85,096)	(81,258)
Total Synthetic Biologics, Inc. and Subsidiaries Equity	11,758	15,230

Edgar Filing: Synthetic Biologics, Inc. - Form 10-Q

Non-controlling interest	-	-
Total Equity	11,758	15,230
Total Liabilities and Equity	\$ 12,531	\$ 16,257

See accompanying notes to unaudited consolidated financial statements.

**Synthetic Biologics, Inc. and Subsidiaries****Consolidated Statements of Operations****(In thousands except share and per share amounts)****(Unaudited)**

	For the three months ended March 31,	
	2014	2013
Operating Costs and Expenses:		
General and administrative	\$ 1,122	\$ 1,122
Research and development	2,717	1,118
Total Operating Costs and Expenses	3,839	2,240
Loss from Operations	(3,839	) (2,240
Other Income:		
Interest income	1	11
Other income	-	1
Total Other Income	1	12
Net Loss	(3,838	) (2,228
Net Loss Attributable to Non-controlling Interest	-	-
Net Loss Attributable to Synthetic Biologics, Inc. and Subsidiaries	\$ (3,838	) \$ (2,228
Net Loss Per Share - Basic and Dilutive	\$ (0.07	) \$ (0.05
Net Loss Per Share Attributable to Synthetic Biologics, Inc. and Subsidiaries	\$ (0.07	) \$ (0.05
Weighted average number of shares outstanding during the period - Basic and Dilutive	58,324,260	44,601,396

See accompanying notes to unaudited consolidated financial statements.

**Synthetic Biologics, Inc. and Subsidiaries****Consolidated Statements of Cash Flows****(In thousands)****(Unaudited)**

	For the three months ended March 31,	
	2014	2013
Cash Flows From Operating Activities:		
Net Loss	\$ (3,838 )	\$ (2,228 )
Adjustments to reconcile net loss to net cash used in operating activities:		
Stock-based compensation	362	457
Depreciation	3	11
Changes in operating assets and liabilities:		
Prepaid expenses and other current assets	259	275
Deposits and other assets	(2 )	22
Accounts payable	631	(199 )
Accrued liabilities	(885 )	-
Net Cash Used In Operating Activities	(3,470 )	(1,662 )
Cash Flows From Investing Activities:		
Purchases of property and equipment	(4 )	(3 )
Net Cash Used In Investing Activities	(4 )	(3 )
Cash Flows From Financing Activities:		
Proceeds from issuance of common stock for stock option exercises	4	231
Net Cash Provided By Financing Activities	4	231
Net decrease in cash and cash equivalents	(3,470 )	(1,434 )
Cash and cash equivalents at beginning of period	14,625	9,954
Cash and cash equivalents at end of period	\$ 11,155	\$ 8,520
Supplemental disclosures of cash flow information:		
Cash paid for interest	\$ -	\$ -
Cash paid for taxes	\$ -	\$ -

See accompanying notes to unaudited consolidated financial statements.



**Synthetic Biologics, Inc. and Subsidiaries****Notes to Consolidated Financial Statements****(Unaudited)****1. Organization and Nature of Operations and Basis of Presentation*****Description of Business***

Synthetic Biologics, Inc. (the “Company” or “Synthetic Biologics”) is a biotechnology company focused on the development of novel anti-infective biologic and drug candidates targeting specific pathogens that cause serious infections and diseases. The Company is developing an oral biologic to protect the gastrointestinal (GI) microflora from the effects of intravenous (IV) antibiotics for the prevention of *C. diff* infection, an oral treatment to reduce the impact of methane producing organisms on constipation-predominant irritable bowel syndrome (C-IBS), a series of monoclonal antibodies for the treatment of Pertussis and *Acinetobacter* infections, and a biologic targeted at the prevention and treatment of a root cause of a subset of IBS. In addition, the Company has two legacy programs. The Company is developing an oral estriol drug for the treatment of relapsing-remitting multiple sclerosis (MS) and cognitive dysfunction in MS. The Company has also partnered the development of a treatment for fibromyalgia.

<b>Therapeutic Area</b>	<b>Product Candidate</b>	<b>Status</b>
Relapsing-remitting MS	Trimesta (oral estriol)	The lead principal investigator from UCLA presented positive Phase II topline results at the American Academy of Neurology Annual Meeting in April 2014
Cognitive dysfunction in MS	Trimesta (oral estriol)	Patient enrollment underway in Phase II clinical trial
<i>C. difficile</i> infection prevention	SYN-004	SYN-004, second generation candidate in preclinical studies;
	(oral enzyme)	Intend to initiate Phase Ia and Ib clinical trials during 2nd half of 2014
Constipation-predominant irritable bowel syndrome (C-IBS)	SYN-010 (oral compound)	Planning for <i>in vivo</i> studies underway; Intend to initiate Phase II clinical trial during 2nd half of 2014; Collaboration with Cedars-Sinai Medical Center

Pertussis	SYN-005 (monoclonal antibody)	Positive preclinical research findings reported in April 2014; Collaborations with Intrexon and The University of Texas at Austin
<i>Acinetobacter</i> infection	SYN-001 (monoclonal antibody)	Discovery; Collaboration with Intrexon
IBS	SYN-007 (biologic)	Discovery; Collaboration with Intrexon
Fibromyalgia	Effirma (oral flupirtine)	Partnered with Meda AB

***Basis of Presentation***

The accompanying consolidated financial statements have been prepared pursuant to the rules and regulations of Securities and Exchange Commission (“SEC”) for interim financial information. Accordingly, they do not include all of the information and notes required by U.S. Generally Accepted Accounting Principles (“GAAP”) for complete financial statements. The accompanying consolidated financial statements include all adjustments, comprised of normal recurring adjustments, considered necessary by management to fairly state our results of operations, financial position and cash flows. The operating results for the interim periods are not necessarily indicative of results that may be expected for any other interim period or for the full year. These consolidated financial statements should be read in conjunction with the consolidated financial statements and notes thereto included in our Annual Report on Form 10-K for the year ended December 31, 2013 (“2013 Form 10-K”) as filed with the SEC. The interim results for the three months ended March 31, 2014, are not necessarily indicative of results for the full year.

The consolidated financial statements are prepared in conformity with U.S. GAAP, which requires the use of estimates, judgments and assumptions that affect the amounts of assets and liabilities at the reporting date and the amounts of revenue and expenses in the periods presented. We believe that the accounting estimates employed are appropriate and the resulting balances are reasonable; however, due to the inherent uncertainties in making estimates actual results could differ from the original estimates, requiring adjustments to these balances in future periods.

## **2. Management's Plan**

The Company has incurred an accumulated deficit of \$85.1 million through March 31, 2014. With the exception of the quarter ended June 30, 2010, the Company has incurred negative cash flow from operations since it started the business. The Company has spent, and expects to continue to spend, substantial amounts in connection with implementing its business strategy, including the planned product development efforts, clinical trials, and research and discovery efforts.

The actual amount of funds the Company will need to operate is subject to many factors, some of which are beyond our control. These factors include the following:

- the progress of research activities;
- the number and scope of research programs;
- the progress of preclinical and clinical development activities;
- the progress of the development efforts of parties with whom the Company has entered into research and development agreements;
- costs associated with additional clinical trials of product candidates;
- the ability to maintain current research and development licensing arrangements and to establish new research and development and licensing arrangements;
- the ability to achieve milestones under licensing arrangements;
- the costs involved in prosecuting and enforcing patent claims and other intellectual property rights; and
- the costs and timing of regulatory approvals.

The Company has based its estimate on assumptions that may prove to be wrong. The Company may need to obtain additional funds sooner or in greater amounts than it currently anticipates. Potential sources of financing include strategic relationships, public or private sales of the Company's shares or debt and other sources.

The Company may seek to access the public or private equity markets when conditions are favorable due to long-term capital requirements. The Company does not have any committed sources of financing at this time, and it is uncertain whether additional funding will be available when needed on terms that will be acceptable to it, or at all. If the Company raises funds by selling additional shares of common stock or other securities convertible into common stock, the ownership interest of the existing stockholders will be diluted. If the Company is not able to obtain

financing when needed, it may be unable to carry out the business plan. As a result, the Company may have to significantly limit its operations and its business, financial condition and results of operations would be materially harmed.

### **3. Fair Value of Financial Instruments**

The fair value accounting standards define fair value as the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. As such, fair value is determined based upon assumptions that market participants would use in pricing an asset or liability. Fair value measurements are rated on a three-tier hierarchy as follows:

- Level 1 inputs: Quoted prices (unadjusted) for identical assets or liabilities in active markets;

- Level 2 inputs: Inputs, other than quoted prices included in Level 1 that are observable either directly or indirectly; and

- Level 3 inputs: Unobservable inputs for which there is little or no market data, which require the reporting entity to develop its own assumptions.

If the inputs used to measure fair value fall in different levels of the fair value hierarchy, the hierarchy level is based upon the lowest level of input that is significant to the fair value measurement.

Cash and cash equivalents include money market accounts of \$9.0 million and \$11.0 million as of March 31, 2014 and December 31, 2013, respectively, that are measured using Level 1 inputs.

**4. Selected Balance Sheet Information***Prepaid expenses and other current assets (in thousands)*

	March 31, 2014	December 31, 2013
Intrexon prepaid research and development expenses	\$ 1,163	\$ 1,361
Prepaid insurance	121	177
Prepaid expenses	48	53
Total	\$ 1,332	\$ 1,591

The anticipated Intrexon research and development expenses for the next twelve months are classified as a current asset. The Company may terminate the arrangement at any time and receive a cash refund of the remaining balance minus any amounts owed to Intrexon.

*Property and equipment (in thousands)*

	March 31, 2014	December 31, 2013
Computer and office equipment	\$ 49	\$ 45
Software	11	11
	60	56
Less accumulated depreciation	(22 )	(19 )
Total	\$ 38	\$ 37

**5. Stock-Based Compensation***Stock Incentive Plan*

During 2001, the Company's Board of Directors and stockholders adopted the 2001 Stock Incentive Plan (the "2001 Stock Plan"). The total number of shares of stock with respect to which stock options and stock appreciation rights may be granted to any one employee of the Company or a subsidiary during any one-year period under the 2001 Stock Plan shall not exceed 250,000. All awards pursuant to the 2001 Stock Plan shall terminate upon the termination of the grantee's employment for any reason. Awards include options, restricted shares, stock appreciation rights, performance shares and cash-based awards (the "Awards"). The 2001 Stock Plan contains certain anti-dilution provisions in the event of a stock split, stock dividend or other capital adjustment, as defined in the plan. The 2001 Stock Plan provides for a Committee of the Board to grant Awards and to determine the exercise price, vesting term, expiration date and all other terms and conditions of the Awards, including acceleration of the vesting of an Award at any time. As of March

31, 2014, there were 953,507 options issued and outstanding under the 2001 Stock Plan.

