May 15, 2017

Synthetic Biologics — BUY

Company Update : Biotechnology

Digestive Disease Week Update

Ribaxamase Data Impresses

Synthetic Biologics presented consistent and compelling data on its prophylactic agent for *Clostridium difficile* infections. Our report focuses on two presentations – one that discussed important findings from a preclinical model and the other that provided comprehensive data from a recently concluded potentially pivotal Phase 2b clinical trial.

A porcine study showed ribaxamase serves two protective functions against β–lactam antibiotics. First, it degraded the IV antibiotic ceftriaxone before it reached the commensal bacteria. This was affirmed by significantly minimizing the changes in bacterial populations that normally accompany antibiotic treatment. The second protective effect was evidenced by preventing an increase in the frequency of antibiotic-resistant genes in the microbiota. This was probably related closely to its ability to block commensal bacteria from coming under the selective pressure of the antibiotic.

The Phase 2b trial resulted in a clear clinical benefit. The study met its primary endpoint in demonstrating that ribaxamase reduced new onset of *C. difficile* infections by 71% and did not affect the cure rate of the primary infection, pneumonia. Just as important, we believe, is that it also significantly reduced new colonization by vancomycin-resistant enterococci. The latter is consistent with the preclinical evidence showing ribaxamase limits the frequency of a variety of antibiotic-resistance genes, not just those related to β–lactam antibiotics. And, Synthetic's drug has a good safety profile, with no drug-related adverse events reported. Further information will come later this year from a CDC-financed deep-sequencing analysis that will provide more detailed information on the antibiotic-related dysbiosis and protection afforded by ribaxamase.

Next on the agenda probably is a partnering agreement. The Company has been discussing the ribaxamase data with potential partners and we believe there is interest, given the drug's excellent safety profile, ability to prevent opportunistic infections, and reduce the spread of drug-resistant genes. Synthetic also has two similar drugs in preclinical development, one that is useful with IV carbapenems and another that is designed to protect against oral β–lactam antibiotics. Thus, the Company has some flexibility in negotiating a partnering deal. The FDA may even decide to approve ribaxamase on the Phase 2b data, given its ability to address issues important to the CDC and society.

We are maintaining our BUY recommendation and $3.00 price target.

GRIFFIN SECURITIES
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Stock Symbol	**NYSE:MKT: SYN**
Current Price	$0.53
12 mos. Target Price	$3.00
Market Cap	$62.8 mln
Shares O/S	121.9 mln
Avg Daily Vol. (3 mos.)	984,755 shs.
52- Week Price Low/High	$0.41 - $2.38
Fiscal Year End	Dec
Dividend / Yield	$0.00 / 0.0%

EPS

	FY 15A	FY 16A	FY 17E
Q1 (Mar)	$(0.17)A	$(0.12)A	$(0.03)A
Q2 (Jun)	(0.19)A	(0.06)A	(0.07)E
Q3 (Sep)	(0.08)A	(0.09)A	(0.08)E
Q4 (Dec)	(0.12)A	(0.02)A	(0.09)E
	$(0.55)A	$(0.29)A	$(0.25)E

INVESTMENT CONCERNS

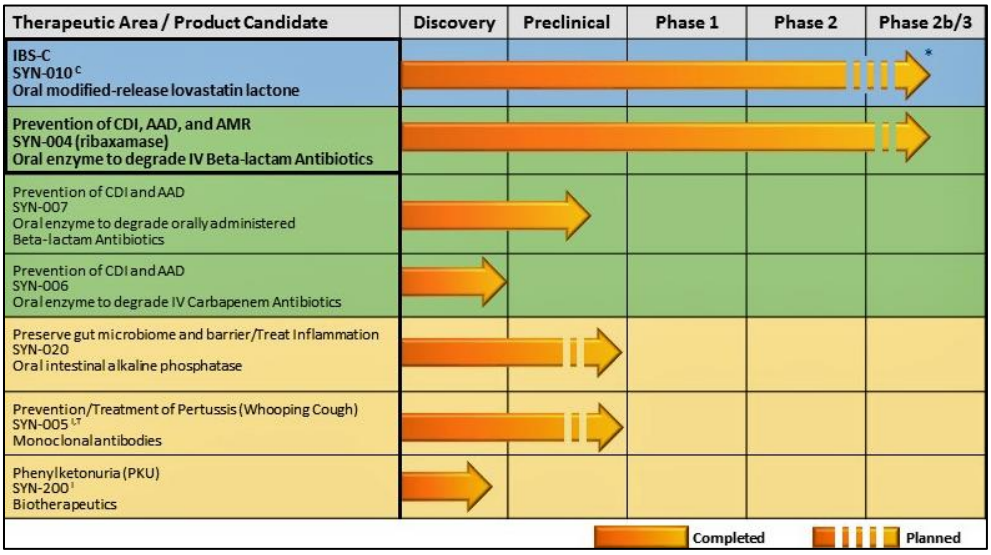
Synthetic Biologics is on a quest to improve health through medicines that address the gut microbiota. The microbes that inhabit the gastrointestinal (GI) tract perform important functions influencing a broad spectrum of the human condition including the conversion of our food into useful components such as essential vitamins, homeostasis of the immune system, and neurological function. One of the most advanced drugs is ribaxamase (see the Figure 1 for the R&D pipeline), an agent that is designed to protect the gut microbiota from the seepage of commonly used intravenous β-lactam antibiotics into the GI tract and thereby prevent opportunistic infections that can become life-threatening. This program was well conceived from the nature of the protective agent to preclinical models used for assessing the drug and subsequently to the disease and antibiotic selected for clinical program. The results have consistently demonstrated the utility of ribaxamase in functioning as designed. Indeed, the drug has a clean safety record and proven efficacy in preclinical and clinical testing. Accordingly, **we believe the ribaxamase program has been largely de-risked.**

The Company's next challenge is to secure a partner(s) to help complete the clinical development and commercialization of ribaxamase, if necessary. There is a possibility that the FDA will consider the data from the Phase 2b trial to be sufficient to warrant approval of the drug, since the study was designed to be pivotal. At this juncture, Synthetic is awaiting the results of a deep-sequencing analysis that is being financed by the U.S. Centers for Disease Control & Prevention. That data may weigh heavily on the FDA's decision, since it will provide a clearer picture of changes in the gut microbiota following treatment with the broad-spectrum antibiotic ceftriaxone and the recovery of the bacterial population six weeks after antibiotic therapy. Moreover, it should provide a better understanding of how the frequency of antibiotic-resistance genes increased in response to antibiotic treatment; that is, whether the resistance genes were transferred horizontally resulting in broader range of drug-resistant bacterial species or whether the increased gene frequency was associated more with a proliferation of already resistant bacteria.

