Synthetic Biologics, Inc.
Form 10-Q
May 11, 2015

UNITED STATES SECURITIES AND EXCHANGE COMMISSION

Washington, DC 20549

FORM 10-Q

(Mark One)

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

For the quarterly period ended March 31, 2015
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	**13-3808303**
(State or other jurisdiction of incorporation or organization)	*(IRS Employer Identification Number)*

155 Gibbs Street, Suite 412
Rockville, MD **20850**
(Address of principal executive offices) *(Zip Code)*

617 Detroit Street, Suite 100
Ann Arbor, MI **48104**
(Mailing Address) *(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 x 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 x No ¨

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated file, a non-accelerated file, 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	¨	Accelerated filer	x
Non-Accelerated filer	¨	Smaller reporting company	¨
(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 x

As of May 8, 2015 the registrant had 73,179,307 shares of common stock outstanding.

SYNTHETIC BIOLOGICS, INC.

FORM 10-Q

TABLE OF CONTENTS

PART I.-FINANCIAL INFORMATION

ITEM 1. FINANCIAL STATEMENTS

Synthetic Biologics, Inc. and Subsidiaries

Consolidated Balance Sheets

(In thousands except share and per share amounts)

Assets	**March 31, 2015** (Unaudited)	**December 31, 2014** (Audited)
Current Assets		
Cash and cash equivalents	$ 12,049	$ 17,525
Prepaid expenses and other current assets	1,574	1,548
Total Current Assets	13,623	19,073
Property and equipment, net	75	65
Deposits and other assets	18	6
Total Assets	**$ 13,716**	**$ 19,144**
Liabilities and Stockholders' Equity (Deficit)		
Current Liabilities:		
Accounts payable	$ 1,559	$ 996
Accrued expenses	2,646	1,298
Warrant liabilities	10,908	6,756
Accrued employee benefits	228	538
Total Current Liabilities	15,341	9,588
Total Liabilities	15,341	9,588
Commitments and Contingencies		
Stockholders' Equity (Deficit):		
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, 72,725,987 issued and 72,807,469 outstanding and 72,594,626 issued and 72,513,144 outstanding	73	72
Additional paid-in capital	111,702	110,526

Accumulated deficit	(113,400)	(101,042)
Total Synthetic Biologics, Inc. and Subsidiaries Equity (Deficit)	(1,625)	9,556
Non-controlling interest	-	-
Total Stockholders' Equity (Deficit)	(1,625)	9,556
Total Liabilities and Stockholders' Equity	**$ 13,716**	**$ 19,144**

See accompanying notes to unaudited consolidated financial statements.

1

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,	
	2015	**2014**
Operating Costs and Expenses:		
General and administrative	$ 1,713	$ 1,122
Research and development	6,494	2,717
Total Operating Costs and Expenses	8,207	3,839
Loss from Operations	(8,207)	(3,839)
Other Income (Expense):		
Change in fair value of warrant liability	(4,152)	-
Interest income	1	1
Total Other Income (Expense)	(4,151)	1
Net Loss	(12,358)	(3,838)
Net Loss Attributable to Non-controlling Interest	-	-
Net Loss Attributable to Synthetic Biologics, Inc. and Subsidiaries	**$ (12,358)**	**$ (3,838)**
Net Loss Per Share - Basic and Dilutive	$ (0.17)	$ (0.07)
Net Loss Per Share Attributable to Synthetic Biologics, Inc. and Subsidiaries	**$ (0.17)**	**$ (0.07)**
Weighted average number of shares outstanding during the period - Basic and Dilutive	72,673,959	58,324,260