On March 20, 2007, the Company's Board of Directors approved the 2007 Stock Incentive Plan (the "2007 Stock Plan") for the issuance of up to 2,500,000 shares of common stock to be granted through incentive stock options, nonqualified stock options, stock appreciation rights, dividend equivalent rights, restricted stock, restricted stock units and other stock-based awards to officers, other employees, directors and consultants of the Company and its subsidiaries. This plan was approved by stockholders on November 2, 2007. The exercise price of stock options under the 2007 Stock Plan is determined by the compensation committee of the Board of Directors, and may be equal to or greater than the fair market value of the Company's common stock on the date the option is granted. The total number of shares of stock with respect to which stock options and stock appreciation rights may be granted to any one employee of the Company or a subsidiary during any one-year period under the 2007 plan shall not exceed 250,000. Options become exercisable over various periods from the date of grant, and generally expire ten years after the grant date. As of March 31, 2014, there are 436,990 options issued and outstanding under the 2007 Stock Plan.

On November 2, 2010, the Board of Directors and stockholders adopted the 2010 Stock Incentive Plan ("2010 Stock Plan") for the issuance of up to 3,000,000 shares of common stock to be granted through incentive stock options, nonqualified stock options, stock appreciation rights, dividend equivalent rights, restricted stock, restricted stock units and other stock-based awards to officers, other employees, directors and consultants of the Company and its subsidiaries. On October 22, 2013, the stockholders approved and adopted an amendment to the Company's 2010 Incentive Stock Plan to increase the number of shares of the Company's common stock reserved for issuance under the Plan from 3,000,000 to 6,000,000. The exercise price of stock options under the 2010 Stock Plan is determined by the compensation committee of the Board of Directors, and may be equal to or greater than the fair market value of the Company's common stock on the date the option is granted. Options become exercisable over various periods from the date of grant, and generally expire ten years after the grant date. As of March 31, 2014, there are 3,100,000 options issued and outstanding under the 2010 Stock Plan.

In the event of an employee's termination, the Company will cease to recognize compensation expense for that employee. There is no deferred compensation recorded upon initial grant date, instead, the fair value of the stock-based payment is recognized ratably over the stated vesting period.

The Company has applied fair value accounting for all share based payment awards since inception. The fair value of each option or warrant granted is estimated on the date of grant using the Black-Scholes option pricing model. The Black-Scholes assumptions used in the three months ended March 31, 2014 and 2013 are as follows:

	Three Months Ended March 31,			
	2014		2013	
Expected dividends	0	%	0	%
Expected volatility	126	%	148	%
Risk free interest rate	1.57	%	0.77	%
Expected life of option	5 years		5 years	
Expected forfeitures	0	%	0	%

The Company records stock-based compensation based upon the stated vested provisions in the related agreements. The vesting provisions for these agreements have various terms as follows:

- immediate vesting,
- half vesting immediately and the remainder over three years,
- quarterly over three years,
- annually over three years,
- one-third immediate vesting and remaining annually over two years,
- one half immediate vesting with remaining vesting over nine months,
- one quarter immediate vesting with the remaining over three years,
- one quarter immediate vesting with the remaining over 33 months; and
- monthly over three years.

During the three months ended March 31, 2014, the Company granted 587,500 options to employees and consultants having an approximate fair value of \$1.4 million based upon the Black-Scholes option pricing model. During the same period in 2013, the Company granted 117,500 options to employees and consultants having an approximate fair value of \$185,000 based upon the Black-Scholes option pricing model.

A summary of stock option activities as of March 31, 2014, and for the year ended December 31, 2013, is as follows:

Edgar Filing: Synthetic Biologics, Inc. - Form 10-Q

	Options	Weighted Average Exercise Price	Weighted Average Remaining Contractual Life	Aggregate Intrinsic Value
Balance - December 31, 2012	4,453,746	\$ 1.78	6.43 years	\$ 1,308,000
Granted	222,500	\$ 1.69		
Exercised	(291,666 )	\$ 0.79		
Forfeited	(475,000 )	\$ 2.30		
Balance - December 31, 2013	3,909,580	\$ 1.78	5.59 years	\$ 785,000
Granted	587,500	\$ 2.73		
Exercised	(6,583 )	\$ 0.58		
Forfeited	-	\$ -		
Balance – March 31, 2014 - outstanding	4,490,497	\$ 1.91	5.55 years	\$ 3,183,000
Balance – March 31, 2014 - exercisable	3,202,164	\$ 1.72	5.08 years	\$ 2,946,000
Grant date fair value of options granted - March 31, 2014		\$ 1,358,000		
Weighted average grant date fair value - March 31, 2014		\$ 2.31		
Grant date fair value of options granted - December 31, 2013		\$ 350,000		
Weighted average grant date fair value - December 31, 2013		\$ 1.57		



Stock-based compensation expense included in general and administrative expenses and research and development expenses relating to stock options issued to employees and consultants for the three months ended March 31, 2014 and 2013 were \$362,000 and \$457,000, respectively

As of March 31, 2014, total unrecognized stock-based compensation expense related to stock options was \$2.5 million, which is expected to be expensed through February 2017.

## **6. Stock Purchase Warrants**

On October 25, 2012, the Company entered into a Common Stock Purchase Agreement with certain accredited investors. As part of this agreement, the Company issued warrants to purchase 635,855 shares of common stock to the placement agent, or its permitted assigns. The warrants have an exercise price of \$1.60 and a life of five years. The warrants vested immediately and expire October 25, 2017. Since these warrants were granted as part of an equity raise, the Company has treated them as a direct offering cost. The result of the transaction has no affect to equity. Warrants outstanding as of March 31, 2014 were 316,522.

On March 15, 2012, the Company entered into a consulting agreement for a financial communications program, for a period of twelve months that began on February 20, 2012. As compensation for such program, the consultant is paid a monthly fee and will be issued a performance warrant exercisable for 250,000 shares of the Company's common stock based on achievement of certain stock price milestones. Upon initiation of the program, 50,000 of the performance warrants vested. The performance warrant is exercisable for a period of two years from the date of issuance for an exercise price equal to the price (\$2.20 per share) of the Company's common stock on the date of execution (March 15, 2012). In March 2013, the performance warrants' vesting period was extended to March 14, 2014. All other provisions of the performance warrants remain unchanged. These warrants expired unexercised on March 14, 2014.

On December 20, 2011, the Company entered into a consulting agreement for financial advisory services, for a period of twelve months. As compensation for such services, the consultant was paid a monthly fee and on February 2, 2012, was issued warrants exercisable for 100,000 shares of the Company's common stock. The warrant is exercisable upon issuance for a period of five years from the date of issue at an exercise price equal to the price (\$1.14) of the Company's common stock on the date of issue. As of March 31, 2014, all of these warrants have been exercised.

A summary of warrant activity for the Company for the three months ended March 31, 2014 and for the year ended December 31, 2013 is as follows:

Weighted Average

Edgar Filing: Synthetic Biologics, Inc. - Form 10-Q

	Number of Warrants	Exercise Price
Balance at December 31, 2012	1,632,501	\$ 1.99
Granted	-	-
Exercised	-	-
Forfeited	-	-
Balance at December 31, 2013	1,632,501	1.99
Granted	-	-
Exercised	(221,661)	) 1.48
Forfeited	(447,672)	) 1.89
Balance at March 31, 2014	963,168	\$ 2.15

There was no stock-based compensation expense included in general and administrative expense relating to warrants for the three months ended March 31, 2014 and 2013.

A summary of all outstanding and exercisable warrants as of March 31, 2014 is as follows:

Exercise Price	Warrants Outstanding	Warrants Exercisable	Weighted Average Remaining Contractual Life	Aggregate Intrinsic Value
\$ 1.32	18,182	18,182	1.75 years	\$ 23,000
\$ 1.60	316,522	316,522	3.57 years	\$ 307,000
\$ 2.22	517,257	517,257	2.66 years	\$ 181,000
\$ 3.30	61,207	61,207	1.16 years	\$ -
\$ 3.75	50,000	50,000	1.88 years	\$ -
\$ 2.15	963,168	963,168	2.81 years	\$ 511,000

## **7. Stockholders' Equity**

During the three months ended March 31, 2014, the Company issued 6,583 shares of common stock, in connection with the exercise of stock options, for proceeds of approximately \$4,000. The Company also issued 221,661 shares of common stock, in connection with cashless warrant exercises for the three months ended March 31, 2014.

## **8. Net Loss per Share**

Net loss per share is computed by dividing net loss by the weighted average number of common shares outstanding. Diluted loss per share is computed by dividing net loss by the weighted average number of common shares outstanding including the effect of common share equivalents. All common equivalent shares were anti-dilutive at March 31, 2013 and 2014, as such there is no separate computation for diluted loss per share. The number of options and warrants for the purchase of common stock, that were excluded from the computations of net loss per common share for the three months ended March 31, 2014 were 4,490,497 and 963,168, respectively, and for the three months ended March 31, 2013 were 3,909,580 and 1,632,501, respectively.