We believe Synthetic has some flexibility in partnering ribaxamase, since it also has two similar drugs, SYN-006 and SYN-007, in preclinical development that may be offered in a three-drug package. SYN-007 is an enzyme akin to ribaxamase that is formulated to protect the gut microbiota from orally available β-lactam antibiotics, while SYN-006 is an enzyme that degrades IV carbapenem antibiotics.

This report discusses two recent presentations at the Digestive Disease Week conference on ribaxamase and it updates our financial model, which reflects the signing of a near-term partnering deal. We also assume ribaxamase and SYN-010, Synthetic's drug for irritable bowel syndrome with constipation, begin to contribute equally to revenue in 2021. Given these assumptions, we are maintaining our BUY recommendation and $3.00 price target.

Figure 1. The Synthetic Biologics R&D Pipeline



DIGESTIVE DISEASE WEEK PRESENTATIONS

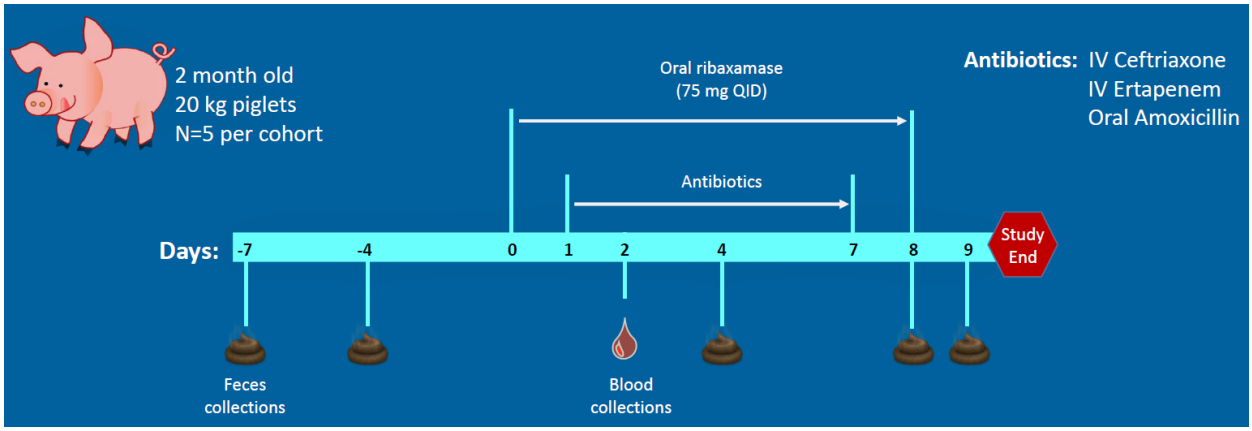
Synthetic Biologics made four presentations at the Digestive Disease Week Conference that was held May 6th – 9th, two oral presentations on ribaxamase and two posters related to SYN-010 and the use of breath tests in identifying patients that may benefit from the therapy. This report discusses the ribaxamase presentations.

RIBAXAMASE PERFORMS SUPERBLY IN A PRECLINICAL MODEL

The Company assessed ribaxamase's ability to protect the microbiome of the porcine gut in much greater detail than prior experiments permitted.[1] This model was selected based upon shared similarities with the human gastrointestinal tract, composition of the microbiome, and its contribution to the developing immune system.

Ribaxamase was prepared for oral delivery in 1 mm enteric-coated pellets designed to release the active enzyme at pH 5.5 or greater and loaded into capsules to contain 75 mg ribaxamase/capsule.[2] Ten two-month old pigs were broken into two groups of five, one that received ceftriaxone (50 mg/kg, IV, once daily for 7 days) with a placebo, and the other that received ceftriaxone plus ribaxamase (75 mg capsule, orally, four times daily). Two other groups of pigs that served as active controls received β-lactam antibiotics, IV ertapenem or oral amoxicillin. (Ribaxamase is not designed to degrade carbapenems, such as ertapenem, nor orally administered antibiotics, including amoxicillin.) Treatment with ribaxamase was started one day before the first antibiotic administration and continued one day beyond the last treatment. As indicated in Figure 2, fecal samples were taken on two days prior to initiation of treatment and on three after initiation.[3] Blood was drawn at three time points on the second day of antibiotic administration.

Figure 2. Preclinical Study Design[3]



The study yielded three important findings:

- **Ribaxamase has no effect on systemic ceftriaxone levels**, as demonstrated in blood samples at 1, 6, and 19 hours after the IV antibiotic was administered. Indeed, no discernable difference was noted in blood levels between animals that received ceftriaxone alone versus ceftriaxone + ribaxamase. The data are consistent with results reported recently in a pharmacokinetic study performed in dogs.[4]

[1] Connelly, S, et al. SYN-004 (ribaxamase), an oral beta-lactamase, mitigates antibiotic-mediated dysbiosis in a porcine gut microbiome model. J Appl Microbiol, epub February 28, 2017.

