

SHIONOGI Invests in Vast Therapeutics for Future In-license of Nitric Oxide Inhaled Antimicrobial Drug Candidate

OSAKA, Japan, December 6, 2018 - Shionogi & Co., Ltd. (Head Office: Osaka, Japan; President and CEO: Isao Teshirogi, Ph.D.; hereafter "Shionogi") announced today that Shionogi and Vast Therapeutics Inc. (Head Office: NC; President and CEO: Neal Hunter; hereafter "Vast") entered into an agreement that Shionogi invests in Vast for future in-license of nitric oxide inhaled antimicrobial drug candidates.

Vast focuses on research and development of inhaled antimicrobial drug which enables spontaneous and controlled nitric oxide (NO) release. Currently, its lead compound, BIOC51, is being investigated in non-clinical studies. BIOC51 has eradicated, in vitro, more than 100 types of bacteria, including many antibiotic-resistant strains. Furthermore, BIOC51 has been designated as a Qualified Infectious Disease Product (QIDP)* by the U.S. Food & Drug Administration. The QIDP designation was granted for “treatment of chronic pulmonary infectious due to *Pseudomonas aeruginosa* in patients with cystic fibrosis”.

*QIDP: QIDP designation is given to antibacterial and antifungal drug products that treat serious or life-threatening infections. QIDP status provides priority review and a five-year extension of market exclusivity in the United States.

Under the terms of the agreement, Shionogi becomes a shareholder of Vast and has preferential negotiating rights for future in-license of BIOC51 and subsequent compounds. The companies plan to complete a collaboration agreement in the coming months as well as license discussions in 2019. Dr. Takeshi Shiota, Senior Vice President, Pharmaceutical Research Division, said “We’ve had a keen interest in nitric oxide technology for some time. In Vast we have found a technology, intellectual property portfolio, and management team that could help us change the anti-infective market.”

Shionogi's research and development targets infectious disease as one of its priority areas, and Shionogi have positioned “protecting people from the threat of infectious diseases” as one of its social mission targets. Through this cooperation, Shionogi strives constantly to bring forth innovative drugs for the treatment of infectious diseases in order to protect the health of patients we serve.

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About BIOC51

BIOC51 is a novel polyglucosamine biopolymer covalently modified with N diazeniumdiolate nitric oxide (NO) donors to facilitate spontaneous (without the need of enzymes) and controlled NO release. The level of NO release from BIOC51 has proved sufficient for eradicating planktonic and biofilm-based bacteria and can be delivered to the lungs as a dry powder or solution (e.g., nebulization).

About Cystic Fibrosis

Cystic Fibrosis (CF) is a rare life-threatening hereditary disease characterized by the production of thick, hard to clear mucus within the lung, leading to recurrent lung infections and loss of lung function. Antibiotic therapy, routinely used to treat lung infections in people with CF, becomes ineffective as bacterial resistance develops. The thick mucus within the lungs also makes it difficult for antibiotics to penetrate bacterial colonies, so there is a great need to develop alternative agents that can treat bacterial infection in people with CF.

About Shionogi & Co., Ltd.

Shionogi & Co., Ltd. is a Japanese major research-driven pharmaceutical company dedicated to bringing benefits to patients based on its corporate philosophy of “supplying the best possible medicine to protect the health and wellbeing of the patients we serve.” The company currently markets products in several therapeutic areas including anti-infectives, pain, CNS disorders, cardiovascular diseases and gastroenterology. Shionogi’s research and development currently target two therapeutic areas: infectious diseases and pain/CNS disorders. For more information on Shionogi & Co., Ltd., visit <http://www.shionogi.co.jp/en/>.

About Vast Therapeutics, Inc.

Vast Therapeutics, a subsidiary of KNOW Bio, LLC, formerly known as Novoclem Therapeutics, Inc., is an innovative, preclinical-stage pharmaceutical company focused on helping people who suffer from severe respiratory diseases to breath better and live life more fully. The Company is initially focused on developing a nitric oxide-based drug to treat cystic fibrosis patients battling chronic *Pseudomonas aeruginosa* infections. The Company anticipates submitting an Investigational New Drug application and initiating First-in-Human clinical trials in 2019. For more details, please visit <http://vasttherapeutics.com/>.

Forward-Looking Statements

This announcement contains forward-looking statements. These statements are based on expectations in light of the information currently available, assumptions that are subject to risks and uncertainties which could cause actual results to differ materially from these statements. Risks and uncertainties include general domestic and international economic conditions such as general industry and market conditions, and changes of interest rate and currency exchange rate. These risks and uncertainties particularly apply with respect to product-related forward-looking statements. Product risks and uncertainties include, but are not limited to, completion and discontinuation of clinical trials; obtaining regulatory approvals; claims and concerns about product safety and efficacy; technological advances; adverse outcome of important litigation; domestic and foreign healthcare reforms and changes of laws and regulations. Also for existing products, there are manufacturing and marketing

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risks, which include, but are not limited to, inability to build production capacity to meet demand, unavailability of raw materials and entry of competitive products. The company disclaims any intention or obligation to update or revise any forward-looking statements whether as a result of new information, future events or otherwise.

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