## ITEM 2. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL INFORMATION AND RESULTS OF OPERATIONS

*The following discussion should be read in conjunction with the attached unaudited consolidated financial statements and notes thereto, and with our audited consolidated financial statements and notes thereto for the fiscal year ended December 31, 2013, found in our Annual Report on Form 10-K. In addition to historical information, the following discussion contains forward-looking statements that involve risks, uncertainties and assumptions. Where possible, we have tried to identify these forward looking statements by using words such as "anticipate," "believe," "intends," or similar expressions. Our actual results could differ materially from those anticipated by the forward-looking statements due to important factors and risks including, but not limited to, those set forth under "Risk Factors" in this 10-Q and as applicable in Part I, Item 1A of our Annual Report on Form 10-K.*

### Overview

We are a biotechnology company focused on the development of novel anti-infective biologic and drug candidates targeting specific pathogens that cause serious infections and diseases. We are developing an oral biologic to protect the gastrointestinal (GI) microflora from the effects of intravenous (IV) antibiotics for the prevention of *Clostridium difficile* (*C. diff*) infection, an oral treatment to reduce the impact of methane producing organisms on constipation-predominant irritable bowel syndrome (C-IBS), a series of monoclonal antibodies (mAbs) for the treatment of Pertussis and *Acinetobacter* infections, and a biologic targeted at the prevention and treatment of a root cause of a subset of IBS. In addition, we have two legacy programs. We are developing an oral estriol drug for the treatment of relapsing-remitting multiple sclerosis (MS) and cognitive dysfunction in MS. We have also partnered the development of a treatment for fibromyalgia.

### *Product Pipeline:*

### *Summary of Pathogen-Specific Anti-Infective Biologic and Drug Programs:*

- ***C. diff* infections:** We are in preclinical development of a novel second-generation oral enzyme drug candidate, SYN-004, for co-administration with commonly used IV antibiotics intended to prevent the development of severe effects of *C. diff* infections. *C. diff* infections are a leading cause of hospital acquired infections (HAIs), that generally occur secondary to treatment with IV antibiotics. Designed to be given orally to protect the gut while certain IV beta-lactam antibiotics (penicillins and cephalosporins) fight the primary infection, SYN-004 is believed

to have a similar profile to its first-generation predecessor, which demonstrated favorable protection of the gut flora (microbiome) during treatment with certain penicillins, with the potentially added ability to act against a broader spectrum of IV beta-lactam antibiotics. Beta-lactam antibiotics are a mainstay in hospital infection management and include the commonly used penicillin and cephalosporin classes of antibiotics. Approximately 14.4 million patients are administered "SYN-004 target" IV beta-lactam antibiotics annually, representing an estimated target market for SYN-004 of 117.6 million beta-lactam doses purchased by U.S. hospitals. The addressable market for SYN-004 is significant. Currently there are no approved treatments designed to protect the microbiome from the damaging effects of IV antibiotics. This worldwide opportunity could represent a multi-billion dollar market.\* We intend to initiate Phase Ia and Ib clinical trials during the second half of 2014, with preliminary topline data expected by year-end 2014.

This information is an estimate derived from the use of information under license from the following IMS Health  
\*Incorporated information service: CDM Hospital database for full year 2012. IMS expressly reserves all rights, including rights of copying, distribution and republication.

**C-IBS:** In December 2013, through our majority-owned subsidiary, Synthetic Biomics, Inc., we entered into a worldwide exclusive license agreement with Cedars-Sinai Medical Center (CSMC) for the right to develop products for therapeutic and prophylactic treatments for acute and chronic diseases. An investigational team led by Mark Pimentel, M.D. at CSMC has discovered that these products are intended to target the production of methane gas by certain pathogenic gastrointestinal (GI) microorganisms that are perceived as the underlying cause of gas, pain and constipation associated with C-IBS, as well as diseases such as obesity and type 2 diabetes. Initially we will focus on the development of an oral treatment to reduce the impact of methane producing organisms on C-IBS. We intend to initiate *in vivo*/pharmacokinetic/pharmacodynamic studies in the first half of 2014, and to initiate a Phase II clinical trial during the second half of 2014 under an Investigational New Drug application (IND). Expected timing of topline data is mid-2015.

**Pertussis:** In April 2014, positive preclinical research findings for SYN-005, our proprietary monoclonal antibody (mAb) combination therapy for treating Pertussis (whooping cough), in two non-human primate studies (n=15). In December 2012, in collaboration with Intrexon Corporation (NYSE: XON) (Intrexon), we initiated development of a mAb therapy for the treatment of Pertussis infections, more commonly known as whooping cough. We are developing a mAb therapy, SYN-005, designed to target and neutralize the pertussis toxin, in order to reduce the mortality rate in infants and shorten the duration of chronic cough in afflicted adults. To further the development of this potential therapy for Pertussis, we entered into an agreement with The University of Texas at Austin to license the rights to certain research and pending patents related to pertussis antibodies. According to the World Health Organization, each year, *B. pertussis* infection causes an estimated 300,000 deaths worldwide, primarily among young, unvaccinated infants. Based on positive non-human primate and murine model findings, we intend to file an IND application to support a Phase I clinical trial expected to initiate during the first half of 2015. Topline data is expected to be available within approximately 90 days of the start of the trial. This is expected to be followed by a Phase II trial, with topline results expected in the second half of 2015. We also intend to request an Orphan Drug designation for SYN-005 for the treatment of Pertussis.

***Acinetobacter* infections:** In September 2012, in collaboration with Intrexon, we initiated efforts to develop a mAb therapy for the treatment of *Acinetobacter* infections. Many strains of *Acinetobacter* are multidrug-resistant and pose an increasing global threat to hospitalized patients, wounded military personnel and those affected by natural disasters. A treatment for *Acinetobacter* infections represents a billion dollar market opportunity. The generation of a panel of antibodies is ongoing.

**IBS:** In December 2013, in collaboration with Intrexon, and partially utilizing the intellectual property optioned from CSMC, we intend to develop biologic approaches targeted at the prevention, and acute and chronic treatment of a subset of IBS pathologies specifically caused by auto-antibodies.

*Summary of Multiple Sclerosis Program:*

The Phase II, double-blinded, placebo-controlled Trimesta trial randomized 158 women with relapsing-remitting MS at 16 sites across the U.S. Positive Phase II topline efficacy and safety results were presented in April 2014 by lead principal investigator, Dr. Rhonda Voskuhl of the University of California, Los Angeles (UCLA) David Geffen School of Medicine at the 66th American Academy of Neurology Annual Meeting. The UCLA-led Phase II study

was designed to show statistical significance at 12 months for the MS relapse rate reduction in patients treated with Trimesta plus Copaxone<sup>®</sup> compared to patients given placebo plus Copaxone<sup>®</sup>. The trial was only powered to trend toward statistical significance at the 24-month time point. According to the protocol, the results of topline data demonstrate that Trimesta met the pre-specified goal of the study with rapid onset of activity observed for Trimesta plus Copaxone<sup>®</sup> compared to placebo plus Copaxone<sup>®</sup>. The Trimesta study also demonstrated a clinically significant near-normalization of cognitive scores at 12 months of therapy in women taking Trimesta plus Copaxone<sup>®</sup>. This outcome is of high importance for MS specialists and patients and we believe it is the result of oral estriol's unique neuroprotective effect. In addition, adjunctive oral Trimesta plus injectable standard of care Copaxone<sup>®</sup> was generally safe and well tolerated by women in the study. This investigator-initiated trial evaluating our drug candidate, Trimesta, is supported by grants awarded to the UCLA exceeding \$8.0 million, which should be sufficient to fund the trial through completion of patient follow-up. Annual worldwide sales of current MS therapies are estimated at \$14.1 billion. We are engaging with the neurology community and potential partners, as we determine next steps for Trimesta.

Trimesta is also being developed for the treatment of cognitive dysfunction in female MS patients. This 12-month randomized, double-blind, placebo-controlled Phase II clinical trial is being conducted at four sites in the United States, including UCLA. The primary endpoint is the effect on cognitive function as assessed by Paced Auditory Serial Addition Test (PASAT). Patient enrollment is ongoing. The majority of the costs of this trial are being funded by grants from foundations and charitable organizations and we have pledged approximately \$500,000 to UCLA to partially fund this trial payable over three years. An estimated 50-65% of MS patients are expected to develop disabilities due to cognitive dysfunction and there is currently no approved treatment.

*Summary of Fibromyalgia Program:*

Effirma<sup>™</sup> (flupirtine) is being developed for the treatment of fibromyalgia by Meda AB (Meda), a multi-billion dollar international pharmaceutical company. On May 6, 2010, we entered into a sublicense agreement with Meda covering all of our patents' rights on the use of flupirtine for fibromyalgia in the United States, Canada and Japan. The sublicense agreement provides that all ongoing and future development costs are to be borne by Meda and we are entitled to receive certain payments if milestones are achieved and royalties on sales. According to Meda's 2012 Year-End Report filed in February 2013, Meda has received the go-ahead from the United States Food and Drug Administration (FDA) to conduct a Phase II proof of concept study for the treatment of fibromyalgia. Meda also announced that the randomized, double-blind, placebo and active-controlled study of patients with fibromyalgia will be conducted at 25 clinics in the United States. Based on an estimated annual price of \$1,200 per fibromyalgia patient, we estimate that the total market potential in the United States is \$6.0 billion.

*Recent Developments*

On December 11, 2013, we completed a firm commitment underwritten public offering of 13,225,000 shares of our common stock at a closing price of \$1.00 per share for gross proceeds of \$13.2 million. We paid direct offering costs of \$1.0 million.

On December 5, 2013, through our newly formed, majority owned subsidiary, Synthetic Biomics, Inc. (“SYN Biomics”), we entered into a worldwide exclusive license agreement (the “CSMC License Agreement”) and option agreement (the “CSMC Option Agreement”) with CSMC for the right to develop, manufacture, use, and sell products for the human and veterinary therapeutic and prophylactic treatments for acute and chronic diseases. An investigational team lead by Mark Pimentel, M.D. at CSMC has discovered that these products are intended to target certain pathogenic GI microorganisms that are perceived as an underlying cause of diseases such as C-IBS, obesity and type 2 diabetes. The portfolio of intellectual property licensed to SYN Biomics under the License Agreement includes nine issued U.S. patents, one issued European patent validated in 18 countries, one issued European patent validated in three countries, two issued Australian patents, and one issued Japanese patent as well as 13 pending U.S. and international patent applications for most fields of use and modalities (subject to certain agreed-upon exceptions); two pending U.S. patent applications are optioned to SYN Biomics under the Option Agreement.”