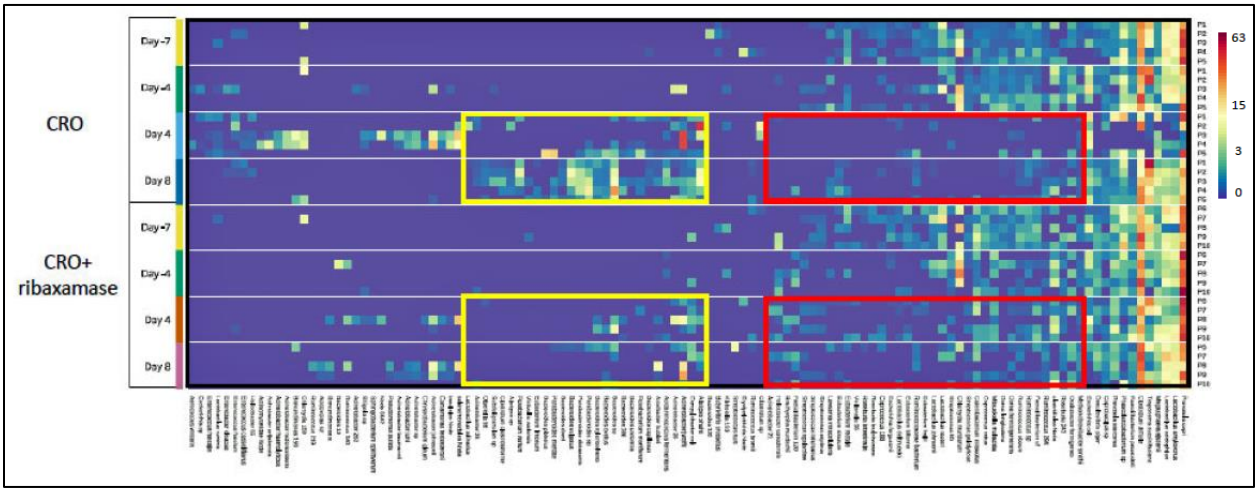
[2] Kaleko, M, et al. Development of SYN-004, an oral beta-lactamase treatment to protect the gut microbiome from antibiotic-mediated damage and prevent *Clostridium difficile* infection. Anaerobe (2016); 41: 58.

[3] Connelly, S. SYN-004 (ribaxamase), An orally-delivered beta-lactamase protects the gut microbiome from antibiotic-mediated damage and mitigates propagation of antibiotic-resistance genes in a porcine dysbiosis model. Presented at Digestive Disease Week Conference, May 7, 2017.

[4] Kokai-Kun, JF, et al. Nonclinical safety assessment of SYN-004: An oral β-lactamase for the protection of the gut microbiome from disruption by biliary-excreted, intravenously administered antibiotics. Int J Toxicol (2016); 35(3): 309.

- **Ribaxamase attenuates ceftriaxone-mediated gut dysbiosis.** Metagenomic DNA analyses were performed on fecal samples collected at pretreatment days -7 and -4 and on post-treatment days 4 and 8. The total number of bacteria in each fecal sample was unchanged at the pre- and post-treatment periods in the two treatment groups. But the compositions of the bacterial populations did change, as shown in Figure 3. (Note that in the figure, CRO refers to ceftriaxone and the legend on the far right provides % relative abundance of bacterial strains.)

Figure 3. Heat Map Comparing Bacterial Species in Pig Microbiome[1]



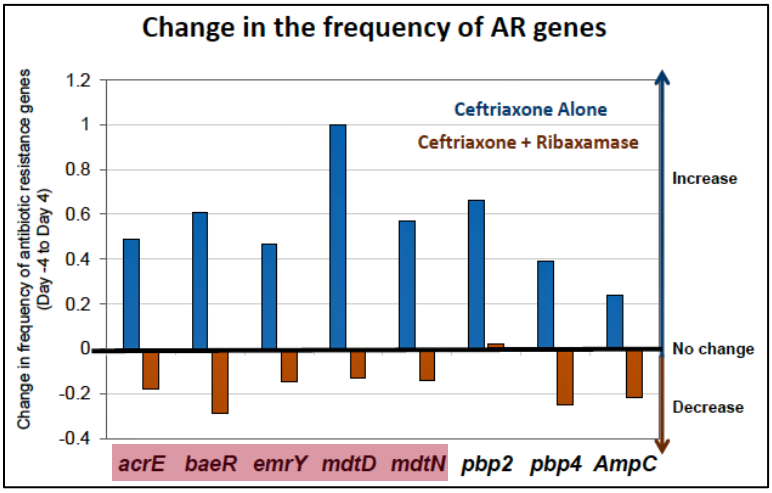
While the species listed below the chart are too small to read, it is clear that the gut microbiome changed considerably between the pre- and post-ceftriaxone treatment. Similar results were obtained with the two active controls (IV ertapenem and oral amoxicillin), thus demonstrating that **each antibiotic causes dysbiosis marked by a loss of some bacterial species and an overgrowth of others.** Indeed, ceftriaxone reduced the similarity between the pre- and post-treatment microbiomes to 36% between days -4 and 4, while the microbiomes of the ribaxamase-treated animals had a similarity index of 80%. Thus, the results demonstrate that **ribaxamase protected the gut microbiota from antibiotic-induced dysbiosis and it enabled a faster recovery by day 8 from the changes that did occur** (data not shown here).

Further analyses identified bacterial species that increased and decreased following ceftriaxone treatment and whether ribaxamase prevented the changes. Decreases were observed in the Ruminococcus, Clostridiales, Dorea and Coprococcus genera, with the species *Faecalibacterium prausnitzii* and *Oxalobaccter formigenes* affected the most (50% decrease between days -4 and 8). The changes in these species, which did not occur in the ribaxamase group, are noteworthy because *F. prausnitzii* produces butyrate, which is important in preventing inflammation of the gastrointestinal tract associated with Crohn's disease, while *O. formigenes* degrades oxalate, which is a compound found in a variety of foods and is an integral component of kidney stones. Increases were found in the Bacteroides, Parabacteroides, and Fusobacterium genera, with *Bacteroides vulgatus, Parabacteroides distasonis,* and *Fusobacterium varium* species rising from undetectable levels prior to ceftriaxone treatment to 1.8% (in 3/5 pigs), 2.5% (in all pigs), and 2.2% (in all pigs), respectively, on day 8. In contrast, these species accounted for 0% (all pigs), 0.06% (1/5 pigs), and 0.04% (1/5 pigs) of the microbes detected in the ribaxamase group's samples on day 8. The increased prevalence of these species is meaningful, since they are associated with colitis in animal models and humans. **The species-specific data indicate that ribaxamase prevented antibiotic-induced changes in the porcine gut microbiota that are associated with human maladies.**

