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Singapore gut microbiome company Amili's lab technicians Ang Yue Ru and Haikel Rasiti storing stool samples in the firm's cryopreservation units. Amili will collect and process the samples for the Microbiota Vault, which receives collections of samples from around the world and stores them at freezing temperatures in a biobank. PHOTO: AMILI

S'pore joins global effort to develop Noah's Ark for microorganisms

Microbiota Vault setting out to preserve diversity of tiny living things in human body, food and in the environment

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Science Correspondent

Climate change and urbanisation are driving species to extinction, but efforts are ongoing to save some from disappearing forever.

To save endangered wild animals, for example, zoos are nurturing "assurance populations" so their offspring can be reintroduced into suitable habitats. Even the continuity of plant life is being safeguarded at the Svalbard Global Seed Vault in Norway.

But life in the microscopic realm should not be ignored as well, says an international group of scientists, which is behind a new "Noah's Ark" for microorganisms that live in humans.

The Microbiota Vault is setting out to preserve the diversity of tiny living things in the human body, food and in the environment, by receiving collections of samples from around the world and storing them at freezing temperatures in a biobank.

Data on the deposited samples can then be available for research.

The vault is a global non-profit initiative, and the pilot phase was launched in Switzerland last year by institutions such as ETH Zurich, the University of Basel and University of Lausanne and Rutgers University.

Scientists learn more about the human microbiota – or the range of microorganisms in the human body, including bacteria, fungi, viruses and parasites – by analysing poop samples.

Data already points to how these microbes are fast disappearing, likely due to changes in diets, the consumption of processed food, and rising antibiotic use.

Antibiotics can kill various species of bacteria in the gut and elsewhere in the body, such as skin – including those that are good for human health.

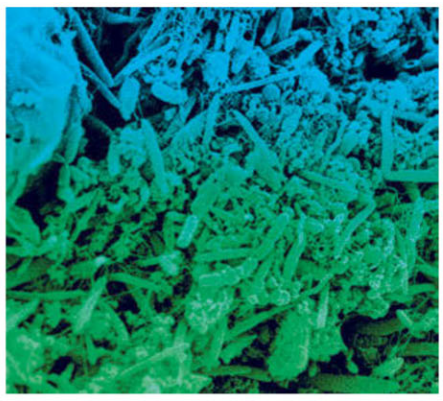
A 2015 study, for example, showed that isolated communities living in the Amazon rainforest had twice the biodiversity in their gut as people in the United States.

The shrinking microbial diversity in humans is coming at a point in time where the scientific community is just starting to tease out the links between human health and the diversity of the gut microbiota.

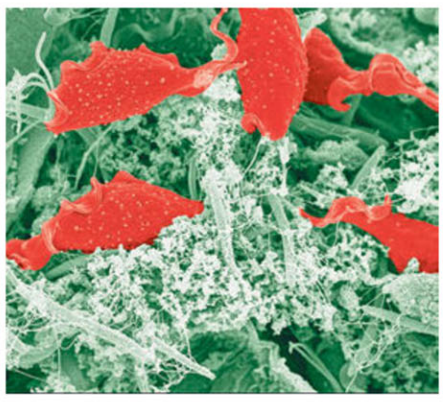
Rutgers University's Professor Maria Gloria Dominguez-Bello, one of the team members behind the new initiative, told The Straits Times: "As societies urbanise, there is also an increase in immune and metabolic diseases such as asthma, allergies, Type 1 diabetes and obesity."

She added: "We hypothesise that... there is a link between losing microbial diversity and functions, and increase in immune and metabolic diseases."

Her colleague at the university, Professor Martin Blaser, said the theory that a disappearing microbiota is fuelling modern "plagues" could explain why so many diseases – such as obesity, diabetes, asthma or food allergies – are all becoming more prevalent at the same time.



HEALTHY MICROBIOME
What the gut microbiome of a healthy mouse looks like, with a diversity of bacteria including rod-shaped Lactobacilli.



TRICHOMONAS
Trichomonas mouse gut infection (red parasites with a whip-like tail) that can trigger diarrhoea and abdominal pain. PHOTOS: DR THET TUN AUNG AND DR BENOIT MALLERET, YONG LOO LIN SCHOOL OF MEDICINE, NUS

Similar to how the fingerprints of climate change have been detected in different events – such as more intense hurricanes, accelerating rates of sea level rise, and changing rainfall patterns – so too can a changing microbiota help to explain the growing incidence of so many different diseases.

"A changing microbiota may not be the only factor, but it is a common underlying one," Prof Blaser explained.

His previous work on *Helicobacter pylori* – an organism found in the stomach – done 25 years ago showed that while the bacteria are considered a pathogen that can cause stomach ulcers and even cancer, they could confer benefits too.

"Our studies began to develop evidence that the organism had benefits as well – protecting people from oesophageal reflux and a form of oesophageal cancer," he said.

At that time, Prof Blaser noticed through analyses of blood samples that fewer people seemed to have H. pylori in their systems. The blood tests measured antibodies, which indicated the presence of the organism.

"We and others had shown that the organism was present in humans for at least 100,000 years. But it became clear that this ancient inhabitant of the stomach, which conferred both cost and benefit to humans, would be disappearing within a matter of a few human generations," he added.

If one organism was disappearing, then others may be gone too, he reasoned.

Prof Blaser said more studies are needed to solidify the relationships between the microbiota and human health, as well as to understand the mechanisms so effective preventive measures and treatments can be developed.

He said: "The good news is that many scientists around the world are working on this, including in Singapore."

The Republic has been invited to contribute to the Microbiota Vault, with Associate Professor Jeremy Lim from the National University of Singapore's (NUS) Saw Swee Hock School of Public Health endeavouring to establish the programme in South-east Asia.

Dr Lim, who is also chief executive of Amili – a gut microbiome or microbiota company specialising in research into this area – said much of the research on the link between the gut microbiome and human health has been based on an industrialised Western population.

"But there is no reason to believe Asia is spared," Dr Lim said.

"We started transitioning decades ago from a distinctly Asian diet, comprising high fibre, fermented and fresh produce, to a Western diet that comprises ultra-processed foods and a diet that is high in fat and sugar."

Dr Lim said there is a desperate need for microbiome research in this part of the world.

"We know the microbiome is heavily influenced by diet, lifestyle and the local environment," he said. "However, 71 per cent of all microbiome profiles are from only... North America and Europe. We in Asia have to step up."

Amili will contribute by collecting and processing the samples for the vault.

All the samples will be stored in Singapore, with parts of it sent to Switzerland, Dr Lim said. This duplication will hedge the risks of putting all the samples in one place.

Those keen to contribute to the vault can contact Amili at hello@amili.asia

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