Under the CSMC License Agreement we issued 291,569 unregistered shares of our common stock to CSMC, as payment of an initial license fee and patent reimbursement fees of \$150,000 and \$220,000, respectively. The parties also entered into a Stock Purchase Agreement with respect to such stock issuance and other issuances of our unregistered shares of common stock that may be issued to CSMC in lieu of cash, including license fees, milestone payments expense reimbursements and options fees under the CSMC License Agreement or CSMC Option Agreement. Any and all such stock issuances by us shall be subject to the prior approval of the NYSE MKT, LLC. The CSMC License Agreement also provides that commencing on the second anniversary of the CSMC License Agreement, SYN Biomics will pay an annual maintenance fee, which payment shall be creditable against annual royalty payments owed under the CSMC License Agreement. In addition to royalty payments which are a percentage of Net Sales (as defined in the CSMC License Agreement) of Licensed Products (as defined in the CSMC License Agreement) and Licensed Technology products (as defined in the CSMC License Agreement), SYN Biomics is obligated to pay CMSC a percentage of any non-royalty sublicense revenues as well as additional consideration upon the achievement of the following milestones (the first two of which are payable in cash or our unregistered shares of stock at our option): (i) successful Phase I trial completion of the first Licensed Product or first Licensed Technology Product; (ii) successful Phase II trial completion of the first Licensed Product or first Licensed Technology Product; (iii) initiation of Phase III dosing for each additional indication of a Licensed Product or Licensed Technology Product; (iv) successful Phase III trial completion for each Licensed Product and each Licensed Technology Product; (v) the FDA’s acceptance of a New Drug Application for each Licensed Product and each Licensed Technology Product; (vi) regulatory approval for each Licensed Product and each Licensed Technology Product; and (vii) the first commercial sale of each Licensed Product and each Licensed Technology Product. The stock issuances are subject to prior approval of the NYSE MKT, LLC. The CSMC License Agreement automatically terminates upon the occurrence of certain events and SYN Biomics has the right to terminate the CSMC License Agreement without cause, upon six months notice to CSMC however, upon such termination, SYN Biomics is obligated to pay a termination fee with the amount of such fee reduced: (i) if such termination occurs after an IND submission to the



FDA but prior to completion of a Phase II clinical trial; (ii) reduced further if such termination is after completion of Phase II clinical trial but prior to completion of a Phase III clinical trial; and (iii) reduced to zero if such termination occurs after completion of a Phase III clinical trial.

Prior to the execution of the License Agreement, we issued shares of common stock of SYN Biomics to each of CSMC and Mark Pimentel, M.D. (the primary inventor of the intellectual property), representing 11.5% and 8.5%, respectively, of the outstanding shares of SYN Biomics (the "SYN Biomics Shares"). The Stock Purchase Agreements for the SYN Biomics Shares provide for certain anti-dilution protection until such time as an aggregate of \$3.0 million in proceeds from equity financings are received by SYN Biomics as well as a right, under certain circumstances in the event that the SYN Biomics Shares are not then freely tradeable, and subject to NYSE MKT, LLC approval, as of the 18 and 36 month anniversary date of the effective date of the Stock Purchase Agreements, for each of CSMC and Dr. Pimentel to exchange up to 50% of their SYN Biomics shares for unregistered shares of our common stock, with the rate of exchange based upon the relative contribution of the valuation of SYN Biomics to our public market valuation at the time of each exchange. The Stock Purchase Agreements also provide for tag-along rights in the event of the sale by us of our shares of SYN Biomics.

Pursuant to the terms of the CSMC Option Agreement, SYN Biomics has a period of six months to negotiate an exclusive license to develop, manufacture, use, and sell biologic products relating to the prevention, acute treatment and chronic treatment of IBS or other indications utilized or derived from certain optioned patent applications pending completion of certain limited testing of technology embodied in the patents applications. Under terms of the CSMC Option Agreement we issued 43,342 shares of our unregistered stock to CSMC, as payment of a non-refundable option fee of \$55,000. In addition, SYN Biomics has the right to extend the option period for an additional six months, for an additional non-refundable extension fee of \$25,000, payable in our unregistered shares of common stock having a market value of 110% of such amount, subject to approval of NYSE MKT, LLC, or in cash. At any time during the 6 or 12 month option period (if so extended) SYN Biomics has the right to exercise the option and negotiate an exclusive license to be optioned patent applications, which shall provide for (i) a \$50,000 license issue fee plus reimbursement of patent expenses incurred by CSMC prior to the exclusive license payable to CSMC in our unregistered shares of stock having a market value of 110% of such amount, subject to approval of the NYSE MKT, LLC, or in cash, (ii) the same milestone payments, royalties and sublicense fees as are payable under the CSMC License Agreement, and (iii) such other customary terms and conditions CSMC typically includes in its license agreements.

In collaboration with Intrexon, and partially utilizing the intellectual property optioned or licensed from CSMC described in the CSMC Option Agreement, we and SYN Biomics intend to develop biologic approaches for the prevention, and acute and chronic treatment of a subset of IBS pathologies specifically caused by auto-antibodies. During the option period, we, SYN Biomics and Intrexon will seek to create and test a variety of biologic candidates for the treatment of IBS. This biologic program has been selected as the third target under our Exclusive Channel Collaboration Agreement with Intrexon dated August 6, 2012.

Since our inception in January 2001, our efforts and resources have been focused primarily on acquiring and developing our product candidates, our clinical trials, raising capital, manufacturing and recruiting personnel. As of June 30, 2010, we emerged from the development stage after entering into a sublicense agreement with Meda AB and receiving an up-front payment of \$2.5 million. We consider this sublicense agreement to be an indication that we commenced our principal operations.

To date, we have financed our operations primarily through public and private sales of our common stock, and we expect to continue to seek to obtain the required capital in a similar manner. We have incurred an accumulated deficit of \$85.1 million through March 31, 2014. We cannot provide any assurance that we will be able to achieve profitability on a sustained basis, if at all, obtain the required funding, obtain the required regulatory approvals, or complete additional corporate partnering or acquisition transactions.

## **Pipeline Programs and Therapeutic Areas**

### **Pathogen-Specific Anti-Infective Biologic and Drug Programs**

We are a biotechnology company focused on the development of novel anti-infective biologic and drug candidates targeting specific pathogens that cause serious infections and other diseases. Infectious disease outbreaks are increasing while intervention options are declining due to widespread multidrug-resistant bacteria, increasing numbers of immuno-compromised patients (e.g., the elderly and cancer patients), and the isolation of new pathogens. We are developing an oral biologic to protect the gastrointestinal microflora from the effects of IV antibiotics for the prevention of *C. diff* infection, an oral treatment to reduce the impact of methane producing organisms on C-IBS, a series of monoclonal antibodies for the treatment of Pertussis and *Acinetobacter* infections, and a biologic targeted at the prevention and treatment of a root cause of a subset of IBS.

Several of our programs are focused on protecting the microbiome, or our gut flora, which is home to millions of bacteria, composed of a natural balance of both “good” beneficial bacteria and “bad” pathogenic bacteria. When that natural balance of all of these bacteria is disrupted, a person’s health is compromised.

*C. difficile:*

According to the Agency for Healthcare Research and Quality, aggregate costs associated with *C. diff* infection (CDI)-related stays in the hospital were \$8.2 billion in the U.S. during 2009. CDI is a rising global HAI problem in which the toxins produced by *C. difficile* bacteria result in diarrhea antibiotic-associated diarrhea (AAD), and in the most serious cases, pseudomembranous colitis (erosion of the lower GI tract) that can lead to death. The Centers for Disease Control and Prevention (CDC) recently identified *C. diff* as an “urgent public health threat,” particularly given its resistance to many drugs used to treat other infections. CDI is a major, unintended risk associated with the prophylactic or therapeutic use of IV antibiotics, which may alter the natural balance of microflora that normally protect the GI tract, leading to *C. difficile* overgrowth and infection. Other risk factors for CDI include hospitalization, prolonged length of stay, underlying illness, immune-compromising conditions including the administration of chemotherapy, and advanced age.

CDI is a widespread and often drug resistant infectious disease, and it is estimated that 1.1 million patients are infected with *C. diff* annually in the U.S.\*, and it has been reported that 30,000 patients die with a *C. diff* infection each year. CDI has surpassed methicillin-resistant staphylococcus aureus (MRSA) as the most frequent infection acquired in the hospital. Controlling the spread of CDI has proven challenging, as the *C. difficile* spores are easily transferred to patients via normal contact with healthcare personnel and other inanimate objects. There is currently no vaccine or approved product for the prevention of *C. diff* infection.

This information is an estimated derived from the use of information under license from the following IMS Health  
\*Incorporated information service: CDM Hospital database for full year 2012. IMS expressly reserves all rights, including rights of copying, distribution and republication.

*C. difficile: Acquisition of Clinical-Stage Program*

In November 2012, we acquired a series of oral beta-lactamase enzymes (P1A, P2A and P3A) and related assets targeting the prevention of CDI, the leading cause of HAIs that generally occurs secondary to treatment with IV antibiotics. The acquired assets include a pre-IND package for P3A (SYN-004), Phase I and Phase II clinical data for P1A, manufacturing processes and data, and a portfolio of issued and pending U.S. and international patents intended to support an IND and Biologics License Application (BLA) with the FDA. Utilizing this portfolio of assets, we intend to develop a proprietary oral beta-lactamase enzyme product candidate, SYN-004, previously known as P3A. When co-administered with certain IV beta-lactam antibiotics, it is expected that SYN-004 can degrade the antibiotic that is excreted in the GI tract, thus preserving the natural balance of the patient's microflora, and preventing opportunistic infections including CDI. Beta-lactam antibiotics are a mainstay in hospital infection management and include the commonly used penicillin and cephalosporin classes of antibiotics. Approximately 14.4 million patients are administered "SYN-004 target" IV beta-lactam antibiotics annually, representing an estimated target market for SYN-004 of 117.6 million beta-lactam doses purchased by U.S. hospitals. The addressable market is significant and currently there are no approved treatments designed to protect the microbiome from the damaging effects of IV antibiotics. This worldwide opportunity could represent a multi-billion dollar market.\*



This information is an estimated derived from the use of information under license from the following IMS Health \*Incorporated information service: CDM Hospital database for full year 2012. IMS expressly reserves all rights, including rights of copying, distribution and republication.

