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Microbes are believed to play a role in almost all of the human body's functions, as well as having an important part in the metabolic process, and it is estimated that the roughly 1.5kg of them living inside a person can perform 19,000 different functions, although more than a quarter of these remain a mystery. ST PHOTO: KELVIN CHNG

The secret life of the microbes living inside us

In and on the human body lives a collection of microbes involved in a range of body functions, such as producing nutrients for cells that support the immune system. What is the science behind it? Samantha Boh gets the answers from cell biologist Sven Pettersson, professor of metabolic disorders at Nanyang Technological University's Lee Kong Chian School of Medicine.

Q *What is a microbe?*

A It is a micro-organism, more commonly called a bug, that lives inside a body or living organism.

Collectively, they are referred to as the microbiome.

About 1.5kg of microbes reside in a person and they can perform an estimated 19,000 different functions. Of these, 5,000 are unknown.

Q *How has the view of microbes changed over time?*

A When discovered, microbes were viewed from a disease perspective. People were dying and researchers focused on finding the disease-causing bacteria, or pathogen, and developing the antibiotics to eradicate them.

This was the case when I did my medical education in the 1980s. In fact, researchers in the 20th century believed antibiotics would solve all health problems.

We now know that is not true.

The thinking began to change in the late 1990s, when there was a big drive to identify the human genome.

This resulted in the development of sequencing techniques and it gave scientists the tools to sequence microbes. And they began to ask whether microbes do anything.

Q *How do microbes interact with the human body?*

A Microbes respond to, for instance, your lifestyle, what you eat and the social life you lead.

While your genome, your proteins, your legs, your eyes and so on are fixed, microbes change every four to five days.

Lots of things can affect the microbiome, including food intake, sleeping patterns, hormones and stress.

Researchers, for instance have found that studies on animals show microbes and their products have an impact on the regulation of bioreceptors which control blood pressure.

These findings are far from conclusive but they indicate there is something much bigger in microbes that awaits discovery.

Q *Can the human microbiome be influenced to promote health?*

A There is a lot of hype about the possibility, driven partly by people who want to sell probiotics. The reality is that few studies are done in strictly controlled conditions.

By and large, doctors do not prescribe probiotics to treat health problems because they, as well as scientists, do not fully understand how probiotics work.

Probiotics are living organisms that are constantly changing, so if you think you can easily control a microbe, you are wrong.

Q *What do we know for certain?*

A There are two things that we know for sure.

One is that the microbes developing inside a person seem to be involved in virtually all aspects of physiology and a body's function.

For instance, a small number of microbes reportedly sit on the sperm cell but researchers do not know if they affect development.

They do not appear to directly contribute to developmental programming but they may contribute indirectly by being involved in the metabolic circuit required in developmental programming.

This means they may be part of the machinery a pregnant woman relies on to help the baby grow.

The other certainty is that microbes are important in the metabolic process. Whatever a person does and eats, microbes will respond accordingly and this can be good or bad.

Microbes also seem to be important in the first 1,000 days of a newborn's life when the baby is growing rapidly.

What goes on during this period is still not well understood but it is becoming a major focus because mounting evidence shows a baby that encounters stressful conditions during this period may pay a price later in life.

For instance, if you are not exposed to microbes when young, it could affect the building up of your immune system.

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Professor Sven Pettersson says that microbes seem to be important in the first 1,000 days of a baby's life, and may affect the building up of the immune system.

Studying how microbes respond to exercise

Singapore scientists are seeking to establish if exercise can change the collection of microbes living in the human body.

The team at Nanyang Technological University's Lee Kong Chian School of Medicine is confining the study to healthy adults aged 65 and older.

It will involve 400 people, half of whom lead sedentary lifestyles in which they do fewer than two 30-minute exercise regimes a week.

The other half will be seniors who have been exercising two to three times a week for the last five years.

The study has started with participants who live a sedentary life. Their microbiome composition is being profiled using stool samples. Also collected are images of their brain, liver and muscles as well as blood and urine samples.

When done, they are put on a 12-week exercise programme, after which the various readings are taken again.

"We want to know how they respond to exercise," said Professor Sven Pettersson, co-leader of the study.

It is expected to be completed in June next year, after which the data will be analysed.

A further study comparing those who exercise with those who do not will be done "further down the road", Prof Pettersson said. He was unable to give further dates as the team has yet to obtain the funds for it.

Samantha Boh