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,	
	2015	2014
Cash Flows From Operating Activities:		
Net Loss	$ (12,358)	$ (3,838)
Adjustments to reconcile net loss to net cash used in operating activities:		
Stock-based compensation	827	362
Stock issued for milestone payments	350	-
Change in fair value of warrant liabilities	4,152	-
Depreciation	8	3
Changes in operating assets and liabilities:		
Prepaid expenses and other current assets	(26)	259
Deposits and other assets	(12)	(2)
Accounts payable	563	631
Accrued liabilities	1,348	-
Accrued employee benefits	(310)	(885)
Net Cash Used In Operating Activities	(5,458)	(3,470)
Cash Flows From Investing Activities:		
Purchases of property and equipment	(18)	(4)
Net Cash Used In Investing Activities	(18)	(4)
Cash Flows From Financing Activities:		
Proceeds from issuance of common stock for stock option exercises	-	4
Net Cash Provided By Financing Activities	-	4
Net decrease in cash	(5,476)	(3,470)
Cash at beginning of period	17,525	14,625
Cash at end of period	$ 12,049	$ 11,155
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 microbiome-focused, clinical-stage company developing therapeutics to protect the microbiome while targeting pathogen-specific diseases. The Company is developing an oral biologic to protect the gut microbiome (gastrointestinal (GI) microflora) from intravenous (IV) antibiotics for the prevention of *C. difficile* infection and an oral statin treatment to reduce the impact of methane producing organisms on irritable bowel syndrome with constipation (IBS-C). In addition, the Company is developing a monoclonal antibody combination for the treatment of Pertussis in collaboration with Intrexon Corporation (NYSE: XON), and a Phase 2 oral estriol drug for the treatment of relapsing-remitting multiple sclerosis (MS) and cognitive dysfunction in MS.

Therapeutic Area	Product Candidate	Status
C. difficile infection prevention	SYN-004 (oral enzyme)	Initiated Phase 2a SYN-004 clinical trial during 1st quarter 2015; Phase 2b proof-of- concept SYN-004 clinical trial is expected to initiate during 2nd half 2015
Irritable bowel syndrome with constipation (IBS-C)	SYN-010 (oral compound)	Intend to initiate Phase 2 clinical trials during 2nd quarter of 2015; Collaboration with Cedars-Sinai Medical Center
Pertussis	SYN-005 (monoclonal antibodies)	Positive preclinical research findings reported at ECCMID in April 2015; Seeking non-dilutive funding to support clinical development of SYN-005; Collaborations with Intrexon and The University of Texas at Austin
Relapsing-remitting MS	Trimesta (oral estriol)	The lead principal investigator presented additional Phase 2 clinical outcome data, including more detailed results on improvements in cognitive and disability measures at the ACTRIMS-ECTRIMS Joint Meeting in September 2014; Partnership discussions ongoing pending data from University of California, Los Angeles (UCLA); MRI data review underway by UCLA

Cognitive dysfunction in MS	Trimesta (oral estriol)	Patient enrollment underway in Phase 2 clinical trial

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, 2014 ("2014 Form 10-K") as filed with the SEC. The interim results for the three months ended March 31, 2015, 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 $113.4 million through March 31, 2015. 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 the Company's 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;
- the 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 $8.5 million and $13.6 million as of March 31, 2015 and December 31, 2014, respectively, that are measured using Level 1 inputs.

4. Selected Balance Sheet Information

Prepaid expenses and other current assets (in thousands):

	March 31, 2015	December 31, 2014
Intrexon prepaid research and development expenses	$ 1,060	$ 1,067
Prepaid insurance	140	228
Prepaid expenses	374	253
Total	$ 1,574	$ 1,548

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, 2015	December 31, 2014
Computer and office equipment	$ 111	$ 93
Software	11	11
	122	104
Less accumulated depreciation	(47)	(39)
Total	$ 75	$ 65

Accrued expenses (in thousands):

	March 31, 2015	December 31, 2014
Accrued manufacturing costs	$ 74	$ 247
Accrued vendor payments	225	176
Accrued milestone payments	1,000	350
Accrued clinical consulting services	1,347	525
Total	$ 2,646	$ 1,298

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, 2015, there were 682,449 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, 2015, there are 428,657 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, 2015, there are 5,420,000 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, 2015 and 2014 are as follows:

	Three Months Ended March 31,			
	2015		2014	
Expected dividends	0	%	0	%
Expected volatility	131	%	126	%
Risk free interest rate	2.03	%	1.57	%
Expected life of option	10 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, 2015, the Company granted 550,000 options to employees having an approximate fair value of $817,000 based upon the Black-Scholes option pricing model. During the same period in 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.

