

People breathe in up to 1 million bugs a day, study finds

Researchers say the micro-organisms can affect those with respiratory problems

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With every breath you take, every move you make, you are inhaling tens of thousands of micro-organisms which will not affect healthy people, but can have an effect on those with respiratory illnesses.

Scientists here have conducted the first study of the atmosphere undertaken in the tropical region to understand what we inhale and how it possibly impacts us.

A team of researchers from the Singapore Centre for Environmental Life Sciences Engineering (SCElse) at Nanyang Technological University (NTU) found that, on average, humans breathe in between 100,000 and one million micro-organisms of more than 1,000 different types a day, with at least 725 species of them constantly present in the air around us.

These microscopic living things cannot be seen by the naked eye and include bacteria and fungi, which dominate the atmosphere in abundance at different times of the day.

The team said that microbial communities in the atmosphere have an effect on environmental and human health, with the most immediate impact on patients with respiratory illnesses.

Professor Stephan Schuster, research director at SCElse and geonomics professor at NTU, said: "What we already know is that healthy people are unaffected. But, at the same time, it is clear that peo-



Singapore Centre for Environmental Life Sciences Engineering research director Stephan Schuster with air sample collectors and his team of researchers who worked on the study of the atmosphere in the tropical region to understand what we inhale and how it can impact us. PHOTOS: NANYANG TECHNOLOGICAL UNIVERSITY

ple who have respiratory problems – they seem to respond to the organisms in the air."

On average, humans breathe in 11 cubic m, or 11,000 litres, of air daily.

Depending on the environment they are in, the air they breathe in could contain 50,000 organism cells in the tropics during the day, but 30 to 100 times that number at night.

Someone who is jogging at night will breathe in, on average, 100 times more micro-organisms than if he were to jog at noon.

The day and night differential is possibly driven by changes in the environment, such as humidity, rainfall, solar radiation and carbon dioxide levels, scientists believe.

In the study, air sample collectors were set up on a rooftop at the NTU campus, gathering samples every two hours over the course of five days. The same experiment was repeated every three months for 13 months.

Airborne biomass was collected by pumping air through an electrostatic filter retaining particles that



Three species of bacteria were used to form the word "air", while the other petri dishes contain fungi grown from the air samples collected by the research team.

ranged from 0.5mm to 10mm.

Previously, air samples had to be amassed for weeks or months before they would be considered sufficient for analysis.

A new biomass DNA sequence protocol developed by the team allowed them to analyse smaller vol-

umes of air and study hourly changes in the composition of micro-organisms in the air.

The findings of the study revealed that tropical air had a microbial diversity that is as complex as other ecosystems, such as sea water, soil and the human gut.

Singapore is the only country in the world to have a complete map of airborne organisms, said Prof Schuster.

He added that understanding the dynamics of bioaerosols – or airborne micro-organisms – will help in managing indoor air quality.

"When one cools the air inside a room very rapidly, such as with the use of air-conditioning, it can lead to condensation of water on surfaces, a pre-condition for mould and fungal growth," he said.

In the long term, people could suffer from the organic compounds and spores that are released into the air from this mould, he said, noting that proper ventilation and monitoring the relative humidity of a room are important in preventing fungal growth.

At the moment, the researchers are working with NTU's Lee Kong Chian School of Medicine to look at how bioaerosols affect patients with bronchitis, chronic obstructive pulmonary disease and severe asthma.

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