*C. difficile: Oral Enzyme Background*

We acquired a series of oral beta-lactamase enzymes. Beta-lactamase enzymes have the ability to degrade beta-lactam antibiotics that may be excreted into the GI tract. P1A (the first generation candidate) showed acceptable safety and tolerability in a Phase I study. In addition, two Phase II clinical studies demonstrated that P1A had the ability to preserve GI microflora in hospitalized patients treated with intravenous ampicillin or the combination of piperacillin and tazobactam.

*C. difficile: Preclinical and Clinical Development*

Compared to the first generation oral enzyme candidate, P1A, we believe that the second generation candidate, SYN-004 (formerly P3A), will have activity against a broader spectrum of beta-lactam antibiotics, including both penicillins and certain cephalosporins. Due to the structural similarities between P1A and SYN-004, and based on previous discussions with the FDA, it is anticipated that certain preclinical data collected on P1A may be used in support of an IND for our new product candidate, SYN-004.

In October 2013, we initiated manufacturing of SYN-004 material to support our planned preclinical and clinical studies. We intend to initiate Phase Ia and Ib clinical trials during the second half of 2014, with preliminary topline data expected by year-end 2014.

***C-IBS:***

Irritable Bowel Syndrome (IBS) is a functional GI disorder characterized by gas, abdominal pain, bloating and diarrhea or constipation, or alternating episodes of both. According to reports published by The International Foundation for Functional Gastrointestinal Disorders (IFFGD), IBS affects an estimated 10 to 15 percent of the population, or as many as 40 million Americans. The illness affects both men and women; two-thirds of diagnosed sufferers are women. The onset of IBS can begin anytime from adolescence to adulthood. Four bowel patterns may be seen with IBS, including: C-IBS (constipation predominant), D-IBS (diarrhea predominant), M-IBS (mixed diarrhea and constipation) and A-IBS (alternating diarrhea and constipation).

It has been reported that one-third of all IBS patients have C-IBS. Current FDA-approved therapies for the treatment of C-IBS include AMITIZA® (lubiprostone) and LINZESS® (linaclotide). Prescription and over-the-counter laxatives are also used by C-IBS patients for symptomatic relief. According to GlobalData, sales of approved drugs to treat C-IBS in seven major markets are projected to reach \$1.3 billion by 2018.

*C-IBS: Acquisition of Clinical-Stage Program*

In December 2013, we entered into a worldwide exclusive license agreement with CSMC for the right to develop products for therapeutic and prophylactic treatments for acute and chronic diseases. We licensed and optioned from CSMC a portfolio of intellectual property comprised of several U.S. and international patents and pending patent applications for various fields of use, including C-IBS, obesity and diabetes. An investigational team led by Mark Pimentel, M.D. at CSMC has discovered that these products are intended to target the production of methane gas by certain pathogenic gastrointestinal microorganisms that are perceived as the underlying cause of gas, pain and constipation associated with C-IBS, as well as diseases such as obesity and type 2 diabetes. Initially we will focus on the development of an oral treatment to reduce the impact of methane producing organisms on C-IBS.

*IBS: Gas Producing Organisms Background*

In the 1990's, research showed that IBS patients (over a given time) produced five times more gas than did people without IBS. Since the only source of those gases was bacterial, the initial presumption was that IBS patients had excessive bacteria in the colon. Subsequent studies showed that IBS patients had excessive quantities of gas in the small bowel; these data were the catalyst for studying small bowel bacteria in IBS. Normally the small intestine contains a very small quantity of bacteria. In published studies, indirect measures of small bowel bacteria suggest that 84% of IBS sufferers have excessive quantities of bacteria typically found in the colon.

The CSMC investigational team led by Dr. Pimentel is researching a recent theory that defines IBS as a bacterial disease. Gut microflora that should normally be confined to the large intestine inappropriately colonize the small intestine. This process is referred to as small intestine bacterial overgrowth (SIBO), which results in gas, bloating, abdominal pain and altered stool habits characterized by IBS.

*C-IBS: Methane Producing Organisms Background*

Further research by the CSMC investigational team led by Dr. Pimentel is focused on the C-IBS patient population. The theory that defines this patient set is that the constipation associated with C-IBS is due to an infectious disease. Overgrowth of certain gut microflora may lead to overproduction of methane gas resulting in pain, bloating and constipation. CSMC investigators have discovered that inhibiting intestinal methane production may treat the underlying cause of major diseases, including constipation associated with C-IBS.

*C-IBS: Preclinical and Clinical Development*

Ongoing efforts led by Dr. Pimentel include formulating and testing non-antibiotic FDA-approved oral drug candidates for ultimate product registration via potential expedited pathways. Such candidates are intended for the specific elimination of methane gas production within the intestines, with the goal of having little or no unintended impact on a patient's normal intestinal microflora. Initially we will focus on the development of an oral treatment to reduce the impact of methane producing organisms on C-IBS.

We intend to initiate *in vivo*/pharmacokinetic/pharmacodynamic studies in the first half of 2014, and to initiate a Phase II clinical trial during the second half of 2014 under an IND. Expected timing of topline data is mid-2015.

***Monoclonal Antibodies:***

*Monoclonal Antibodies for Infectious Diseases*

Acting as the body's army, antibodies are proteins, generally found in the bloodstream, that provide immunity in detecting and destroying pathogens, such as viruses and bacteria and their associated toxins. MAbs can also be designed and produced as therapeutic agents, utilizing protein engineering and recombinant production technologies. The mAbs being developed under our collaboration with Intrexon are intended to supplement a patient's own immune

system by providing the means to specifically and rapidly neutralize and/or clear specific pathogens and toxins of interest in a process known as “passive immunity”. Many pathogens that cause infectious diseases are innately resistant to, or over time have developed increased resistance to, antibiotics and other drugs.

*Intrexon Collaboration: Monoclonal Antibodies for Infectious Diseases*

In August 2012, we entered into a worldwide exclusive channel collaboration (“Second ECC”) with Intrexon through which we intend to develop a series of mAb therapies for the treatment of certain infectious diseases not adequately addressed by existing therapies. Utilizing Intrexon’s comprehensive suite of proprietary technologies, including the mAbLogix™ platform for rapid discovery of fully human mAbs and the LEAP™ cell processing station, our initial efforts will target three infectious disease indications.\*\*\* We also have the option to target an additional five infectious disease indications under this collaboration. To date, we have initiated development of a mAb therapy for the treatment of Pertussis and *Acinetobacter* infections.

\*\*\*mAbLogix™ and LEAP™ are registered trademarks of Intrexon Corporation.

***Pertussis:***

*Bordetella pertussis* (*B. pertussis*) is a gram-negative bacterium that infects the upper respiratory tract, causing uncontrollable, and violent coughing. Antibiotic treatment does not have a major effect on the course of Pertussis, because while it can eliminate the *B. pertussis* bacteria from the respiratory tract, it does not neutralize the pertussis toxin. Infants with Pertussis often require hospitalization in pediatric intensive care units, frequently requiring mechanical ventilation. Pertussis in adults generally leads to a chronic cough referred to as the "cough of 100 days." The incidence of Pertussis is increasing due to a less effective acellular vaccine introduced in the 1990s, exposure of unvaccinated and under-vaccinated individuals including infants who are not yet fully vaccinated, exposure of individuals whose immunity has diminished over time, as well as asymptomatic carriers.

According to the World Health Organization there are 50 million cases of whooping cough and *B. pertussis* infection that causes an estimated 300,000 deaths each year worldwide, primarily among young, unvaccinated infants. Recent news reports throughout the U.S. indicate that the pertussis vaccine introduced in the 1990s does not provide long-term protection and, as a result, whooping cough cases have increased to a 60-year high. There is no approved treatment for Pertussis, and antibiotic treatment does not have a major effect on the course of Pertussis, because while it can eliminate the *B. pertussis* bacteria from the respiratory tract, it does not neutralize the pertussis toxin.

*Pertussis: Intrexon Collaboration and The University of Texas at Austin Agreement*



In December 2012, we initiated mAb development for the treatment of Pertussis focusing on toxin neutralization pursuant to our August 2012 collaboration with Intrexon. Unlike antibiotics, we are developing a mAb therapy, SYN-005, to target and neutralize the pertussis toxin, in order to reduce the mortality rate in infants and shorten the duration of chronic cough in afflicted adults.

To further the development of this potential therapy for pertussis, we have entered into an agreement with The University of Texas at Austin to license the rights to certain research and pending patents related to pertussis antibodies. These research efforts are being conducted at the Cockrell School of Engineering in the laboratory of Assistant Professor, Jennifer A. Maynard, Ph.D., the Laurence E. McMakin, Jr. Centennial Faculty Fellow in the McKetta Department of Chemical Engineering. Dr. Maynard brings to the project her expertise in defining the key neutralizing epitopes of pertussis toxin to optimize the potential efficacy of antibody therapeutics.

#### *Pertussis: Preclinical and Clinical Development*

Working with our collaborator, Intrexon, and our academic collaborator, The University of Texas at Austin, we have established a combination of two humanized antibodies designed to neutralize pertussis toxin, a major cause of pertussis-mediated infant morbidity and mortality. Benchtop studies demonstrated high affinity binding to the toxin, as well as potent neutralization of the toxin. In addition, the antibodies were highly efficacious in a murine model of pertussis in which they completely mitigated elevations of the white blood cell count that is characteristic of the illness.

In April 2014, positive preclinical research findings for SYN-005, our proprietary monoclonal antibody (mAb) combination therapy for treating Pertussis (whooping cough), in two non-human primate studies (n=15). In the second pertussis study in particular, SYN-005 was associated with favorable decreases in white blood cell counts within two days and the achievement of nearly normal levels within one week.

Based on positive non-human primate and murine model findings, we have filed an additional patent application around pertussis antibodies, intend to move into cGMP manufacturing of SYN-005, and intend to file an IND application to support a Phase I clinical trial expected to initiate during the first half of 2015. Topline data is expected to be available within approximately 90 days of the start of the trial. This is expected to be followed by a Phase II trial, with topline results expected in the second half of 2015. We also intend to request an Orphan Drug designation for SYN-005 for the treatment of Pertussis.

