

PRESS RELEASE

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Gut inflammation caused by substance secreted by microbe: NUS study

A rare subtype of the world's most common parasite, *Blastocystis*, has been found to produce a unique by-product of its metabolism, which can cause gut inflammation under normal gut conditions

Singapore, 29 September 2023 — The human gut—or gastrointestinal system—where food is broken down into nutrients for the body, is an ecosystem that harbours thousands of bacteria species. While some microorganisms are harmful, many are beneficial and help keep the human body in good health. Besides bacteria, the gut microbiota also consists of other types of microorganisms, including protists, yeasts, and viruses.

Blastocystis, the world's most common protist—a form of unicellular microscopic organism—in the gut, is made up of many sub-species, known as subtypes. Depending on the subtype (ST) of *Blastocystis* that is present in a person, it can lead to a healthy gut in some individuals, and gut problems in others.

In Singapore, a rare subtype, *Blastocystis* ST7, is commonly found in patients with diarrhoea. *Blastocystis* ST7 is more common in Asia than in the West. This observation, along with other supporting studies, suggests that *Blastocystis* ST7 causes gut disease in humans. However, the detailed way it causes disease, has been a mystery.

To find out how *Blastocystis* ST7 causes gut disease, a team of researchers led by Professor Nicholas Gascoigne, Department of Microbiology and Immunology at the Yong Loo Lin School of Medicine, National University of Singapore (NUS Medicine), and Associate Professor Kevin Tan, from the same department, investigated the biology of *Blastocystis* ST7 at the molecular level. This work is published in [The EMBO Journal](#).

The study conducted by Dr Lukasz Wojciech, first author of the paper and Senior Research Fellow from the Department of Microbiology and Immunology at NUS Medicine, revealed that gut disease is caused by *Blastocystis* ST7, which synthesises a substance during its metabolism, called indole-3-acetyldehyde (I3AA).

“I3AA is produced in very few organisms. It binds to immune cells in the gut, which reduces the gut's tolerance for gut bacteria, causing the immune system to flare up even when exposed to normal gut bacteria. I3AA also promotes gut inflammation by inhibiting the protective properties of an important class of immune cells (regulatory T cells), while

stimulating inflammation through another class of immune cells (T helper 17 cells) in the gut,” said Dr Wojciech.

“From a biological perspective, this is the first time that a rare metabolite, I3AA, has been studied in detail, and is shown to promote inflammation,” said A/Prof Tan.

The researchers also found that some bacteria are useful in negating the effects of I3AA in the gut. One of them is a probiotic group known as lactobacillus—commonly found in foods like yoghurt, cottage cheese, sourdough bread, and more. It is able to regulate immunity and aid with gastrointestinal diseases. Thus, a way to potentially cure patients from *Blastocystis* ST7-associated diarrhoea, could therefore be to supplement one’s diet with foods that contain lactobacilli.

“Based on our findings, it is important to identify the specific subtypes involved in *Blastocystis*-related diseases, as some subtypes are harmful, while others are not. This can potentially result in clearer and more accurate diagnosis and treatment for patients. Our team is currently working on further studies on this. We will be investigating if I3AA production is unique to ST7 and can be used as a biomarker of disease. We are also exploring if certain strains on lactobacilli are able to prevent *Blastocystis* ST7 inflammatory effects on the host,” said Prof Gascoigne.

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Our multidisciplinary and real-world approach to education, research and entrepreneurship enables us to work closely with industry, governments and academia to address crucial and complex issues relevant to Asia and the world. Researchers in our faculties, research centres of excellence, corporate labs and more than 30 university-level research institutes focus on themes that include energy; environmental and urban sustainability; treatment and prevention of diseases; active ageing; advanced materials; risk management and resilience of financial systems; Asian studies; and Smart Nation capabilities such as artificial intelligence, data science, operations research and cybersecurity.

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Through a dynamic and future-oriented five-year curriculum that is inter-disciplinary and inter-professional in nature, our students undergo a holistic learning experience that exposes them to multiple facets of healthcare and prepares them to become visionary leaders and compassionate doctors and nurses of tomorrow. Since the School's founding in 1905, more than 12,000 graduates have passed through our doors.

In our pursuit of health for all, our strategic research programmes focus on innovative, cutting-edge biomedical research with collaborators around the world to deliver high impact solutions to benefit human lives.

The School is the oldest institution of higher learning in the National University of Singapore and a founding institutional member of the National University Health System. It is one of the leading medical schools in Asia and ranks among the best in the world (Times Higher Education World University Rankings 2023 by subject and the Quacquarelli Symonds (QS) World University Rankings by subject 2023).

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