August 8, 2019

Synthetic Biologics Reports Second Quarter 2019 Operational Highlights and Financial Results

-- Announced Clinical Trial Agreement with Washington University School of Medicine to Conduct a Phase 1b/2a Clinical Trial of SYN-004 (ribaxamase) in Allogeneic Hematopoietic Cell Transplant Recipients --

-- Conference Call Today, August 8, 2019, at 4:30 p.m. (ET) --

ROCKVILLE, Md., Aug. 8, 2019 /PRNewswire/ --Synthetic Biologics, Inc. (NYSE American: SYN), a late-stage clinical company developing therapeutics that preserve the microbiome to protect and restore the health of patients, today provided an operational update and reported financial results for the three months ended June 30, 2019. The Company also announced today a clinical trial agreement with Washington University School of Medicine in St. Louis ("Washington University") to conduct a Phase 1b/2a clinical trial of SYN-004 (ribaxamase), with enrollment expected to begin in the first quarter of 2020.

"Our clinical trial collaboration with Washington University is an important step in our pursuit of a more cost-effective development strategy for SYN-004 targeting a more specialized patient population," stated Steven A. Shallcross, Chief Executive and Financial Officer. "SYN-004's unique mechanism of action designed to degrade intravenous (IV) beta-lactam antibiotics and prevent dysbiosis of the gut microbiome has the potential to significantly improve outcomes for patients who undergo allogeneic hematopoietic cell transplantation (HCT), an area of significant unmet medical need."

"Prompt initiation of broad-spectrum IV beta-lactam antibiotics at onset of fever after conditioning chemotherapy for allogenic HCT is a life-saving intervention. However, this causes significant disruption of the microbiome, which places these patients at very high risk for infection due to some of our greatest antibiotic resistant threats, such as *Clostridioides difficile*, vancomycin-resistant *Enterococci* (VRE), and multidrug-resistant Gram-negative bacteria. We are seeking to determine if coadministration of SYN-004 while the patient is receiving IV beta-lactam antibiotics will preserve the microbiome and thus mitigate the risk from these threats," said Dr. Erik R. Dubberke Professor of Medicine and Clinical Director, Transplant Infectious Diseases at Washington University. "There are data to suggest preservation of the microbiome in allogeneic HCT recipients results in improved immune function after HCT as well. This would further enhance these patients' outcomes and quality of life."

Mr. Shallcross continued, "During the second quarter, we remained focused on executing our strategy to advance our portfolio of gastrointestinal (GI) and microbiome-focused clinical programs. We held a highly informative pre-IND meeting with the U.S. Food and Drug Administration (FDA) for our SYN-020 intestinal alkaline phosphatase (IAP) program and clarified the parameters for IND-enabling toxicology studies. These activities are ongoing and will support our anticipated Investigational New Drug (IND) application which we intend to file promptly during the first

quarter of 2020." Mr. Shallcross concluded, "Interest from prospective patients in our investigator-sponsored Phase 2b clinical trial of SYN-010 in breath-methane positive irritable bowel syndrome with constipation (IBS-C) patients remains strong. However, after consulting with the investigators at Cedars-Sinai Medical Center, the study sponsor, enrollment has been extended to accommodate higher than anticipated screen-fail rates. This is, in part, due to errant laxative use during the screening period that adversely impacts baseline measurements of IBS-C symptoms and breath-methane levels. Rigorous screening and reliable baseline parameters are critical to all IBS-C clinical trials in order to ensure the possibility of generating a meaningful data set of the highest quality. At this time, we are discussing with Cedars-Sinai the opportunity for a data read out in the first half of 2020, extending our previous guidance from the fourth quarter of 2019. We look forward to sharing important updates and progress for this and all our GI and microbiome-focused clinical programs."