#### *Acinetobacter Infections:*

*Acinetobacter baumannii* is a difficult to treat pathogen due to its rapid and well-established development of resistance to most antibiotics, making it a multidrug-resistant pathogen. In addition, as a biofilm-forming pathogen, *Acinetobacter baumannii* has the ability to survive up to twice as long as non-biofilm-forming pathogens. In the U.S., *Acinetobacter baumannii* has been reported to be the cause of up to 2.6% of hospital acquired infections, 1.3% of bloodstream infections and 7.0% of ICU respiratory tract infections, and more than half of the *Acinetobacter baumannii* isolates are multidrug-resistant. According to published articles, mortality rates associated with *Acinetobacter*

infections as high as 43.0% are reported in hospitals and ICU settings. While *Acinetobacter baumannii* is a well-documented pathogen in the hospital setting, this pathogen also poses an increasing danger to wounded servicemen and women in military treatment centers and to those treated in trauma centers following natural disasters.

A treatment for *Acinetobacter* infections represents a billion dollar market opportunity.

*Acinetobacter: Intrexon Collaboration*

In August 2012, we initiated a mAb discovery and development program for *Acinetobacter* infections pursuant to our August 2012 collaboration with Intrexon. Discovery efforts for the development of a mAb are currently underway.

**IBS:**

Existing IBS therapies, which are primarily focused on supportive care, are unlikely to address the treatment needs of the patient population with auto-antibodies, an underlying immune-specific pathology. Through our collaboration with Intrexon, we intend to address the unmet medical need in these patients with personalized medicine and target the root causes of a subset of IBS-associated pathologies.

*IBS: Intrexon Collaboration*

In December 2013, in collaboration with Intrexon, and partially utilizing the intellectual property optioned from CSMC, we announced an intent to develop biologic approaches targeted at the prevention, and acute and chronic treatment of a subset of IBS pathologies specifically caused by auto-antibodies.

We intend to utilize intellectual property optioned from CSMC. According to an increasing body of recent work conducted by CSMC, a subset of IBS cases appear to be causally initiated by one or more encounters with acute infectious gastroenteritis, such as the foodborne illness, *Campylobacter jejuni*. CSMC has identified a novel autoimmune target for this subset of IBS cases because of the development of cross-reacting antibodies between a bacterial toxin and a protein important for controlling GI motility. This program is in the discovery stage.

## **Multiple Sclerosis Program**

### ***Relapsing-Remitting MS:***

MS is a progressive neurological disease in which the body loses the ability to transmit messages along the central nervous system, leading to pain, loss of muscle control, paralysis, cognitive impairment and in some cases death. According to the National Multiple Sclerosis Society (NMSS), more than 2.3 million people worldwide (approximately 400,000 patients in the U.S. of which approximately 65% are women) have been diagnosed with MS. The diagnosis is typically made in young adults, ages 20 to 50. According to the NMSS, approximately 85% of MS patients are initially diagnosed with the relapsing-remitting form, and 10-15% with other progressive forms.

There are nine FDA-approved therapies for the treatment of relapsing-remitting MS: Betaseron<sup>®</sup>, Rebif<sup>®</sup>, Avonex<sup>®</sup>, Copaxone<sup>®</sup>, Tysabri<sup>®</sup>, Gilenya<sup>®</sup>, Extavia<sup>®</sup>, Aubagio<sup>®</sup> and Tecfidera<sup>™</sup>. Many of these therapies provide only a modest benefit for patients with relapsing-remitting MS. All of these drugs except Gilenya<sup>®</sup>, Aubagio<sup>®</sup> and Tecfidera<sup>™</sup> require frequent (daily, weekly & monthly) injections (or infusions) on an ongoing basis and can be associated with unpleasant side effects (such as flu-like symptoms) and high rates of non-compliance among users. Despite the availability of therapies for the treatment of relapsing-remitting MS, the disease is highly underserved and exacts a heavy personal and economic toll. Annual worldwide sales of current MS therapies are estimated at \$14.1 billion.

### ***Relapsing-Remitting MS: Background***

Research has shown that pregnant women with MS tend to experience a spontaneous reduction of disease symptoms during pregnancy, particularly in the third trimester. The PRIMS (Pregnancy In MS) study published in 1998, a landmark observational clinical study published in the *New England Journal of Medicine* followed 254 women with MS during 269 pregnancies and for up to one year after delivery. The PRIMS study demonstrated that relapse rates were significantly reduced by 71% ( $p < 0.001$ ) through the third trimester of pregnancy compared to pre-pregnancy-rates, and that relapse rates increased by 120% ( $p < 0.001$ ) during the first three months after birth (post-partum) and then return to pre-pregnancy rates. It has been hypothesized that the female hormone, estriol, produced by the placenta during pregnancy, plays a role in “fetal immune privilege”, a process that prevents a mother’s immune system from attacking and rejecting the fetus. The maternal levels of estriol increase linearly through the third trimester of pregnancy until birth, whereupon it abruptly returns to low circulating levels. The anti-autoimmune effects of estriol are thought to be responsible for the therapeutic effects of pregnancy on MS.

Rhonda Voskuhl, M.D., Director, UCLA MS program, UCLA Department of Neurology, has found that plasma levels of estriol achieved during pregnancy have potent immunomodulatory effects. She further postulated and tested in a

pilot clinical study that oral doses of estriol may have a therapeutic benefit when administered to non-pregnant female MS patients by, in essence, mimicking the spontaneous reduction in relapse rates seen in MS patients during pregnancy.

Estriol has been approved and marketed for over 40 years throughout Europe and Asia for the oral treatment of post-menopausal symptoms. It has never been approved by the U.S. FDA for any indication.

#### *Relapsing-Remitting MS: Clinical Development*

Trimesta (oral estriol) is being developed as an adjunctive oral once-daily treatment for relapsing-remitting MS in women. An investigator-initiated, 10-patient, 22-month, single-agent, crossover clinical trial to study the therapeutic effects of 8 mg. of oral Trimesta taken daily in non-pregnant female relapsing-remitting MS patients was completed in the U.S. The total volume and number of gadolinium-enhancing lesions were measured by brain magnetic resonance imaging (an established neuroimaging measure of disease activity in MS). Over the next three months of treatment with Trimesta, the median total enhancing lesion volumes decreased by 79% ( $p = 0.02$ ) and the number of lesions decreased by 82% ( $p = 0.09$ ). They remained decreased during the next 3 months of treatment, with lesion volumes decreased by 82% ( $p = 0.01$ ), and numbers decreased by 82% ( $p = 0.02$ ). Following a six-month drug holiday during which the patients were not on any drug therapies, median lesion volumes and numbers returned to near baseline pretreatment levels. Trimesta therapy was reinitiated during a four-month retreatment phase of this clinical trial. The relapsing-remitting MS patients again demonstrated a decrease in enhancing lesion volumes of 88% ( $p = 0.008$ ) and a decrease in the number of lesions by 48% ( $p = 0.04$ ) compared with original baseline scores.

The Phase II, double-blinded, placebo-controlled trial randomized 158 women with relapsing-remitting MS at 16 sites across the U.S. The study evaluated Trimesta as an oral, once-daily dose of 8 mg per day plus Copaxone® in women with relapsing-remitting MS, aged 18-50 years. Positive topline efficacy and safety results were presented in April 2014 by lead principal investigator, Dr. Rhonda Voskuhl of UCLA David Geffen School of Medicine at the 66th American Academy of Neurology Annual Meeting. The UCLA-led Phase II study was designed to show statistical significance at 12 months for the MS relapse rate reduction in patients treated with Trimesta plus Copaxone® compared to patients given placebo plus Copaxone®. The trial was only powered to trend toward statistical significance at the 24-month time point. According to the protocol, the results of topline data demonstrate that Trimesta met the pre-specified goal of the study with rapid onset of activity observed for Trimesta plus Copaxone® compared to placebo plus Copaxone®. Dr. Voskuhl and her team anticipated an approximately 29% reduction in MS relapse rate, per the study protocol. A statistically significant 47% decrease in relapse rate was observed at 12 months of therapy ( $p$ -value = 0.03 / powered for significance level of 0.05), as well as a clear trend toward a 32% reduction at 24 months ( $p$ -value = 0.15 / powered for significance level of 0.10), which far surpassed the investigator's expectations. The Trimesta study also demonstrated a clinically significant near-normalization of cognitive scores at 12 months of therapy in women taking Trimesta plus Copaxone®. This outcome is of high importance for MS specialists and patients and we believe it is the result of oral estriol's unique neuroprotective effect. In addition, adjunctive oral Trimesta plus injectable standard of care Copaxone® was generally safe and well tolerated by women in the study.

Edgar Filing: Synthetic Biologics, Inc. - Form 10-Q

By demonstrating the therapeutic potential and safety of Trimesta in the Phase II exploratory trial, we achieved a key goal of the Trimesta program, which is providing further support to enable us to attract a strategic partner to accelerate development of this innovative therapy for MS. We are engaging with the neurology community and potential partners, as we determine next steps for Trimesta.

With over \$8 million in grant funding awarded to UCLA to date, from organizations such as the National Institutes for Health and the National Multiple Sclerosis Society, the ongoing Trimesta clinical trial should be funded to its completion of patient follow-up.

*Relapsing-Remitting MS: Patents*

In March 2014, we announced that the U.S. Patent & Trademark Office issued U.S. Patent No. 8,658,627 entitled, *Pregnancy Hormone Combination for Treatment of Autoimmune Diseases*, to the Regents of the University of California. The patent includes claims to the use of our drug candidate, Trimesta (oral estriol), in conjunction with a gestagen for the treatment of multiple sclerosis (MS) and other autoimmune diseases. The patent also includes a claim for the administration of Trimesta, a gestagen and a third standard of care MS agent, such as glatiramer acetate injection (Copaxone<sup>®</sup>), interferon beta-1a (Avonex<sup>®</sup>, Rebif<sup>®</sup>), interferon beta-1b (Betaseron<sup>®</sup>, Extavia<sup>®</sup>) or sphingosine-1-phosphate receptor modulator (Gilenya<sup>®</sup>).