- **Ribaxamase reduces antibiotic resistance gene propagation.** Synthetic Biologics evaluated changes in the frequency of antibiotic resistance genes in the two groups of animals. The results show that exposure to ceftriaxone increased multiple resistance genes that protect the bacteria from β-lactam antibiotics specifically and from antibiotics more generally, while treatment with ribaxamase not only prevented the

increases, but even reduced the presence of some resistance genes in the gut microbiome. Figure 4 illustrates the changes that were identified. (Note that the increased expression of various antibiotic-resistance genes seen in this study is consistent with results reported elsewhere.[5])

Figure 4. Changes in Antibiotic Resistance Genes from Day -4 to Day 4



Some bacteria produce the enzyme β-lactamase as a protection against β-lactam antibiotics, which include cephalosporins, monobactams, penems (i.e., penicillin derivatives), and carbapenems. Several genes that code for these degradative enzymes were present on day 4 in two of the five animals treated with ceftriaxone alone, while *AmpC* was present in nine of the ten animals on day -7. (The presence of antibiotic-resistance genes is a common occurrence on farms in particular and in the environment more generally, due in part to the use of antibiotics as feed additives and their release into the environment via manure, human sewage and open-ocean fish farms, as well as by the spread of drug resistant bacteria through human travels and bird migration.[6,7,8]) The results indicate that by day 4, the pigs treated only with the IV antibiotic had a higher frequency of *AmpC* in the microbiome, while the ribaxamase group showed a decreased frequency. Five genes (i.e., *acrE, baeR, emrY, mdtD,* and *mdtN* – see Figure 4 labels highlighted in red) that confer multidrug resistance through efflux transporter systems were even more elevated than *AmpC.* In contrast, animals that received ceftriaxone and ribaxamase exhibited lower frequencies of all of these multidrug resistance genes. The study reported similar results in the frequency of two other genes, *pbp2* and *pbp4*, that encode for penicillin binding proteins, which are enzymes involved in bacterial cell wall synthesis and are capable of inactivating β-lactam antibiotics. The results show that ribaxamase prevented an increase in the frequency of the *pbp2* gene seen with ceftriaxone alone and lowered the frequency of *pbp4*. **Overall, Synthetic's drug prevented the increased frequency of various antibiotic-resistance genes that occur through horizontal transfer of gene elements between bacterial species and/or the proliferation of antibiotic-resistant microbes during IV antibiotic therapy.**

[5] Raymond, F, et al. The initial state of the human gut microbiome determines its reshaping by antibiotics. ISME J (2016); 10(3): 707.

[6] Hocquet, D, et al. What happens in hospitals does not stay in hospitals: antibiotic-resistant bacteria in hospital wastewater systems. J Hosp Infect (2016); 93(4): 395.

[7] Laxminarayan, R, et al. Antibiotic-resistance – the need for global solutions. Lancet Infect Dis (2013); 13(12): 1057.

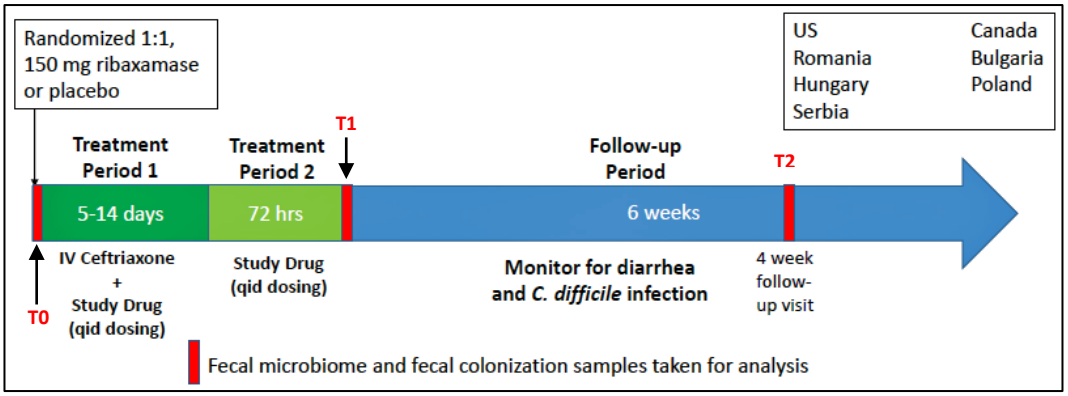
[8] Wang, J, et al. The role of wildlife (wild birds) in the global transmission of antimicrobial resistance genes. Zool Res (2017); 38(2): 55.

RIBAXAMASE IMPRESSES IN THE CLINIC

Synthetic Biologics recently completed a clinical study of ribaxamase and has reported solid results on several levels. The only remaining data still to come from the 412-patient study involves deep-sequencing analyses that are being performed by an outside lab hired by the CDC. The government agency is financing the test because the Company's trial provides the first opportunity to assess the impact of an antibiotic (and ribaxamase) on the microbiota of a well-defined patient population and to evaluate the recovery of the microbiota. (A myriad of relatively small clinical studies have shown different changes and "recoveries" following antibiotic treatment, particularly among the elderly.[9] The data suggests that certain crucial functions of the microbiota are replaced, but not by the original bacterial species.)

The ribaxamase study, which was designed as a potentially pivotal Phase 2b trial, enrolled 412 patients in 84 medical centers in the North America and Europe. The patients were more than 50 years old (average age ~70) and were treated for at least 5 days with ceftriaxone as shown in Figure 5. Ribaxamase treatment continued for three days after the ceftriaxone therapy ended to ensure the gut was protected during antibiotic's wash-out period. Fecal samples were collected at three times, upon enrollment in the study, after conclusion of the ribaxamase treatment, and four weeks later (i.e., approximately six weeks since enrollment). During the follow-up period, a record of diarrhea was kept and patients were monitored/treated for possible *C. difficile* infection as necessary.