Clinical Development and Operational Update

- Entered into a Clinical Trial Agreement with Washington University School of Medicine in St. Louis to conduct a Phase 1b/2a clinical trial of SYN-004 (ribaxamase)
    - Under the terms of this agreement, Synthetic Biologics will serve as the sponsor of the study and supply SYN-004 (ribaxamase) and Dr. Dubberke will serve as the principal investigator along with his Washington University colleague Dr. Mark A. Schroeder, Associate Professor of Medicine, Division of Oncology, Bone Marrow Transplantation and Leukemia,
    - Enrollment is expected to begin during the first quarter of 2020, contingent upon review by the FDA and approval of the clinical study protocol by Washington University's Institutional Review Board (IRB),
    - The proposed study is a Phase 1b/2a single-center, randomized, double-blinded, placebo-controlled clinical trial designed to evaluate the safety, tolerability and pharmacokinetics of oral SYN-004 (ribaxamase) in up to 36 adult allogeneic HCT recipients,
    - Study participants will be enrolled into three sequential cohorts that will be administered a different study-assigned IV beta-lactam antibiotic. Eight participants in each cohort will receive SYN-004 (ribaxamase) and four will receive placebo,
    - Safety and pharmacokinetic data for each cohort will be reviewed by an independent Data and Safety Monitoring Committee, which will make a recommendation on whether to proceed to the next IV beta-lactam antibiotic,
    - The proposed study will also evaluate potential protective effects of SYN-004 (ribaxamase) on the gut microbiome as well as generate preliminary information on potential therapeutic benefits and patient outcomes of SYN-004 (ribaxamase) in allogeneic HCT recipients;
- Enrollment is ongoing in the Phase 2b investigator-sponsored clinical study of SYN-010, for the treatment of IBS-C
    - The Phase 2b clinical study is being conducted by the Medically Associated Science and Technology (MAST) Program at Cedars-Sinai Medical Center and is a 12-week, placebo-controlled, double-blind, randomized clinical trial evaluating two dose strengths of oral SYN-010 (21 mg and 42 mg) in approximately 150 patients diagnosed with IBS-C,
    - The primary objective for the study will be to determine the efficacy of SYN-010, measured as an improvement from baseline in the weekly average number of complete spontaneous bowel movements (CSBMs) during the 12-week treatment period for SYN-010 21 mg and 42 mg daily doses relative to placebo,
    - Secondary efficacy endpoints for both dose strengths of SYN-010 will measure changes from baseline in abdominal pain, bloating, stool frequency as well as the use of rescue medication relative to placebo,
    - A data readout is anticipated in 1H 2020,
    - Cedars-Sinai Medical Center and Synthetic Biologics are co-funding the study. The patent rights covering the use of SYN-010 are owned by Cedars-Sinai Medical Center and are exclusively licensed by Cedars-Sinai Medical Center to Synthetic Biologics;
- Evaluated potential clinical development strategies to advance SYN-020 (intestinal alkaline phosphatase) to and through clinical trials targeting areas of significant unmet medical need, including enterocolitis associated with radiation therapy for cancer
    - Held Pre-IND meeting with FDA and clarified the requirements for IND-enabling toxicology studies
    - Exploratory study found SYN-020 enhanced 5-FU tumor treatment in a mouse ectopic colon cancer tumor model. A confirmatory study is ongoing with larger cohort sizes and additional mechanistic endpoints which, if repeated, may allow for further broadening of the clinical development strategy for this program,
    - Anticipate filing a US IND application in Q1 2020;
- Continued to exercise prudent cash management and financial stewardship
    - Further reduced cash burn, extending projected cash runway to fund operations through at least the end of Q3 2020;

Quarter Ended June 30, 2019 Financial Results

General and administrative expenses decreased by 27% to $1.0 million for the three months ended June 30, 2019, from $1.4 million for the three months ended June 30, 2018. This decrease is primarily due to decreased stock-based compensation expense related to forfeitures and decreased options grants, along with the reduction of investor relations and consulting costs. The charge related to stock-based compensation expense was $59,000 for the three months ended June 30, 2019, compared to $264,000 the three months ended June 30, 2018.