In April 2013, we announced that the U.S. Patent & Trademark Office issued U.S. Patent No. 8,372,826 entitled, *Estriol Therapy for Multiple Sclerosis and Other Autoimmune Diseases*, to the Regents of the University of California which includes claims to the use of our drug candidate, Trimesta (oral estriol), in combination with glatiramer acetate injection (Copaxone<sup>®</sup>). According to Teva Pharmaceutical Industries Ltd.'s Form 20-F for the year ended December 31, 2012, filed with the SEC on February 12, 2013. Copaxone<sup>®</sup> is the number one selling drug for multiple sclerosis with approximately \$4 billion in annual sales. Currently marketed exclusively by Teva Pharmaceutical Industries Ltd., Copaxone<sup>®</sup> is expected to face generic competition as certain patent terms begin to expire in 2014.

Through our wholly owned subsidiary, we hold the exclusive worldwide license to issued U.S. Patents 8,658,627, 8,372,826 and 6,936,599 and pending patents for multiple sclerosis and other autoimmune diseases covering the uses of our drug candidate, Trimesta.

*Cognitive Dysfunction in MS:*

According to the NMSS and the Multiple Sclerosis Society of Canada publication, *Hold that Thought! Cognition and MS*, it is fairly common for people with MS to complain of cognitive difficulties, such as remembering things, finding the right words and the ability to concentrate. Among MS patients, 50-65% have some degree of cognitive dysfunction.

The major areas of cognition that may be affected include complex attention and executive functions. Complex attention involves multitasking, the speed with which information can be processed, learning and memory, and perceptual skills; executive functions include problem solving, organizational skills, the ability to plan, and word finding. Just as the nature, frequency, and severity of MS-related physical problems can widely vary, not all people with MS will have cognitive dysfunction, and no two people will experience exactly the same type or severity.

*Cognitive Dysfunction in MS: Background*

In the investigator-initiated, 10-patient, 22-month, single-agent, crossover clinical trial conducted by Dr. Rhonda Voskuhl, a statistically significant 14% improvement from baseline in the PASAT cognitive testing scores ( $p = 0.04$ ) was observed in relapsing-remitting MS patients after six months of Trimesta therapy. PASAT is a routine cognitive test performed in patients with a wide variety of neuropsychological disorders such as MS. The PASAT scores are expressed as a mean percent change from baseline.

*Cognitive Dysfunction in MS: Clinical Development*

Our Trimesta (oral estriol) drug candidate is also being developed for the treatment of cognitive dysfunction in female MS patients. This randomized, double-blind, placebo-controlled Phase II clinical trial to evaluate Trimesta's potential neuroprotective and therapeutic effect on cognitive dysfunction in female MS patients is currently enrolling relapsing-remitting or secondary-progressive female MS patients at four clinical sites in the United States, including UCLA. Up to 64 patients between the ages of 18 and 50 will be randomized 1:1 into the treatment and placebo groups. Dr. Voskuhl will administer either oral Trimesta or a matching placebo, in addition to an FDA-approved MS treatment, including Copaxone<sup>®</sup>, Avonex<sup>®</sup>, Betaseron<sup>®</sup>, Extavia<sup>®</sup>, Rebif<sup>®</sup>, Gilenya<sup>®</sup>, Aubagio<sup>®</sup> and Tecfidera<sup>®</sup>. Each patient will be dosed and monitored for one year after being enrolled. The primary endpoint in this clinical trial being run under an investigator-initiated IND application is expected to be improvement in PASAT cognitive testing scores versus matching placebo. We and a private foundation have pledged to equally support this new clinical trial, and we will also provide Trimesta drug supply. The trial also received contributions from several other supporters. Patient recruitment and enrollment into this trial is ongoing.

**Fibromyalgia Program**

Fibromyalgia is a chronic and debilitating condition characterized by widespread pain and stiffness throughout the body, often accompanied by severe fatigue, insomnia and alterations in mood. According to the National Fibromyalgia Association, fibromyalgia affects an estimated 3-6% of the population worldwide, including an estimated 10 million people in the U.S. There are presently three FDA products approved for the treatment of fibromyalgia - Lyrica<sup>®</sup>, Cymbalta<sup>®</sup> and Savella<sup>®</sup>.

Based on an estimated annual price of \$1,200 per fibromyalgia patient, we estimate that the total market potential in the U.S. is \$6 billion.



*Fibromyalgia: Meda Corporate Partnership*

On May 6, 2010, we entered into a sublicense agreement with Meda, a multi-billion dollar international pharmaceutical company, pursuant to which Meda assumed all future development costs and may commercialize flupirtine, a molecular entity with a unique mode of action for the treatment of fibromyalgia in the U.S. As consideration for such sublicense, we received an up-front payment of \$2.5 million and are entitled to milestone payments of \$5.0 million upon the FDA's acceptance of the New Drug Application (NDA) for flupirtine for fibromyalgia and \$10.0 million upon FDA approval of such NDA. Pursuant to the sublicense agreement, we will also receive a 7% royalty on net sales of flupirtine for fibromyalgia in the U.S., Canada and Japan, with such royalties being shared equally with our licensor, McLean Hospital, a Harvard teaching hospital.

Flupirtine is approved and marketed by Meda and its distributors in Europe and other countries for indications other than fibromyalgia and has been prescribed to millions of patients worldwide. We believe that such substantial human experience with flupirtine should greatly assist the FDA in its evaluation of the safety of flupirtine upon review of an NDA of flupirtine for fibromyalgia.

*Fibromyalgia: Clinical Development*

Our Effirma (flupirtine) drug candidate for the treatment of fibromyalgia, has been partnered to Meda (see "Fibromyalgia: Meda Corporate Partnership" section above). Effirma is a selective neuronal potassium channel opener that also has N-methyl-D-aspartic (NMDA) receptor antagonist properties. Effirma is a non-opioid, non-NSAID, non-steroidal, analgesic. Preclinical data and clinical experience suggest that Effirma should also be effective for neuropathic pain since it acts in the central nervous system via a mechanism of action distinguishable from most marketed analgesics. Effirma is especially attractive because it operates through non-opiate pain pathways, exhibits no known abuse potential, and lacks withdrawal effects. In addition, no tolerance to its antinociceptive effects has been observed. One common link between neuroprotection, nociception and Effirma may be the N-methyl-D-aspartic acid glutamate system, a major receptor subtype for the excitotoxic neurotransmitter, glutamate. Effirma has strong inhibitory actions on N-methyl-D-aspartic acid-mediated neurotransmission. Flupirtine was originally developed by Asta Medica (subsequently acquired by Meda) and has been approved and is marketed by Meda in Europe since 1984, as well as other countries, for the treatment of pain. It has never been approved by the FDA for any indication.

According to Meda's 2012 Year-End Report filed in February 2013, Meda has received the go-ahead from the FDA to conduct a Phase II proof of concept study for the treatment of fibromyalgia. Meda also announced that the randomized, double-blind, placebo and active-controlled study of patients with fibromyalgia will be conducted at 25 clinics in the U.S.

## **Critical Accounting Policies**

The consolidated financial statements are prepared in conformity with U.S. GAAP, which require the use of estimates, judgments and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts of revenues and expenses in the periods presented. We believe that the accounting estimates employed are appropriate and resulting balances are reasonable; however, due to inherent uncertainties in making estimates, actual results could differ from the original estimates, requiring adjustments to these balances in future periods. The critical accounting estimates that affect the consolidated financial statements and the judgments and assumptions used are consistent with those described in the MD&A section in our 2013 Form 10-K.

## **Results of Operations**

### ***Three Months Ended March 31, 2014 and 2013***

#### *General and Administrative Expenses*

General and administrative expenses for both the three months ended March 31, 2014 and 2013, were \$1.1 million. The charge relating to stock-based compensation expense was \$255,000 for the three months ended March 31, 2014, compared to \$353,000 for the three months ended March 31, 2013.

#### *Research and Development Expenses*

Research and development expenses increased by 143% to \$2.7 million for the three months ended March 31, 2014, from \$1.1 million for the three months ended March 31, 2013. This increase is primarily the result of increased program costs associated with expanded research, development and manufacturing activities in our anti-infective pipeline, including our *C. diff*, C-IBS and Pertussis programs. Research and development expenses also include a charge relating to non-cash stock-based compensation expense of \$107,000 for the three months ended March 31, 2014, compared to \$104,000 for the three months ended March 31, 2013.

#### *Other Income*

Other income was \$1,000 for the three months ended March 31, 2014, compared \$12,000 for the three months ended March 31, 2013.

*Net Loss*

Our net loss was \$3.8 million, or \$0.07 per common share for the three months ended March 31, 2014, compared to a net loss of \$2.2 million, or \$0.05 per common share for the three months ended March 31, 2013.

## Liquidity and Capital Resources

We have financed our operations since inception primarily through proceeds from equity financings, corporate partnering license fees, laboratory revenues and miscellaneous equipment sales.

Our cash totaled \$11.2 million as of March 31, 2014, a decrease of \$3.4 million from December 31, 2013. During the three months ended March 31, 2014, the primary use of cash was for working capital requirements and operating activities which resulted in a net loss of \$3.8 million for the three months ended March 31, 2014.

Our continued operations will primarily depend on our ability to raise additional capital from various sources including equity and debt financings, as well as, license fees from potential corporate partners, joint ventures and grant funding. Such additional funds may not become available on acceptable terms and there can be no assurance that any additional funding that we do obtain will be sufficient to meet our needs in the long term. We will continue to fund operations from cash on hand and through the similar sources of capital previously described. We can give no assurance that any additional capital that we are able to obtain will be sufficient to meet our needs.

### *Current and Future Financing Needs*

We have incurred an accumulated deficit of \$85.1 million through March 31, 2014. With the exception of the quarter ended June 30, 2010, we have incurred negative cash flow from operations since we started our business. We have spent, and expect to continue to spend, substantial amounts in connection with implementing our business strategy, including our planned product development efforts, our clinical trials, and our research and discovery efforts.

However, the actual amount of funds we will need to operate is subject to many factors, some of which are beyond our control. These factors include the following:

- the progress of our research activities;
- the number and scope of our research programs;
- the progress of our preclinical and clinical development activities;
- the progress of the development efforts of parties with whom we have entered into research and development agreements;
- our ability to maintain current research and development licensing arrangements and to establish new research and development and licensing arrangements;
- our ability to achieve our milestones under licensing arrangements;

- the costs involved in prosecuting and enforcing patent claims and other intellectual property rights; and
- the costs and timing of regulatory approvals.