A summary of stock option activities as of March 31, 2015, and for the year ended December 31, 2014, is as follows:

	Options	Weighted Average Exercise Price	Weighted Average Remaining Contractual Life	Aggregate Intrinsic Value
Balance - December 31, 2013	3,909,580	$ 1.78	5.59 years	$785,000
Granted	2,382,500	$ 2.36		
Exercised	(6,583)	$ 0.58		
Forfeited	(304,391)	$ 1.93		
Balance - December 31, 2014	5,981,106	$ 2.01	5.80 years	$685,000

Granted	550,000	$ 1.54		
Exercised	-	$ -		
Forfeited	-	$ -		
Balance - March 31, 2015 - outstanding	6,531,106	$ 1.97	5.79 years	$2,628,000
Balance - March 31, 2015 - exercisable	4,168,043	$ 1.89	4.98 years	$1,939,000
Grant date fair value of options granted - March 31, 2015		$ 817,000		
Weighted average grant date fair value - March 31, 2015		$ 1.49		
Grant date fair value of options granted - December 31, 2014		$ 4,974,000		
Weighted average grant date fair value - December 31, 2014		$ 2.09		

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, 2015 and 2014 were $826,000 and $362,000, respectively

As of March 31, 2015, total unrecognized stock-based compensation expense related to stock options was $4.0 million, which is expected to be expensed through February 2017.

6. Stock Purchase Warrants

On October 10, 2014, the Company raised net proceeds of $19.1 million through the sale of 14,059,616 units at a price of $1.47 per unit to certain institutional investors in a registered direct offering. Each unit consisted of one share of the Company's common stock and a warrant to purchase 0.5 shares of common stock. The warrants, exercisable for an aggregate of 7,029,808 shares of common stock, have an exercise price of $1.75 per share and a life of five years. The warrants vested immediately and expire October 10, 2019.

The warrants issued in conjunction with the registered direct offering in October 2014 include a provision, that if the Company were to enter into a certain transaction, as defined in the agreement, the warrants would be purchased from the holder at a premium. Accordingly, the Company recorded the warrants as a liability at their estimated fair value on the issuance date and changes in estimated fair value will be recorded as non-cash income or expense in the Company's statement of operations at each subsequent period. At March 31, 2015, the fair value of the warrant liability was $10.9 million, which represented non-cash expense of $4.2 million for the three months ended March 31, 2015. In accordance with authoritative accounting guidance, the warrant was valued on the date of grant and in subsequent periods using the Black-Scholes valuation model. The assumptions used by the Company are summarized in the following table:

	March 31, 2015	**December 31, 2014**	**Issuance Date**
Closing stock price	$2.19	$1.46	$1.75
Expected dividends	0 %	0 %	0 %
Expected volatility	90 %	90 %	95 %
Risk free interest rate	1.26 %	1.59 %	1.39 %
Expected life of warrant	4.55 years	4.79 years	5 years

The following table summarizes the estimated fair value of the warrant liability *(in thousands)*:

Balance at December 31, 2014	$6,756
Change in fair value of warrant liability	4,152
Balance at March 31, 2015	$10,908

As of March 31, 2015, all of the warrants remained outstanding.

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, 2015 were 316,522.

A summary of warrant activity for the Company for the three months ended March 31, 2015 and for the year ended December 31, 2014 is as follows:

	Number of Warrants	Weighted Average Exercise Price
Balance at December 31, 2013	1,632,501	$ 1.99
Granted	7,029,808	$ 1.75
Exercised	(232,619)	$ 1.47
Forfeited	(454,896)	$ 1.88
Balance at December 31, 2014	7,974,794	$ 1.80
Granted	-	$ -
Exercised	-	$ -
Forfeited	-	$ -
Balance at March 31, 2015	7,974,794	$ 1.80

A summary of all outstanding and exercisable warrants as of March 31, 2015 is as follows:

Exercise Price	Warrants Outstanding	Warrants Exercisable	Weighted Average Remaining Contractual Life	Aggregate Intrinsic Value
$ 1.60	316,522	316,522	2.57 years	$ 187,000
$ 1.75	7,029.808	7,029,808	4.53 years	$ 3,903,000
$ 2.22	517,257	517,257	1.66 years	$ -
$ 3.30	61,207	61,207	0.16 years	$ -
$ 3.75	50,000	50,000	0.88 years	$ -
$ 1.80	7,974,794	7,974,794	4.21 years	$ 3,280,000

7. Stockholders' Equity (Deficit)

During the three months ended March 31, 2015, the Company issued 212,843 shares of common stock to Prev ABR LLC, with a fair value of $350,000, that was recorded as research and development expense, in consideration for achieving the first two milestones as set forth in the Asset Purchase Agreement dated November 28, 2012. In lieu of receiving any cash payment for achieving the first two milestones, Prev ABR LLC exercised its option to receive the milestone payments in shares of the Company's common stock. The number of shares of common stock issued upon achievement of each milestone was based upon the average of the opening and closing prices of the Company's stock on the date each milestone was achieved as specified in the Asset Purchase Agreement.

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, 2014 and 2015, 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, 2015 were 6,531,106 and 7,974,794, respectively, and for the three months ended March 31, 2014 were 4,490,497 and 963,168, 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, 2014, 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 microbiome-focused, clinical-stage company developing therapeutics to protect the microbiome while targeting pathogen-specific diseases. We are developing an oral biologic to protect the gut microbiome (gastrointestinal (GI) microflora) from intravenous (IV) antibiotics for the prevention of *C. difficile* infection and an oral statin treatment to reduce the impact of methane producing organisms on irritable bowel syndrome with constipation (IBS-C). In addition, we are developing a monoclonal antibody combination for the treatment of Pertussis in collaboration with Intrexon Corporation (NYSE: XON), and a Phase 2 oral estriol drug for the treatment of relapsing-remitting multiple sclerosis (MS) and cognitive dysfunction in MS.

Product Pipeline:

Summary of Pathogen-Specific Therapy Programs:

- ***C. difficile* infections (CDI):** We are in clinical development of a novel second-generation oral enzyme candidate, SYN-004, for co-administration with commonly used IV beta-lactam antibiotics, intended to protect the microbiome and prevent the development of and severe effects from CDI. CDIs are a leading type of hospital acquired infection (HAI) and are frequently associated with IV antibiotic treatment. Designed to be given orally and co-administered with certain IV beta-lactam antibiotics (e.g., penicillins and cephalosporins), SYN-004 is intended to protect the gut while the IV antibiotics fight the primary infection. SYN-004 is believed to not only have a similar profile to its

first-generation predecessor, which demonstrated protection of the microbiome (gut flora) during treatment with certain penicillins, but also has the potential to protect the gut from 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. SYN-004's target market is significant and represented by annual U.S. hospitals purchases of approximately 118 million doses of IV beta-lactam antibiotics which are administered to approximately 14 million patients.* Currently there are no approved treatments designed to protect the gut microbiome from the damaging effects of IV antibiotics. This worldwide market could represent a multi-billion dollar opportunity for us. In November 2014, the U.S. Patent and Trademark Office (USPTO) issued Patent No. 8,894,994 that has claims to compositions of matter and pharmaceutical compositions of beta-lactamases, including SYN-004, and carries a patent term to at least 2031. We also have an extensive patent estate on other aspects of this program which includes patent applications that could carry a term to at least 2035. In the fourth quarter of 2014, we initiated our randomized, double-blind placebo-controlled Phase 1a clinical trial, reported positive topline safety and tolerability results from the Phase 1a clinical trial, and initiated the Phase 1b clinical trial evaluating multiple ascending doses of SYN-004. In February 2015, we reported positive topline results from the Phase 1b clinical trial of escalating doses of oral SYN-004, with no safety or tolerability issues reported at dose levels and dose regimens both meeting and exceeding those expected to be studied in upcoming clinical trials. In March 2015, we reported positive pharmacokinetics data from both Phase 1 clinical trials, with supportive evidence that SYN-004 should have no effect on the IV antibiotic in the bloodstream, allowing the antibiotic to fight the primary infection. We also initiated a Phase 2a clinical trial to evaluate the GI antibiotic-degrading effects and the safety of SYN-004 in March 2015. The initiation of a Phase 2b proof-of-concept clinical trial is expected in the second half of 2015, with Phase 2b topline data anticipated during the second half of 2015.

