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Ã¢â?¬Å?Accelerated ageing is associated with reduced diversification of the gut microbiome that further increases the risk of developing diseaseÃ¢â?¬Â•

November 1, 2022 | Opinion | By Hithaishi C Bhaskar

Singapore's Nanyang Technological University (NTU Singapore) has launched the Centre for Microbiome Medicine, a research facility that aims to improve human health and find new ways to treat diseases by leveraging the microbiome, the community of microorganisms that can usually be found living together in any given habitat. The research centre at NTU Singapore's Lee Kong Chian School of Medicine (LKCMedicine) has partnered with Singapore's Ã¢â?¬Ë?National Healthcare Group, Imperial College London, and AMILI, a precision gut microbiome company. As microbiome research advances, researchers hope to uncover the relationship between microbiome mechanisms and their correlation with diseases, to translate discoveries into improved diagnostics and new treatments. In support of microbiome research, the new centre has received a S$2.5 million supporting fund. In an interaction with BioSpectrum Asia, Associate Professor Sunny Wong, a clinician-scientist and Programme Director of the centre shares the mission and vision of the centre and plans on addressing comprehensive health challenges. Edited excerpts;



How would you describe your primary mission and vision of the Centre for Microbiome Medicine?

Microbiome is the little world of microbes living in each of us. The Centre for Microbiome Medicine advances research into the microbiome to improve human health and find new ways to treat diseases by leveraging the microbiome.

Furthermore, accelerated ageing is generally a manifestation of hidden chronic disease, often caused by a dysfunction in more than one organ of the body. Accelerated ageing is also associated with reduced diversification of the gut microbiome that further increases the risk of developing disease. The mechanisms underlying age-related changes in microbiome

composition are not known nor do we know the mechanisms by which microbiome richness and diversification can be sustained.

As we age, interventions aimed at preventing or reversing organ decline should address multiple organs, including gut microbes. A holistic approach requires detailed knowledge of organ-to-organ communication, including gut microbe communication. The gut microbiome theme is dedicated to identifying the molecular dynamics of interorgan crosstalk and interaction with gut microbes and to translate this information to develop diagnostic and prognostic tools to help identify the baseline and the transition from a healthy to a disease state.

Our mission is to create a healthier world through better understanding of and modulating the microbiome which can improve the lives of patients. We also hope to develop new ways to protect and promote human health. Our vision is to be a leading research centre to make discoveries and transform healthcare. The centre will bring together advanced research infrastructure and microbiome technology, relevant clinical expertise as well as strong partnerships to develop novel diagnostic and therapeutic strategies for patients. Through our work in microbiome medicine, we hope to make a positive impact and transform healthcare in Singapore and beyond.

What are the potentials and objectives of the newly launched Centre?

The centre was founded to transform healthcare through research on microbes and their impact on human health. As a key research facility within NTU Singapore's LKC Medicine, the centre is uniquely positioned to harness the potential of microbiome research in Asia. It brings together leading researchers from a variety of disciplines. Through its research, it seeks to improve our understanding of the role of microbes in human health and disease. The facility also aims to develop new diagnostics, therapeutics, and preventive strategies against microbiome-related conditions. With its innovative research programme, the centre is poised to make a major impact on healthcare in Asia and beyond.

The gut microbiome thematic platform includes studies using animal models, ex vivo organoids and population health data. Research activities include, but are not limited to, identification of signalling pathways and molecules that regulate microbe host interactions during health and disease, including brain function, skin biology, liver function and metabonomic biochemical research that identify microbial metabolites guiding metabolic homeostasis in our body. We are particularly interested in research programmes that aim to uncover the interaction between gut microbes and the immune system and how this contributes to maintaining cognition as we age. The gut microbiome thematic research engine is dedicated to delivering integrated pathways to sustain human health life span and slowing down ageing symptoms by food intervention regimes.

How do you plan on addressing comprehensive health challenges?

We are on the cutting edge of research into the microbiome, and its application in a variety of health challenges. The centre is working to transform healthcare by harnessing the power of the microbiome to develop innovative new diagnoses and treatments, for conditions like metabolic diseases, cancers, lung diseases and skin diseases. The research being done at the centre has the potential to improve the lives of people around the world, and we are excited to see what future innovations will come from this cutting-edge research.

To develop new treatments for diseases, it is essential to understand how diseases arise in the first place. We are working hard to gain a better understanding of the microbiome, and how it interacts with the human and environment. With deep research, we can identify novel biomarkers or molecular targets for therapeutic development. Additionally, new engineering technologies can be tested in laboratory and clinical trials to determine their effectiveness in treating disease. These represent innovative solutions to some of our most pressing challenges.

Using human sample collections, advanced DNA sequencing, and laboratory experiments, we will look at how microbiomes cause a range of diseases like obesity, diabetes, fatty liver, and chronic lung diseases like bronchiectasis. The centre is currently working on understanding the role of the microbes in obesity-related cancers such as colon and other digestive cancers.

What are the possibilities for translating microbiome studies into breakthroughs in diagnostics?

We are driving the translation of microbiome studies into new diagnostics that are more accurate and reliable. The increased accuracy is made possible by the identification of new biomarkers that can be used to diagnose a range of conditions. Some of these biomarkers are closely related to microbiomes, such as microbial genes or proteins that can be detected in blood that are sensitive and specific. These tools will allow clinicians to make better decisions about which treatments are most likely to be effective. The work of the centre is therefore exciting and promising, and it is making a significant contribution to improving the accuracy of diagnosis and the quality of care for patients.

Could you summarise the NTU 2025 strategic plan which aims to address Singapore's national priorities?

The NTU 2025 strategic plan details the University's education, research and innovation ambitions and goals for the next five years. The plan highlights three major goals for NTU – achieving uniformity of excellence in all activities; growing NTU's national, regional, and global impact; and deepening disciplinary strengths while nurturing greater interdisciplinary collaborations that span the entire spectrum of our core activities. We will focus on these clusters with potential for significant intellectual and societal impact, aligned with Singapore's national plan.

We are aligned with NTU's strategic plan in 'Health and Society'. The centre is dedicated to advancing this research to improve the health of Singaporeans and make a positive impact on national health priorities. The research conducted at the centre has the potential to make a real difference to our lives. Furthermore, the microbiome is part of the natural ecosystem, an interface between humans and the environment. The centre will study the impact of microbiome in humans and the environment on our health.

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