

## Media Release

### Singapore study sheds light on antibiotics-associated diarrhea

**Singapore, 11 February 2022** – A joint study by the Singapore General Hospital (SGH) and Singapore-MIT Alliance for Research and Technology (SMART), MIT’s research enterprise in Singapore, may have found the reason why some patients experience diarrhea after taking the antibiotic, amoxicillin-clavulanate, commonly known as Augmentin. It is a widely prescribed antibiotic used to treat many infections including pneumonia and urinary tract infections.

The team of researchers found that the level of gut *Ruminococcaceae*, a family of bacteria that plays an important role in maintaining an individual’s gut health, strongly impacts diarrheal outcomes following antibiotic treatment.

“The problem is very real for patients who are unable to take amoxicillin-clavulanate because it gives them diarrhea, even though it is an effective and affordable antibiotic for their infection. Knowing why may help us identify those at risk of antibiotic-associated diarrhea, and devise treatment strategies in the future to minimise or avoid such adverse effects,” said Dr Shirin Kalimuddin, Consultant, Department of Infectious Diseases, SGH, and Principal Investigator of the study.

A total of 30 healthy volunteers were recruited for the study. They each received a three-day oral course of amoxicillin-clavulanate. Their stool samples were collected on stipulated days over a period of four weeks and analysed using gene sequencing to look for changes in the gut microbiome during the study period.

Results showed that *Ruminococcaceae* levels in the stools of study volunteers who developed diarrhea were significantly lower when compared to those who did not, both before and during treatment with amoxicillin-clavulanate. This suggests that individuals may, depending on their gut composition, be predisposed to antibiotic-associated diarrhea. The team further devised a simple polymerase chain reaction (PCR) test based on levels of *Faecalibacterium prausnitzii*, a species within the *Ruminococcaceae* family, that could potentially be used in clinical settings to quickly determine an individual’s risk of developing diarrhea with amoxicillin-clavulanate treatment.

“People respond differently to medication. Understanding this response and the ability to predict those at risk will help guide the development of point-of-care diagnostics,” said Professor Eric J. Alm, Professor of Biological Engineering at MIT, Principal Investigator at SMART Antimicrobial Resistance (AMR) interdisciplinary research group, and co-corresponding author of the study.

“While a lot of attention has been paid to how DNA influences a person’s response to medication, the impact of the gut microbiome on the human drug response has not been widely researched. Our findings provide evidence that an individual’s gut microbial composition can influence the risk of developing antibiotics-associated diarrhea. Tested against amoxicillin-clavulanate, the study provides a framework to identify other potential causes of antibiotic-associated diarrhea in relation to other classes of antibiotics,” added Professor Alm.

Globally, one in three patients prescribed amoxicillin-clavulanate will develop diarrhea. In some cases, their diarrhea may be so severe that doctors have to stop the antibiotic prematurely, resulting in inadequate treatment of the infection, or the need to switch to another antibiotic that may be more costly or can only be given intravenously. The diarrhea could also prolong patients’ hospital stays, leading to an increased risk of other infections as a result.

Building upon what is now known, the team now hopes to conduct a clinical trial to see if certain species of bacteria within the *Ruminococcaceae* family could be used as a probiotic to prevent diarrhea in patients receiving antibiotics.

The study findings were published in the peer-reviewed scientific journal *iScience* in January 2022.

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## About Singapore General Hospital

Singapore General Hospital, a member of Singapore Health Services, is the public sector's flagship hospital. Established in 1821, SGH is Singapore's largest acute tertiary hospital with 1,700 beds and national referral centre offering a comprehensive range of more than 40 clinical specialties on its campus. Every year, about 1 million Singaporeans benefit from medical care delivered by its 800 specialists. As an academic healthcare institution and the bedrock of medical education, SGH plays a key role in nurturing doctors, nurses and allied health professionals, and is committed to innovative translational and clinical research in her continual strive to provide the best care and outcomes to her patients. [www.sgh.com.sg](http://www.sgh.com.sg)

## About Singapore-MIT Alliance for Research and Technology (SMART) [新加坡-麻省理工学院 研究中心]

Singapore-MIT Alliance for Research and Technology (SMART) is MIT's Research Enterprise in Singapore, established by the Massachusetts Institute of Technology (MIT) in partnership with the National Research Foundation of Singapore (NRF) since 2007. SMART is the first entity in the Campus for Research Excellence and Technological Enterprise (CREATE) developed by NRF. SMART serves as an intellectual and innovation hub for research interactions between MIT and Singapore. Cutting-edge research projects in areas of interest to both Singapore and MIT are undertaken at SMART. SMART currently comprises an Innovation Centre and five Interdisciplinary Research Groups (IRGs): Antimicrobial Resistance (AMR), Critical Analytics for Manufacturing Personalized-Medicine (CAMP), Disruptive & Sustainable Technologies for Agricultural Precision (DiSTAP), Future Urban Mobility (FM) and Low Energy Electronic Systems (LEES).

SMART research is funded by the National Research Foundation Singapore under the CREATE programme.

For more information, please visit: <http://smart.mit.edu>

## About Antimicrobial Resistance Interdisciplinary Research Group (AMR IRG)

The AMR IRG is a translational research and entrepreneurship program that tackles the growing threat of antimicrobial resistance. By leveraging talent and convergent technologies across Singapore and MIT, we aim to tackle AMR head-on by developing multiple innovative and disruptive approaches to identify, respond to, and treat drug-resistant microbial infections. Through strong scientific and clinical collaborations, our goal is to provide transformative, holistic solutions for Singapore and the world.

For more information, please log on to: <http://amr.smart.mit.edu/#home>