* 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.

- **IBS-C:** 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 of acute and chronic diseases, including the development of SYN-010 to target IBS-C. An investigational team led by Mark Pimentel, M.D., at CSMC discovered that SYN-010 may reduce the production of methane gas by certain gastrointestinal (GI) microorganisms. Methane produced by these organisms is perceived as an underlying cause of pain, bloating, and constipation associated with IBS-C, and may contribute to the pathology of other diseases. SYN-010 is a modified release formulation of a statin being designed to reduce the impact of methane producing organisms on IBS-C. A 505(b)(2) regulatory pathway is anticipated for the development of SYN-010. We licensed an extensive intellectual property portfolio from CSMC including granted use patents and pending patent applications for SYN-010. Additional worldwide patent filings having composition of matter claims, which were recently filed by CSMC and licensed to us, could extend patent protection of SYN-010 to 2035. Based on guidance from the members on our IBS clinical advisory board, we plan to file an Investigational New Drug (IND) application with the U.S. Food and Drug Administration (FDA) to support the initiation of Phase 2 clinical trials in the second quarter of 2015, with Phase 2 topline data anticipated during the second half of 2015.

- **Pertussis:** In December 2012, in collaboration with Intrexon Corporation (NYSE: XON) (Intrexon), we initiated development of a monoclonal antibody (mAb) therapy for the treatment of Pertussis infections, more commonly known as whooping cough. Combining two mAbs, SYN-005 is designed to target and neutralize pertussis toxin as a prophylaxis for high-risk newborns and in order to reduce the mortality rate in infected infants. To further the development of this potential therapy for Pertussis, we entered into an agreement with The University of Texas at Austin (UT) to license the rights to certain research and pending patents related to pertussis antibodies. We have patents pending on compositions and uses of SYN-005 and we have an issued U.S. patent on other pertussis mAbs from UT. According to the World Health Organization, each year, *B. pertussis* infection is estimated to cause up to 300,000 deaths worldwide, primarily among unvaccinated infants. Positive preclinical research findings for SYN-005 were reported in April 2014, and again in September 2014, for our proprietary mAb combination therapy for treating Pertussis, in non-human primate studies. In September 2014 we received a U.S. Orphan Drug designation for SYN-005 for the treatment of Pertussis. We intend to seek non-dilutive funding to support preclinical and clinical development of SYN-005 for prophylaxis and treatment of Pertussis, including the anticipated filing of an IND application and the anticipated initiation of a Phase 1 clinical trial.

- ***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. This program is in the discovery stage and the generation of a panel of antibodies to treat this infection is ongoing.

Summary of Multiple Sclerosis Program:

- **Relapsing-Remitting MS:** Patient follow-up is complete in the University of California, Los Angeles (UCLA) led Phase 2, investigator-initiated, randomized (n = 158), double-blinded, placebo-controlled trial which evaluated our drug candidate, Trimesta, in women with relapsing-remitting MS at 16 sites across the U.S. In April 2014, the lead principal investigator presented positive Phase 2 topline efficacy and safety results. In September 2014, the lead

principal investigator presented additional Phase 2 clinical outcome data, including more detailed results on improvements in cognitive and disability measures, at the 2014 Joint Americas and European Committees for Treatment and Research in Multiple Sclerosis Meeting (ACTRIMS-ECTRIMS) in Boston. The data as reported by the lead principal investigator for the UCLA-led Phase 2 study supported the potential of Trimesta to have a novel dual mechanism of action for both the anti-inflammatory effects that improve relapse rate, and a neuroprotective effect that improves standard measures of disability and cognition. Further analyses of the magnetic resonance imaging (MRI) data are ongoing, with topline data expected from the lead principal investigator during the first half of 2015. This investigator-initiated Phase 2 clinical trial was supported by grants exceeding $8 million, awarded primarily by the National Multiple Sclerosis Society (NMSS) in partnership with the NMSS's Southern California chapter, and the National Institutes of Health. Annual worldwide sales of MS therapies are forecasted to be approximately $17.8 billion in 2019. We have licensed issued method of treatment patents in the U.S. for MS therapy with estriol and estriol combination therapies (including estriol with Copaxone®) from UCLA, and numerous new provisional patent applications have been filed based on the Phase 2 clinical results. We are engaging with the neurology community and potential strategic partners, as we determine next steps for Trimesta.