Figure 5. The Phase 2b Trial Design



The Phase 2b study underpinned the clinical benefit of ribaxamase:

- **Ribaxamase protected the gut microbiota and expedited its recovery:** As shown in Figure 6 on the next page, ribaxamase treatment prevented the dysbiosis caused by ceftriaxone and it facilitated a recovery of the microbiota four weeks later. An alternative assessment of the data revealed that the antibiotic significantly reduced the diversity of the microbiota and that even after four weeks (T2 in Figure 5) the patients' GI tracts remained impaired. In contrast, ribaxamase treatment prevented a significant loss of diversity and as a result, this set the stage for a significant recovery in microbial diversity seen at T2.

  This finding is important because microbial diversity is important for the microbiota to function optimally for our own health (e.g., food digestion) and to defend against pathological microbes that may enter the GI tract with our food or drink.

[9] Biagi, E, et al. Ageing of the human metaorganism: the microbial counterpart. Age (2012); 34(1): 247.

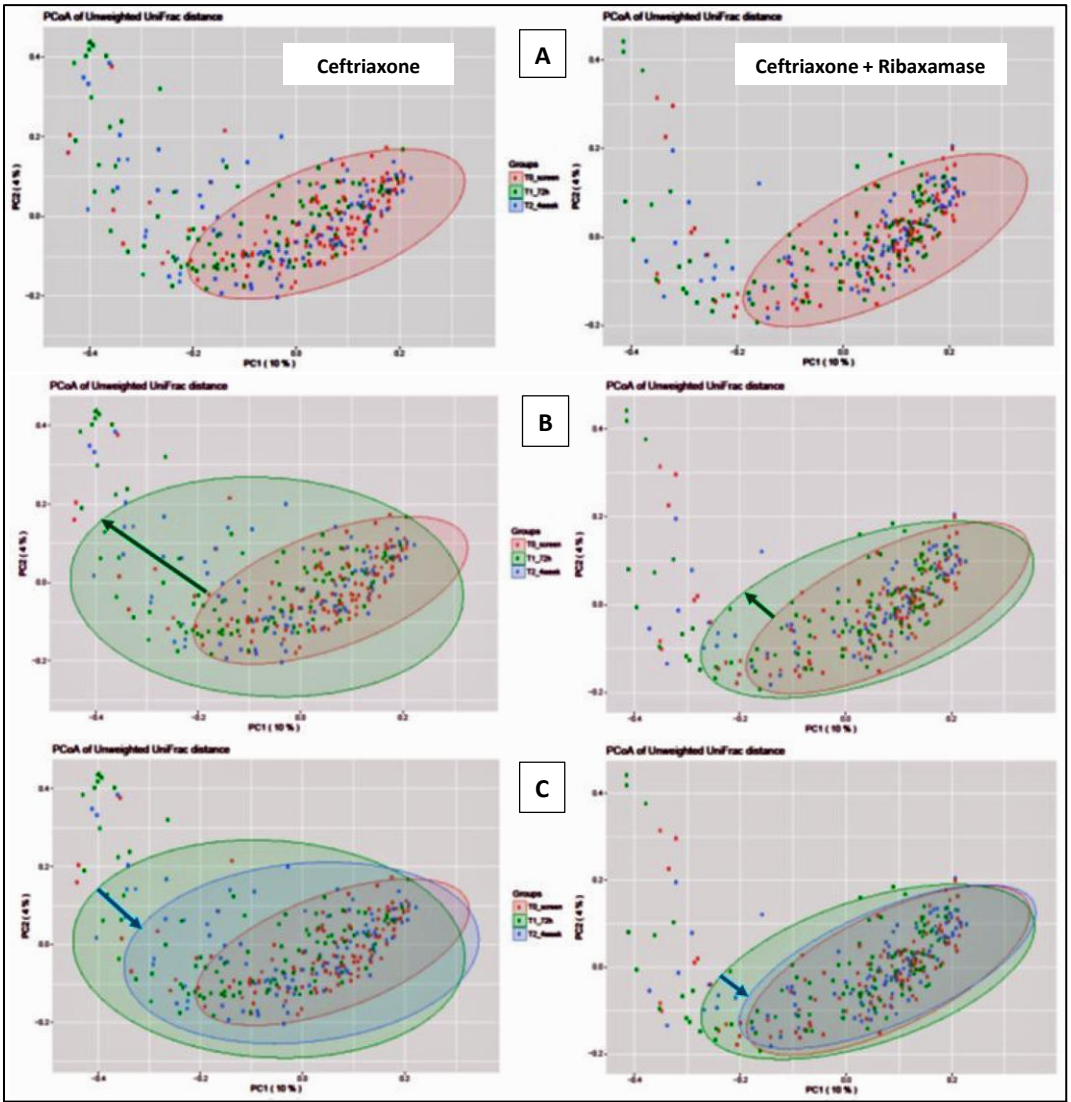
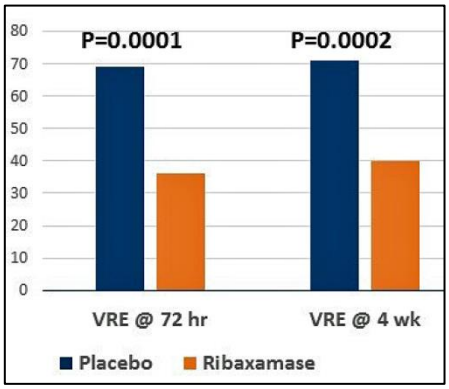


Figure 6. Changes in the Microbiota with Ceftriaxone ± Ribaxamase. This figure consists of three plots of each patient's microbiota (β diversity, species level) at three times, (A) T0, (B) T1, and (C) T2, depicted in Figure 5. The left column is the control group (i.e., ceftriaxone + placebo) and the right column is the ceftriaxone + ribaxamase group. The PCoA plots are based on a data transformation that reduces the information and plots it based upon two components. At T0, the vast majority of the samples fall within the orange elipses. At T1, which is 72 hours after the last antibiotic administration, the plot for the ceftriaxone group has expanded considerably more to the left and upward than the plot for the ribaxamase-treated patients, indicating that there was a loss of primary components (x-axis) and an overgrowth of others (y-axis). And at T2, which is four weeks later, the ribaxamase microbiota has nearly returned to its original state, while the microbiota of the control group remains distorted by the ceftriaxone therapy. Hence, ribaxamase protected the commensal bacteria from the broad-spectrum antibiotic.