Research and development expenses decreased by 27% to $2.6 million for the three months ended June 30, 2019, from $3.6 million for the three months ended June 30, 2018. This decrease is primarily the result of lower SYN-004 (ribaxamase) indirect program costs for the three months ended June 30, 2019, including salary and related expense reductions resulting from the 2018 restructuring and the fact that no clinical trial activity for SYN-004 (ribaxamase) was ongoing during the quarter, offset by an increase in manufacturing costs for SYN-020. The research and development costs incurred during the quarter were primarily related to the investigator-sponsored Phase 2b clinical study of SYN-010, a potential Phase 1b/2a clinical trial of SYN-004 (ribaxamase) in allogeneic HCT recipients, and the continued development of SYN-020. Research and development expenses also include a charge relating to stock-based compensation expense of $31,000 for the three months ended June 30, 2019, compared to $293,000 for the three months ended June 30, 2018.

Other income was $80,000 for the three months ended June 30, 2019, compared to other income of $789,000 for the three months ended June 30, 2018. Other income for the three months ended June 30, 2019 is primarily comprised of interest income while the three months ended June 30, 2018 is comprised of non-cash income of $783,000 from the change in fair value of warrants. The decrease in the fair value of the warrants was due to the decrease in our stock price.

Cash and cash equivalents as of June 30, 2019 was $21.7 million, a decrease of $7.2 million from December 31, 2018.

Conference Call

Synthetic Biologics will hold a conference call today, Thursday, August 8, 2019, at 4:30 p.m. (ET). The dial-in information for the call is as follows, U.S. toll free: +1 888-347-5280 or International: +1 412-902-4280. Participants are asked to dial in 15 minutes before the start of the call to register. The call will also be webcast over the Internet at https://www.webcaster4.com/Webcast/Page/1096/31274. An archive of the call will be available for replay at the same URL, https://www.webcaster4.com/Webcast/Page/1096/31274, for 90 days after the call.

About Synthetic Biologics, Inc.

Synthetic Biologics, Inc. (NYSE American: SYN) is a clinical-stage company developing therapeutics that preserve the microbiome to protect and restore the health of patients. The Company's lead candidates are: (1) SYN-004 (ribaxamase) which is designed to degrade certain commonly used intravenous (IV) beta-lactam antibiotics within the gastrointestinal (GI) tract to prevent microbiome damage, *C. difficile* infection (CDI), overgrowth of pathogenic organisms, the emergence of antimicrobial resistance (AMR) and acute graft-versus-host-disease (aGVHD) in allogeneic hematopoietic cell transplant (HCT) recipients, and (2) SYN-010, which is intended to reduce the impact of methane-producing organisms in the gut microbiome to treat an underlying cause of irritable bowel syndrome with constipation (IBS-C). The Company is also advancing SYN-020, an early-stage oral formulation of the enzyme intestinal alkaline phosphatase (IAP) to treat both local GI and systemic diseases. For more information, please visit Synthetic Biologics' website at www.syntheticbiologics.com.

This release contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. In some cases forward-looking statements can be identified by terminology such as "may," "should," "potential," "continue," "expects," "anticipates," "intends," "plans," "believes," "estimates," and similar expressions, and includes statements that SYN-004's unique mechanism of action designed to degrade IV beta-lactam antibiotics and prevent dysbiosis of the gut microbiome has the potential to significantly improve outcomes for patients who undergo allogeneic hematopoietic cell transplantation (HCT); data to suggest preservation of the microbiome in allogeneic HCT recipients results in improved immune function after HCT as well and this further enhancing these patients' outcomes and quality of life; an IND for SYN-020 will be filed during the first quarter of 2020; enrollment for the Phase 1b/2a clinical trial of SYN-004 is expected to begin during the first quarter of 2020, contingent upon approval of the clinical study protocol by the Washington University School of Medicine's Institutional Review Board (IRB) and the FDA; a data readout for the Phase 2b investigator-sponsored clinical study of SYN-010 for the treatment of IBS-C is anticipated in 1H 2020; *and extending Synthetic Biologics' projected cash runway through at least the end of Q3 2020. These forward-looking statements are based on management's expectations and assumptions as of the date of this press release and are subject to a number of risks and uncertainties, many of*