- **Cognitive Dysfunction in MS:** Trimesta is also being developed for the treatment of cognitive dysfunction in female MS patients. This 12-month, UCLA-led, randomized, double-blind, placebo-controlled investigator-initiated Phase 2 clinical trial is being conducted at four sites in the United States. 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 through direct funding to the lead principal investigator 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 for this indication.

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. 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 $113.4 million through March 31, 2015. 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 Therapy Programs

We are developing pathogen-specific therapies for serious infections and diseases, with a focus on protecting the microbiome. 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 GI microflora from the effects of certain IV beta-lactam antibiotics for the prevention of CDI, an oral treatment to reduce the impact of methane producing organisms on IBS-C and a monoclonal antibody combination for the treatment of Pertussis.

Microbiome-Focused Therapies:

Our *C. difficile* and IBS-C programs are focused on protecting the microbiome, or our gut flora, which is home to billions of bacteria and 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 can be compromised.

***C. difficile*:**

According to the Agency for Healthcare Research and Quality, aggregate costs associated with 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 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) identified *C. difficile* 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. It is estimated that 1.1 million patients are infected with *C. difficile* annually in the U.S.*, and it has been reported that 30,000 patients die with a *C. difficile* infection each year. CDI has surpassed methicillin-resistant staphylococcus aureus (MRSA) as the most frequent hospital acquired infection. 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 with inanimate objects. There is currently no vaccine or approved product for the prevention of CDI.

* 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 HAI that generally occurs secondary to treatment with IV antibiotics. The acquired assets include a pre-IND package for P3A (now known as SYN-004), Phase 1 and Phase 2 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 developed a proprietary, second generation oral beta-lactamase enzyme product candidate, SYN-004.

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. SYN-004's target market is significant and represented by annual U.S. hospitals purchases of approximately 118 million doses of IV beta-lactam antibiotics which are administered to approximately 14 million patients.* Currently there are no approved treatments designed to protect the microbiome from the damaging effects of IV antibiotics. The worldwide market for SYN-004 could represent a multi-billion dollar opportunity for us.

* 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

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 1 study. In addition, two Phase 2 clinical studies demonstrated that P1A had the ability to preserve GI microflora in hospitalized patients treated with IV 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, 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, certain preclinical data collected on P1A was used in support of an IND for our new product candidate, SYN-004.

In June 2014, we formed a Clinical Advisory Board (CAB) to support development of SYN-004. The CAB is comprised of industry leaders Mark Wilcox, M.D., (Chairman), Curtis Donskey, M.D., Ciarán Kelly, M.D. and Tom Louie, M.D., all of whom are providing expertise and guidance on each aspect of the *C. difficile* clinical program.

In August 2014, we announced an agreement with Evonik Corporation for Good Manufacturing Practices (GMP) manufacturing of our proprietary oral beta-lactamase enzyme, SYN-004. Evonik formulated and encapsulated enterically coated SYN-004 for oral delivery for use in our Phase 1a, 1b and planned Phase 2a clinical trials, using

material generated by our API manufacturer FUJIFILM Diosynth Biotechnologies UK Limited. In January 2015, we entered into an agreement with Halo Pharmaceutical (Whippany, NJ) to formulate and encapsulate enterically coated SYN-004 for oral delivery for use in our planned Phase 2b and other future clinical trials, using material generated by our Active Pharmaceutical Ingredient (API) manufacturer FUJIFILM Diosynth Biotechnologies UK Limited.