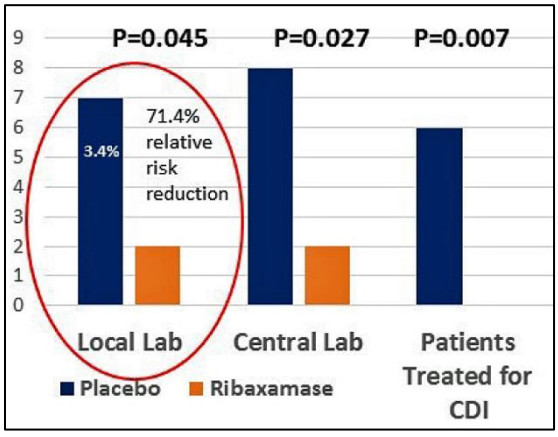
- **Ribaxamase protected against opportunistic pathogens.** Synthetic Biologics conducted an assessment its drug's protective capacity by testing for patients newly colonized by vancomycin-resistant enterococci. The results show markedly fewer patients in the ribaxamase group developed this infection than the control group did (see Figure 7) when evaluated shortly after ceftriaxone treatment and four weeks later. This is consistent with ribaxamase's ability to protect the microbiota since VRE is an opportunistic pathogen.

Figure 7. Ribaxamase Prevents New VRE Colonization



The primary endpoint of the Phase 2b study was a statistically significant reduction in new onset of *C. difficile* infections. This is an important element within the CDC's goal of preventing the spread of drug-resistant bacteria because *C. difficile* is often drug-resistant and it can be spread readily through human waste. **Figure 8 shows that the Phase 2b trial met its primary endpoint, reducing the relative risk of infection by 71.4%.** The number of patients in the control group (i.e., ceftriaxone + placebo) with a *C. difficile* infection was small, but the proportion that did so (3.4% of the total in that cohort) was within the expected range, indicating the Company conducted the trial in hospitals that were representative of the average U.S. medical center. In addition, it should be noted that a central lab used to confirm the results found one *C. difficile* infection missed by the local lab. The two patients in the ribaxamase cohort that tested positive for *C. difficile* received ribaxamase at least an hour after the first IV ceftriaxone dose was administered, which was within protocol of the study.

Figure 8. Ribaxamase Significantly Reduced *C. difficile* Infections



The market for ribaxamase might be as large as all patients receiving an IV β-lactam antibiotic or limited, for example, to the elderly who are at greatest risk for a *C. difficile* infection or pediatric patients who may suffer long-term effects from dysbiosis including overweight and juvenile idiopathic arthritis.[10,11] Consistent with use by the

[10] Poulsen, MN, et al. Associations of prenatal and childhood antibiotic use with child body mass index at age 3 years. Obesity (2017); 25(2): 438.

elderly, Synthetic's Phase 2b trial enrolled older individuals (average age: ~70 years old), but it seems likely that the drug's label would not be age-limited. This would open another strategy for the use of ribaxamase – given its protective effects, ribaxamase use should enable doctors greater flexibility in selecting the best antibiotic therapy for each patient. Presently, hospitals worldwide are implementing antibiotic stewardship programs with the intent to reduce unnecessary use of antibiotics and limit the number of doses administered, particularly of broad-spectrum antibiotics, such as β-lactams.[12,13,14] Reports on stewardship programs have demonstrated their success in reducing antibiotic-resistant bacteria without affecting mortality rates. However, there can still be a cost associated with these programs. For instance, one study that reported a 27% reduction in antibiotic use had a 26% increase in the use of ventilator support.[14] The market for ribaxamase and antibiotics in general is likely to change as more diagnostic tests become commercially available that are able to rapidly identify the infectious agent and drug resistance. We believe β-lactams, which have been among the most widely used antibiotics, will retain an important place in the fight against bacterial infections and thereby secure a place for ribaxamase.

[11] Arvonen, M, et al. Repeated exposure to antibiotics in infancy: A predisposing factor for juvenile idiopathic arthritis or a sign of this group's greater susceptibility to infections? J Rheumatol (2015); 42(3): 521.

[12] Barlam, TF, et al. Implementing an antibiotic stewardship program: Guidelines by the Infectious Disease Society of America and the Society for Healthcare Epidemiology of America. Clin Infect Dis (2016); 62(10): e51.

[13] deWith, K, et al. Strategies to enhance rational use of antibiotics in hospital: a guideline by the German Society for Infectious Diseases. Infection (2016); 44(3): 395.

[14] Hou, D, et al. Evaluation of the short-term effects of antimicrobial stewardship in the intensive care unit at a tertiary hospital in China. PLoS ONE (2014); 9(7): e101447.

FINANCIAL REVIEW & VALUATION ANALYSIS

We updated our financial model for the first-quarter results and have made only small modifications to the near-term estimates. Our long-range projections remain based on an assumption that ribaxamase and SYN-010 are launched in 2021 and contribute equally to revenues at that time.

QUARTERLY INCOME STATEMENTS⸸ (FISCAL YEARS END DECEMBER 31ST)

⸸ Data are in thousands. Estimates are in italics.