which are difficult to predict that could cause actual results to differ materially from current expectations and assumptions from those set forth or implied by any forward-looking statements. Important factors that could cause actual results to differ materially from current expectations include, among others, the ability of Synthetic Biologics' product candidates to demonstrate safety and effectiveness, as well as results that are consistent with prior results, Synthetic Biologics' clinical trials continuing enrollment as expected, a failure to receive the necessary regulatory approvals for commercialization of Synthetic Biologics' therapeutics, including approval of proposed trial designs, a failure of Synthetic Biologics' clinical trials, and those conducted by investigators, for SYN-004, SYN-010 and SYN-020 to be commenced or completed on time or to achieve desired results and benefits, a failure to file INDs when anticipated, a failure of Synthetic Biologics' clinical trials to continue enrollment as expected or receive anticipated funding, a failure of Synthetic Biologics to successfully develop, market or sell its products, Synthetic Biologics' inability to maintain its material licensing agreements, or a failure by Synthetic Biologics or its strategic partners to successfully commercialize products, Synthetic Biologics' ability to achieve acceptance of its product candidates in the marketplace and the successful development, marketing or sale of Synthetic Biologics' products by competitors that render Synthetic Biologics' products obsolete or non-competitive, Synthetic Biologics' ability to continue to comply with the continued listing requirements of the NYSE American, the continued maintenance and growth of Synthetic Biologics' patent estate, Synthetic Biologics becoming and remaining profitable, Synthetic Biologics' ability to obtain or maintain the capital or grants necessary to fund its research and development activities, a loss of any of Synthetic Biologics' key scientists or management personnel and other factors described in Synthetic Biologics' Form 10-K and 10-K/A for the year ended December 31, 2018 and its other filings with the SEC, including subsequent periodic reports on Forms 10-Q and 8-K. The information in this release is provided only as of the date of this release, and Synthetic Biologics undertakes no obligation to update any forward-looking statements contained in this release on account of new information, future events, or otherwise, except as required by law.

- Financial Tables Follow -

Synthetic Biologics, Inc. and Subsidiaries
(in thousands, except share and per share amounts)

Consolidated Balance Sheets

	June 30, 2019	December 31, 2018
Assets		
Cash and cash equivalents	$ 21,712	$ 28,918
Prepaid expenses and other current assets	1,298	593
Property and equipment, net	485	607
Right of use asset	481	-
Deposits and other assets	23	23
Total Assets	$ 23,999	$ 30,141
Liabilities and Stockholder's Equity		
Total liabilities	$ 4,412	$ 3,686
Series A Convertible Preferred Stock	12,419	12,296
Total stockholder's equity	7,168	14,159
Total Liabilities and Stockholders' Equity	$ 23,999	$ 30,141

Condensed Consolidated Statements of Operations	**For the three months ended June 30**	
	2019	**2018**
Operating Costs and Expenses		
General and administrative	$ 1,044	$ 1,431
Research and development	2,594	3,572
Total Operating Costs and Expenses	3,638	5,003
Loss from Operations	(3,638)	(5,003)
Other Income		
Change in fair value of warrant liability	-	783
Interest income	80	6
Total Other Income	80	789
Net Loss	(3,558)	(4,214)
Net Loss Attributable to Non-controlling Interest	(27)	(17)
Net Loss Attributable to Synthetic Biologics, Inc. and Subsidiaries	$ (3,531)	$ (4,197)
Series A Preferred Stock Dividends	(61)	(61)
Series B Preferred Stock Dividends	(117)	-

Net Loss Attributable to Common Stockholders	(3,709)	(4,258)
Net Loss Per Share - Basic and Dilutive	$ (0.23)	$ (1.16)
Weighted average number of common shares outstanding - Basic and Dilutive	16,465,314	3,683,383

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