We have based our estimate on assumptions that may prove to be wrong. We may need to obtain additional funds sooner or in greater amounts than we currently anticipate. Potential sources of financing include strategic relationships, public or private sales of our shares or debt and other sources. We may seek to access the public or private equity markets when conditions are favorable due to our long-term capital requirements. We do not have any committed sources of financing at this time, and it is uncertain whether additional funding will be available when we need it on terms that will be acceptable to us, or at all. If we raise funds by selling additional shares of common stock or other securities convertible into common stock, the ownership interest of our existing stockholders will be diluted. If we are not able to obtain financing when needed, we may be unable to carry out our business plan. As a result, we may have to significantly limit our operations and our business, financial condition and results of operations would be materially harmed.

### **ITEM 3. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK.**

Synthetic Biologics, Inc. is a smaller reporting company as defined by Rule 12b-2 of the Exchange Act and is not required to provide the information required under this item.

### **ITEM 4. CONTROLS AND PROCEDURES**

#### **(a) Evaluation of disclosure controls and procedures**

Pursuant to Rule 13a-15(b) under the Securities Exchange Act of 1934 (“Exchange Act”), the Company carried out an evaluation, with the participation of the Company’s management, including the Company’s Chief Executive Officer (“CEO”) and Chief Financial Officer (“CFO”), of the effectiveness of the Company’s disclosure controls and procedures (as defined under Rule 13a-15(e) under the Exchange Act) as of the end of the period covered by this report. Based upon that evaluation, the Company’s CEO and CFO concluded that the Company’s disclosure controls and procedures are effective as of March 31, 2014 to ensure that information required to be disclosed by the Company in the reports that the Company files or submits under the Exchange Act, is recorded, processed, summarized and reported, within the time periods specified in the SEC’s rules and forms, and that such information is accumulated and communicated to the Company’s management, including the Company’s CEO and CFO, as appropriate, to allow timely decisions regarding required disclosure.

#### **(b) Changes in Internal Control over Financial Reporting**

There has been no change in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) of the Exchange Act) that occurred during our fiscal quarter ended March 31, 2014, that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

## **PART II-OTHER INFORMATION**

### **ITEM 1. LEGAL PROCEEDINGS**

None.

### **ITEM 1A. RISK FACTORS**

The following information updates, and should be read in conjunction with, the information disclosed in Part 1, Item 1A, "Risk Factors," of our Annual Report on Form 10-K for the fiscal year ended December 31, 2013, which was filed with the Securities and Exchange Commission on March 31, 2014. There have been no material changes from the risk factors disclosed in our Form 10-K for the year ended December 31, 2013, other than as set forth below.

### **RISKS RELATING TO OUR BUSINESS**

*We will need to raise additional capital to operate our business.*

With the exception of the three months ended June 30, 2010, we have experienced significant losses since inception and have a significant accumulated deficit. We expect to incur additional operating losses in the future and therefore our cumulative losses to increase. To date, other than the licensing fee we received from Meda AB for the development and commercialization of Effirma (flupirtine) for fibromyalgia in the U.S., Canada and Japan and limited laboratory revenues from Adeona Clinical Laboratory, which we sold in March 2012, we have generated very minimal revenues. Inasmuch as our sole source of revenue (with the exception of the Meda licensing fee) has been our laboratory revenue and our laboratory was sold in March 2012, we do not expect to derive revenue from any source in the near future until we or our partners successfully commercialize our products. As of March 31, 2014, our accumulated deficit totaled approximately \$85.1 million on a consolidated basis. Until such time as we receive approval from the FDA and other regulatory authorities for our product candidates, we will not be permitted to sell our products and therefore will not have product revenues from the sale of products. For the foreseeable future we will have to fund all of our operations and capital expenditures from equity and debt offerings, cash on hand, licensing fees and grants. If our current cash, cash equivalents and short-term investments are not sufficient to sustain our operations, we will need to seek additional sources of financing and such additional financing may not be available on favorable terms, if at all. If we do not succeed in raising additional funds on acceptable terms, we may be unable to complete planned preclinical and clinical trials or obtain approval of our product candidates from the FDA and other

regulatory authorities. In addition, we could be forced to delay, discontinue or curtail product development, forego sales and marketing efforts, and forego licensing in attractive business opportunities. Any additional sources of financing will likely involve the issuance of our equity or debt securities, which will have a dilutive effect on our stockholders.

## **RISKS RELATING TO OUR STOCK**

*We are substantially controlled by our current officers, directors and principal stockholder.*

Currently, our directors, executive officers, and principal stockholder beneficially own a substantial number of shares of our common stock. As a result, they will be able to exert substantial influence over the election of our Board of Directors and the vote on issues submitted to our stockholders. Our executive officers and directors beneficially owned approximately 1.8 million shares of our common stock, including stock options exercisable within 60 days of May 1, 2014. Through Intrexon Corporation and NRM VII Holdings I, LLC, Randal J. Kirk indirectly, beneficially owns approximately 12.3 million shares of our common stock. Because our common stock has from time to time been “thinly traded”, the sale of a substantial number of shares by our executive officers, directors and principal stockholder would have an adverse effect on the market for our stock and our share price.



**ITEM 2. UNREGISTERED SALES OF EQUITY SECURITIES AND USE OF PROCEEDS**

None.

**ITEM 3. DEFAULTS UPON SENIOR SECURITIES**

None.

**ITEM 4. MINE SAFETY DISCLOSURES**

Not applicable.

**ITEM 5. OTHER INFORMATION**

None.

25

**ITEM 6. EXHIBITS**

31.1 Certification of Principal Executive Officer pursuant to Rule 13a-14(a)/15d-14(a) \*

31.2 Certification of Principal Financial Officer pursuant to Rule 13a-14(a)/15d-14(a) \*

32.1 Certification of Principal Executive Officer pursuant to Section 1350 of the Sarbanes-Oxley Act of 2002 \*

32.2 Certification of Principal Financial Officer pursuant to Section 1350 of the Sarbanes-Oxley Act of 2002 \*

EX-101.INS XBRL Instance Document \*

EX-101.SCH XBRL Taxonomy Extension Schema \*

EX-101.CAL XBRL Taxonomy Extension Calculation Linkbase \*

EX-101.DEF XBRL Taxonomy Extension Definition Linkbase \*

EX-101.LAB XBRL Taxonomy Extension Label Linkbase \*

EX-101.PRE XBRL Taxonomy Extension Presentation Linkbase \*

\*Filed herewith.

**SIGNATURES**

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

SYNTHETIC  
BIOLOGICS, INC.

By: /s/ Jeffrey Riley  
Jeffrey Riley  
President and Chief  
Executive Officer  
(Principal Executive  
Officer)  
Date: May 15, 2014

By: /s/ C. Evan  
Ballantyne  
C. Evan Ballantyne  
Chief Financial  
Officer  
(Principal Financial  
Officer)  
Date: May 15, 2014

## GLOSSARY

<b>Term</b>	<b>Definition</b>
Adverse Event	Any adverse change in health or “side-effect” that occurs in a person participating in a clinical trial, from the time they consent to joining the trial until a pre-specified period of time after their treatment has been completed.
BLA - Biologics License Application	An application in the U.S. through which biologic sponsors formally propose that the FDA approve a new biologic for sale and marketing.
Clinical Study/Trial	A research study that is conducted to find out if a treatment or procedure is safe and/or effective in humans.
Controlled Clinical Trial	A clinical study that compares patients receiving a specific treatment to patients receiving an alternate treatment for the condition of interest. The alternate treatment may be another active treatment, standard of care for the condition and/or a placebo (inactive) treatment.
Double-blinded Study/Trial	Both the participant and the researcher are unaware of who is receiving the active treatment or the placebo.
FDA - Food & Drug Administration	The U.S. government agency that ensures that medicines, medical devices, prescription medical foods and radiation-emitting consumer products are safe and effective. Authorized by Congress to enforce the Federal Food, Drug, and Cosmetic Act and several other public health laws, the agency monitors the manufacture, import, transport, storage, and sale of \$1 trillion worth of goods annually.
GMP - Good Manufacturing Practice	Regulations that require that manufacturers, processors, and packagers of drugs, medical devices, some food, and blood take proactive steps to ensure that their products are consistently produced, pure, and stable. GMP regulations require a quality approach to manufacturing, enabling companies to minimize or eliminate instances of contamination, mix-ups, and errors.
Monoclonal Antibodies (mAbs)	Acting as the body's army, antibodies are proteins, generally found in the bloodstream, that provide immunity in detecting and destroying pathogens, such as viruses and bacteria and their associated toxins.
IND - Investigational New Drug	An application in the U.S. submitted to the FDA for a new drug or biologic that, if allowed, will be used in a clinical trial.
IRB - Institutional Review Board	A committee designated to formally approve, monitor, and review biomedical research at an institution involving human studies. Institutional Review Boards aim to protect the rights and welfare of the research subjects.
NDA - New Drug Application	An application in the U.S. through which drug sponsors formally propose that the FDA approve a new pharmaceutical for sale and marketing.

Open-label Clinical Study/Trial A trial in which both the treating physician and the patient know they are receiving the experimental treatment.

Phase I Clinical Trial A Phase I trial represents an initial study in a small group of patients to primarily test for safety.

Phase II Clinical Trial A Phase II trial represents a study in a larger number of patients to assess the safety and efficacy of a product.

Phase III Clinical Trial Phase III trials are initiated to establish safety and efficacy in an expanded patient population and at multiple clinical trial sites and are generally larger than trials in earlier phases of development.

Placebo	An inactive pill or liquid. Many studies compare an active drug to a placebo to determine whether any changes seen during the study can be attributed to the active drug.
Principal Investigator	This is the study director who is ultimately responsible for the conduct of the study.
Prospective Clinical Study/Trial	A clinical study/trial in which participants are identified and then followed throughout the study going forward in time.
Protocol	A clinical study/trial's plan - includes the schedule of tests, requirements for participation, procedures, and medications.
Randomized Study/Trial	Participants in a study are assigned by chance to either one or more of the active treatment group(s) or the placebo group.
Single-blinded Study/Trial	One party, either the participant or the researcher, does not know if the participant is taking the active treatment or the placebo.
Study/Trial Coordinator	Staff member who is often the primary contact for research participants and coordinates their care and evaluations throughout the study.