	2015				2016				2017			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Total Revenues	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Operating expenses												
G&A expense	$ 1,713	$ 2,222	$ 1,604	$ 2,535	$ 2,426	$ 2,147	$ 2,095	$ 3,475	$ 2,090	*$ 2,100*	*$ 2,110*	*$ 2,200*
R&D expense	6,494	7,508	10,046	8,858	8,155	7,164	7,061	6,729	6,059	*6,100*	*7,500*	*8,341*
Operating profit/(loss)	$ (8,207)	$ (9,730)	$ (11,650)	$ (11,393)	$ (10,581)	$ (9,311)	$ (9,156)	$ (10,204)	$ (8,149)	*$ (8,200)*	*$ (9,610)*	*$ (10,541)*
Warrant-related (inc)/(exp)	(4,152)	(3,895)	4,141	95	(498)	3,513	666	7,731	5,090	-	-	-
Other Income/expense (net)	1	2	2	1	1	34	1	1	1	*1*	*4*	*3*
Pretax profit/(loss)	$ (12,358)	$ (13,623)	$ (7,507)	$ (11,297)	$ (11,078)	$ (5,764)	$ (8,489)	$ (2,472)	$ (3,058)	*$ (8,199)*	*$ (9,606)*	*$ (10,538)*
Income taxes	-	-	-	-	-	-	-	-	-	-	-	-
Net profit/(loss)	$ (12,358)	$ (13,623)	$ (7,507)	$ (11,297)	$ (11,078)	$ (5,764)	$ (8,489)	$ (2,472)	$ (3,058)	*$ (8,199)*	*$ (9,606)*	*$ (10,538)*
Loss attributable to non-controlling interest	$ -	$ -	$ 733	$ 315	$ 233	$ 82	$ 136	$ 97	$ 212	$ -	$ -	$ -
Net profit/(loss)	$ (12,358)	$ (13,623)	$ (6,774)	$ (10,982)	$ (10,845)	$ (5,682)	$ (8,353)	$ (2,375)	$ (2,846)	*$ (8,199)*	*$ (9,606)*	*$ (10,538)*
Earnings/(loss) per share	$ (0.17)	$ (0.19)	$ (0.08)	$ (0.12)	$ (0.12)	$ (0.06)	$ (0.09)	$ (0.02)	$ (0.03)	*$ (0.07)*	*$ (0.08)*	*$ (0.09)*
Basic shares outstanding	72,673	72,737	85,975	91,439	90,827	91,015	91,442	106,172	117,447	*122,250*	*122,500*	*123,000*

Operating expenses declined in the March quarter, because of a decline in costs related to the ribaxamase study and preclinical research activities, as well as lower employee salary expenses. Our estimates for the remainder of this year reflect the Company's efforts to hold the cash utilization rate steady in the near term and efforts to advance the development of its two lead drugs later this year with partners.

ANNUAL INCOME STATEMENTS⸸ (FISCAL YEARS END DECEMBER 31ST)

⸸ Data are in thousands. Estimates are in italics.

	2015	2016	2017	2018	2019	2020	2021
Total Revenues	$ -	$ -	*$ -*	*$ -*	*$ -*	*$ -*	*$ 147,075*
Cost of products sold			*-*	*-*	*-*	*-*	*9,637*
Gross Profit	$ -	$ -	*$ -*	*$ -*	*$ -*	*$ -*	*$ 137,437*
Operating expenses							
SG&A expense	8,074	10,143	*8,500*	*8,900*	*9,500*	*14,000*	*28,000*
R&D expense	32,906	29,109	*27,500*	*40,000*	*35,000*	*35,000*	*45,000*
Total operating costs	40,980	39,252	*36,000*	*48,900*	*44,500*	*49,000*	*73,000*
Operating profit/(loss)	$ (40,980)	$ (39,252)	*$ (36,000)*	*$ (48,900)*	*$ (44,500)*	*$ (49,000)*	*$ 64,437*
Warrant-related (inc)/(exp)	(3,811)	11,412	*5,090*	*-*	*-*	*-*	*-*
Other Income/expense (net)	6	37	*9*	*4*	*4*	*5*	*8*
Pretax profit/(loss)	$ (44,785)	$ (27,803)	$ (30,901)	$ (48,896)	$ (44,496)	$ (48,995)	$ 64,445
Income taxes	-	-	-	-	-	*(18,618)*	*24,489*
Net profit/(loss)	$ (44,785)	$ (27,803)	*$ (30,901)*	*$ (48,896)*	*$ (44,496)*	*$ (30,377)*	*$ 39,956*
Non-controlling interst	1,048	548	*212*	*-*	*-*	*-*	*-*
Net profit/(loss) SYN & subs.	$ (43,737)	$ (27,255)	$ (30,689)	$ (48,896)	$ (44,496)	$ (30,377)	$ 39,956
Earnings/(loss) per share	$ (0.55)	$ (0.29)	*$ (0.25)*	*$ (0.33)*	*$ (0.30)*	*$ (0.19)*	*$ 0.24*
Shares outstanding	80,706	94,290	*121,299*	*146,000*	*150,000*	*160,000*	*165,000*

VALUATION ANALYSIS

Our price target was calculated using a discounted future valuation model. We applied a price-earnings multiple of 30 to the projected share net of $0.24 in 2021, which yielded a future price of $7.20. We discounted that value back three years at an annual rate of 34%, yielding a price of $2.99, which we rounded to $3.00 for our price target.

BALANCE SHEET[⨯] (FISCAL YEARS END DECEMBER 31ST)

⨯ Data are in thousands.

ASSETS	3/31/2017	12/31/2016
Current Assets		
Cash & equivalents	$ 13,471	$ 19,055
Prepaid expenses & other	3,366	2,515
Total Current Assets	$ 16,837	$ 21,570
Long-Term Assets		
Property & equipment	859	905
Other	23	23
Total Assets	$ 17,719	$ 22,498
LIABILITIES		
Current Liabilities		
Accounts payable	$ 3,796	$ 1,993
Debt due	-	-
Accrued expenses	2,921	2,627
Warrant liabilities	9,731	14,821
Other	40	316
Total Current Liabilities	$ 16,488	$ 19,757
Long-term deferred rent	470	492
Shareholders Equity		
Common Stock, par value	$ 118	$ 117
Additional Paid-In Capital	177,331	175,762
Accumulated Deficit	(174,880)	(172,034)
Non-controlling interest	(1,808)	(1,596)
Total Shareholders Equity	$ 761	$ 2,249
Total liabilities & equity	$ 17,719	$ 22,498

