

PRESS RELEASE

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The sharing of skin microbiome between children with Atopic Dermatitis (AD) and their healthy close contacts might contribute to disease recurrence

Current treatment approaches to cure AD focus solely on patients, and does not break the chain of transmission between close contacts of patients

Singapore, 14 September 2022 – Patients with moderate to severe Atopic Dermatitis (AD) experience intense skin irritation and itchiness that causes them to scratch uncontrollably and may also experience complications such as bacterial skin infections. Now, recent research has revealed that the sharing of skin microbes between patients with AD and their caregivers, may be the cause of the transference and perpetuation of AD in these patients.

AD is a common chronic skin condition that occurs in 15 to 20% of children. The flares happen because of a predominance of *Staphylococcus aureus* (*S. aureus*) and reduced microbial diversity. Up to 30% to 40% of the human population is asymptotically colonised with *S. aureus*, but *S. aureus* colonisation in children with AD is as high as 80% to 100%, of which up to 16% are methicillin resistant, which complicates clinical treatment.

The study was published in the Journal of Allergy and Clinical Immunology, led by Dr Elizabeth Tham from the Department of Paediatrics at the Yong Loo Lin School of Medicine, National University of Singapore (NUS Medicine) and Dr Chia Minghao from A*STAR's Genome Institute of Singapore (GIS), and including scientists from both organisations as well as the A*STAR Skin Research Labs (A*SRL). The study sought to understand shared skin microbiomes between children with AD and their parents or caregivers. The team recruited 30 children with moderate to severe AD, between the ages of 0 to 10 years old, and one healthy primary caregiver for each child. The primary caregiver had to be someone who was living in the same household as the child and spent at least 8 hours a day with the child for the past 6 months.

Skin samples were collected from non-lesional skin at common flare sites, such as the forearms, cheeks and the elbow pit of children and their primary caregivers, as well as from lesional skin in AD patients.

It was discovered that there were distinctive microbial signatures in the healthy caregivers which were similar to the non-lesional skin of AD children, despite the absence of any skin disease in the caregivers.

In particular, a higher proportion of *S. aureus* abundances compared to the commensal *Staphylococcus hominis* (the A/H ratio) was found to be a sensitive and specific marker for affiliation to an AD household, regardless of whether they were otherwise healthy adults or children. This means that the ongoing skin microbial sharing between the children with AD

and their caregivers could increase the tendency for the recolonisation of *S. aureus* strains in the child which would exacerbate their skin inflammation.

The study findings continue to suggest that the factor contributing to the failure of treatment may be the sharing of skin microbes between children with AD and their close contacts. When treatment ceases, the skin of AD patients is often quickly recolonised with *S. aureus*, which could contribute to recurrent disease. Therefore, to remedy AD would require a multi-pronged approach including existing measures like adequate skin hydration, aggressive treatment of ongoing inflammation and eradication of pathogenic bacteria, but most importantly, potentially extending precautionary measures to include close household contacts to break the chain of transmission.

Speaking as one of the leads in this study, Dr Tham says, “Our research showed that management of AD is more than treating symptoms of disease flares, which is only a temporary solution. The transference of skin microbiota between individuals in close contact is understudied in the field of AD. This sheds light on the possibility that future therapeutic approaches in AD may require extension to close contacts to disrupt the infectious chain of transmission.”

Dr Chia Minghao, Senior Research Fellow at A*STAR’s GIS and co-lead of this study adds, “Our research is a promising step in discovering how to better manage skin conditions such as AD more efficiently, and to better understand how skin microbes contribute to disease. We are optimistic that similar research could bring us one step closer to eradicating pathogenic microbes that cause painful skin inflammation, and this would bring much-needed relief to those suffering from various skin conditions, other than AD.”

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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 Asia's leading medical schools and ranks among the best in the world (Times Higher Education World University Rankings 2022 by subject and the Quacquarelli Symonds (QS) World University Rankings by subject 2022).

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The Genome Institute of Singapore (GIS) is an institute of the Agency for Science, Technology and Research (A*STAR). It has a global vision that seeks to use genomic sciences to achieve extraordinary improvements in human health and public prosperity. Established in 2000 as a centre for genomic discovery, the GIS pursues the integration of technology, genetics and biology towards academic, economic and societal impact, with a mission to "read, reveal and write DNA for a better Singapore and world".

Key research areas at the GIS include Precision Medicine & Population Genomics, Genome Informatics, Spatial & Single Cell Systems, Epigenetic & Epitranscriptomic Regulation, Genome Architecture & Design, and Sequencing Platforms. The genomics infrastructure at the GIS is also utilised to train new scientific talent, to function as a bridge for academic and industrial research, and to explore scientific questions of high impact.

For more information about GIS, please visit www.a-star.edu.sg/gis.

About A*STAR's Skin Research Labs (A*SRL)

The A*STAR Skin Research Labs (A*SRL) is an institute of the Agency for Science, Technology and Research (A*STAR) conducting high impact, interdisciplinary skin research that translates to innovations and improved skin health, for economic and societal impact. A*SRL's core capabilities include: wound care innovation, atopic dermatitis, skin ageing, and microbiome research.

A*SRL collaborates with public sector, the medical community and industry, and contributes actively to the Skin Research Institute of Singapore (SRIS) - a collaboration between A*STAR, Nanyang Technological University, Singapore and the National Healthcare Group that brings together biologists, engineers and clinicians to tackle clinically important questions in skin research.

For more information about A*SRL, please visit www.a-star.edu.sg/asrl.