In December 2014, we initiated Phase 1a and 1b clinical trials of SYN-004, and also reported positive topline safety and tolerability results from the Phase 1a study. In February 2015, we reported positive topline results from the Phase 1b clinical trial of escalating doses of oral SYN-004, with no safety or tolerability issues reported at dose levels and dose regimens both meeting and exceeding those expected to be studied in upcoming clinical trials.

In March 2015, we reported positive pharmacokinetic data from both Phase 1 clinical trials, with supportive evidence that SYN-004 should have no effect on the IV antibiotic in the bloodstream, allowing the antibiotic to fight the primary infection. We also initiated a Phase 2a clinical trial to evaluate the GI antibiotic-degrading effects and the safety of SYN-004. The initiation of a Phase 2b proof-of-concept clinical trial is expected in the second half of 2015, with Phase 2b topline data anticipated during the second half of 2015.

In March 2015, we also announced that late-breaking preclinical results supporting the development of SYN-004 were accepted for poster presentation at Digestive Disease Week® (DDW) 2015 in Washington DC in May 2015. The late-breaking abstract title is "*SYN-004, a Clinical Stage Oral Beta-Lactamase Therapy, Protects the Intestinal Microflora from Antibiotic-Mediated Damage in Humanized Pigs.*"

In April 2015, we announced that clinical data supporting the development of SYN-004 were selected for poster presentation at the 115th General Meeting of the American Society of Microbiology (ASM2015) in New Orleans, LA in May-June 2015. The abstract title is "*Clinical Evaluation of SYN-004, an Oral Beta-Lactamase Therapy for the Prevention of Antibiotic-Induced Disruption of Intestinal Microflora*." A second poster featured data that support expanding the development of therapeutics designed to protect the microbiome from all beta-lactam antibiotics for the prevention of *C. difficile* infection, beyond penicillins and cephalosporins was also selected. The abstract title is "*Development of Therapeutic Agents that Protect the Colonic Microflora from All Beta-Lactam Antibiotics for the Prevention of Clostridium difficile Infection*."

C. difficile: *Intellectual Property*

In November 2014, the USPTO issued U.S. Patent 8,894,994 that has claims to compositions of matter and pharmaceutical compositions of beta-lactamases, including SYN-004, and carries a patent term to at least 2031. In addition to this newly granted patent, we have numerous related granted and pending U.S. and international patent applications that are central to our intellectual property estate. Further, we continue to grow our intellectual property estate with new filings, many of which would expire in at least 2035, if granted.

13

IBS-C:

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: IBS-C (constipation predominant), IBS-D (diarrhea predominant), IBS-M (mixed diarrhea and constipation) and IBS-A (alternating diarrhea and constipation). The development of SYN-010 is an oral treatment intended to reduce the impact of methane producing organisms on IBS-C.

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

IBS-C: 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 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 IBS-C, obesity and diabetes. An investigational team led by Mark Pimentel, M.D. at CSMC has discovered that these products may reduce the production of methane gas by certain GI microorganisms. Methane produced by these microorganisms is perceived as the underlying cause of pain, bloating, and constipation associated with IBS-C, and may contribute to the pathology of other diseases. Initially we will focus on the development of SYN-010, an oral treatment being designed to reduce the impact of methane producing organisms on IBS-C.

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.

IBS-C: Methane Producing Organisms Background

Further research by the CSMC investigational team led by Dr. Pimentel is focused on the IBS-C patient population. Extensive studies conducted by Dr. Pimentel and collaborators have shown that overproduction of methane gas is directly associated with bloating, pain and constipation in IBS-C patients. CSMC investigators have discovered that inhibiting intestinal methane production may reverse constipation associated with IBS-C, and can be beneficial in other major diseases such as obesity and type 2 diabetes.

IBS-C: Preclinical and Clinical Development

Efforts led by Dr. Pimentel included formulating and testing non-antibiotic FDA-approved oral drug candidates for ultimate product registration via potential expedited pathways. Such candidates are intended for the reduction or elimination of methane gas production within the intestines, with the goal of having little or no unintended impact on a patient's normal GI microflora.