INVESTOR CONCERNS & RISKS

For a complete description of risks and uncertainties related to Synthetic Biologics business, see the "Risk Factors" section in Synthetic's SEC filings, which can be accessed directly from the SEC Edgar filings at www.sec.gov. Potential risks include:

- **Stock risk and market risk:** Trading of the Company's common stock varies widely on a daily basis. There can be no assurance that an active trading market will be sustained, which could limit one's ability to buy or sell the Company's common stock at a desired price. Investors should also consider technical risks common to many small-cap or micro-cap stock investments, such as float, risk of dilution, dependence upon key personnel, and the strength of competitors that may be larger and better capitalized.
- **Competitive risk:** The markets for anti-infective agents are highly competitive, based on individual product characteristics, pricing, and marketing support. Other companies are actively engaged in the development/commercialization of products to directly or indirectly address the uses being pursued by Synthetic Biologics. These companies may have substantially greater research and development capabilities, as well as significantly greater marketing, financial, and human resources than Synthetic.
- **Products still in development phases:** The Company's drugs may appear to be promising, but may not reach commercialization for various reasons, including a lack of efficacy in advanced clinical trials, failure to achieve regulatory approvals, safety concerns, and/or the inability to be manufactured at a reasonable cost. And even if the products are commercialized, there can be no assurance that they will be accepted, which may prevent the Company from becoming profitable.
- **Funding requirements:** It is difficult to predict Synthetic's future capital requirements. The Company may need additional financing to continue to fund operations and expand its business. There is no guarantee that it can secure the desired future capital or, if sufficient capital is secured, that current shareholders will not suffer significant dilution.
- **Regulatory risk:** There is no guarantee that the Company's products under development will be approved by the Food and Drug Administration (FDA) or international regulatory bodies for marketing in the U.S. or abroad. In addition, regulations pertaining to drug development may undergo further changes, which may affect the Company's ability to gain regulatory approvals and/or labeling that supports its marketing strategies.
- **Reimbursement risk:** Healthcare reimbursement decisions have undergone significant changes and may continue to do so. There is no guarantee that the Company's drugs will receive adequate insurance coverage for them to be commercially viable.
- **Patent risk:** The field of pharmaceutical and biotechnology drugs is very competitive, and although Synthetic Biologics has licensed and/or filed for numerous patents to secure its right to commercialize its technology, these patents may not protect the Company's rights adequately in the marketplace.

Disclosures

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MEANINGS OF RATINGS: Our rating system is based upon 12 to 36 month price targets. **BUY** describes stocks that we expect to appreciate by more than 20%. **HOLD/NEUTRAL** describes stocks that we expect to change plus or minus 20%. **SELL** describes stocks that we expect to decline by more than 20%. **SC** describes stocks that Griffin Securities has **Suspended Coverage** of this Company and price target, if any, for this stock, because it does not currently have a sufficient basis for determining a rating or target and/or Griffin Securities is redirecting its research resources. The previous investment rating and price target, if any, are no longer in effect for this stock and should not be relied upon. **NR** describes stocks that are **Not Rated**, indicating that Griffin Securities does not cover or rate this Company.

DISTRIBUTION OF RATINGS/IB SERVICES:

			IB Serv./Past 12 Mos.	
Rating	**Count**	**Percent**	**Count**	**Percent**
BUY [BUY]	29	80.56	2	6.90
HOLD [HOLD]	7	19.44	0	0
SELL [SELL]	0	0.00	0	0

COMPANIES MENTIONED:

Ticker	Company Name	Rating
SYN	Synthetic Biologics Inc.	Buy

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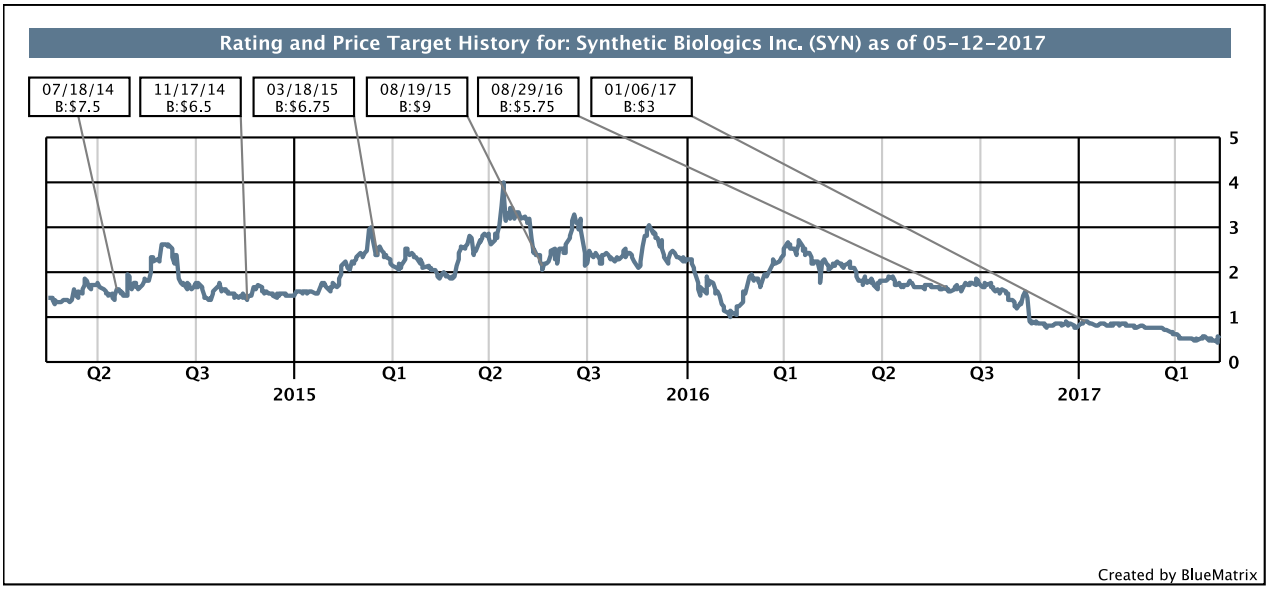

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