In April 2014, we formed a CAB to support development of SYN-010, and also announced that gastroenterologist and lead investigator for the IBS-C program, Dr. Mark Pimentel, is the Chair of the CAB. In October 2014, we announced the expansion of the IBS-C CAB to include William Chey, M.D., Gail M. Comer, M.D., Anthony J. Lembo, M.D., and, Philip Schoenfeld, M.D., MSEd, MSc.

In September 2014, we announced that our candidate, SYN-010, is a modified release formulation of a statin being designed to reduce the impact of methane producing organisms on IBS-C. A 505(b)(2) regulatory pathway is anticipated for the development of SYN-010.

Based on guidance from the members on our IBS CAB, we plan to file an IND application with the U.S. FDA to support the initiation of Phase 2 clinical trials in the second quarter of 2015, with Phase 2 topline data anticipated during the second half of 2015.

In February 2015, we announced that preclinical results supporting the development of SYN-010 (based on research performed at Cedars-Sinai Medical Center under the direction of Dr. Mark Pimentel), our candidate therapy to reduce the impact of methane producing organisms on IBS-C, were accepted for poster presentation at DDW 2015 in Washington DC in May 2015. The abstract title is "*Lovastatin improves stool form in Methanobrevibacter smithii colonized rats with constipation.*"

IBS-C: Intellectual Property

An extensive intellectual property portfolio including granted use patents and pending patent applications for SYN-010 has been licensed to us by CSMC. Additional worldwide patent filings, including composition of matter claims, among other claims, recently filed by CSMC and licensed to us could extend patent protection of SYN-010 to 2035.

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 have targeted three infectious disease indications.** To date, we have initiated development of mAb therapies

for the treatment of Pertussis and *Acinetobacter* infections.

**mAbLogix™ and LEAP® are 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 the declining effectiveness of the 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 are estimated to cause up to 300,000 deaths each year worldwide, primarily among 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.

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 therapy comprising a combination of two mAbs, SYN-005, to target and neutralize the pertussis toxin as a prophylaxis for high-risk newborns and in order to reduce the mortality rate in infected infants.

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 Associate 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 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, and again in September 2014, we received positive preclinical research findings for SYN-005, our proprietary mAb combination therapy for treating Pertussis (whooping cough), in three non-human primate studies (n = 19). In the latter two Pertussis studies in particular, SYN-005 rapidly blunted the rise in white blood cell count that is characteristic of the disease and accelerated its return to baseline.

In addition, during September 2014 we received U.S. Orphan Drug designation from the FDA for SYN-005 for the treatment of Pertussis.

We intend to seek non-dilutive funding to support additional preclinical and clinical development of SYN-005 for the prophylaxis and treatment of Pertussis, including the anticipated filing of an IND application, and the anticipated initiation of a Phase 1 clinical trial.

In April 2015, preclinical efficacy data that support advancing SYN-005 toward the clinic were presented in two poster presentations at the European Congress of Clinical Microbiology and Infectious Diseases meeting (ECCMID) 2015 in Copenhagen, Denmark. The data suggest that SYN-005 has therapeutic potential to diminish morbidity, long-term complications and mortality from Pertussis in critically ill infants. In addition, the data support a prophylactic approach for use in newborns that has the potential to save thousands of lives annually, particularly in the developing world where the unmet need is greatest.

Pertussis: Intellectual Property

We have patents pending on compositions and uses of SYN-005 and we have an issued U.S. patent and patents pending on other pertussis mAbs from UT.

Acinetobacter Infections:

Acinetobacter baumanii 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 baumanii* has the ability to survive up to twice as long as non-biofilm-forming pathogens. In the U.S., *Acinetobacter baumanii* 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 baumanii* 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 baumanii* 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 September 2012, we initiated a mAb discovery and development program for *Acinetobacter* infections pursuant to our August 2012 collaboration with Intrexon. This program is in the discovery stage and the generation of a panel of antibodies is ongoing.

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 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®, Rebif®, Avonex®, Copaxone®, Tysabri®, Gilenya®, Extavia®, Aubagio® and Tecfidera®. Many of these therapies provide only a modest

benefit for patients with relapsing-remitting MS. All of these drugs except Gilenya®, Aubagio® and Tecfidera® 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 t