



Germ at Home

Article

PART 1

MANAUS, Brazil. You may live in a jungle hut or a high-rise apartment. Either way, your home is covered in bacteria. Now, new research from the Amazon rainforest suggests that people who live in the city might want to open a window.

Scientists traveled from villages in Peru to a large Brazilian city. They tracked the effects of urbanization on the kinds of bacteria in people's homes. They wondered, "Do city homes have different types of bacteria than country homes?" It's a small first step in a larger effort to understand how different environmental bacteria help shape what's called the microbiome. That's the trillions of bacteria that share our bodies. They play an important role in our health.

Everyone carries microbes. They exist on the skin, in the nose, and in the gut. This microbial zoo begins forming when a person is born. It aids in the inner working of the body. It protects us from illness. Some of these bacteria are good. Some are harmful. What changes the balance between good and bad bacteria? That differs. It depends on things like a person's diet or any medicine he or she may take. Environmental exposure plays a role, too. Some say that conditions such as asthma and allergies are on the rise in some parts of the world because of a lack of early contact with once-common bacteria. This idea seems to be strengthened by the fact that children who grow up on farms or around animals tend to have fewer of those illnesses.

Increasingly, scientists studying the microbiome are looking at indoor spaces. They are studying places where people spend a lot of time, particularly homes. One of those scientists is microbiologist Maria Gloria Dominguez-Bello. She led the study in Peru and Brazil.

"Very little is known about the microbes of the built environment," said Dominguez-Bello.

To track the effects of urbanization, Dominguez-Bello's team studied the microbiomes of 10 houses and their inhabitants in three Peruvian locations. One was a village of hunter-gatherers. Another was a slightly more modern village. The last was Iquitos, a medium-sized city that cannot be reached by roads. The scientists also looked at the bacteria in homes in the Brazilian city of Manaus.

The housing styles were different in each setting. In the jungle, large families shared open-air huts. These huts have no outside walls. In the villages, homes had walls, but they didn't reach the roof. In the city, homes were larger. They had standard rooms and smaller families.

The team found that as people living in the Amazon rainforest become more urbanized, the kinds of bacteria in their homes change. The more crowded country homes in the study had bacteria mostly found in nature. They were the bacteria commonly found in soil and water. But the city homes had bacteria that live on people.



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Humberto Cavallin/University of
Puerto Rico/Science Advance via AP

Scientist Maria Gloria Dominguez-Bello, left, collects temperature information from the floor of a hut in Peru. She led a study in Peru and Brazil about bacteria in homes.

The researchers discovered that the more urbanized a home, the more human bacteria live on its walls and floors. This is true even though homes in the city have fewer people living in them. In fact, in city dwellings, the researchers could tell just by the bacteria on the walls whether the room was a kitchen, bathroom, or living room. In Manaus, a collection of microbes normally found in the mouth and in the gut were the most important in telling rooms apart.

"That's amazing," Dominguez-Bello said. "The walls talk."

Country homes are open to air circulation. But the walls in city homes were acting as traps as people shed bacteria, the team reported. Dominguez-Bello was shocked by the findings. She had the windows in her New York office unsealed so she could open them.

These results are similar to those from another study. It was done in U.S. homes and hospitals about the role of fresh air, said microbiologist Jack Gilbert of the Argonne National Laboratory and University of Chicago. Gilbert's study was able to match which family lived in different locations by the bacteria they shed inside their homes.

"Our modern homes are set up perfectly" for studying microbes, Gilbert said.

The Associated Press contributed to this story.

PART 2

Dig Deeper

There are some single-celled organisms without a nucleus. Most of these are bacteria. Bacteria are found in almost every environment. They do many different jobs. Some bacteria have chlorophyll. These bacteria use sunlight for energy. They are an important food source for many organisms in oceans. These bacteria also give off oxygen gas. Animals need oxygen to breathe.

Bacteria without chlorophyll do different jobs. Some bacteria break down parts of dead plants and animals. This helps recycle matter. Some bacteria give off chemicals into the environment. They are a food source for other organisms. Scientists often group bacteria by what they do for the environment.

- **Producers**

Some bacteria can change energy from sunlight into energy that cells can use. These bacteria are called producers. Organisms that cannot make their own food use these bacteria as a food source.

- **Decomposers**

How do decomposers get energy? They break down materials in dead or decaying organisms. Decomposers help other organisms reuse materials found in decaying matter.

- **Parasites**

Some bacteria live inside or on another organism. That organism is the host organism or the host cell. Some of these bacteria do not affect their host organisms or host cells. Some bacteria help their hosts. Some bacteria harm their hosts. These bacteria are called parasites.

Bacteria may help or harm other organisms. These are just a few examples:

Helpful Bacteria

- One shovelful of soil has trillions of bacteria. Every fallen leaf or dead animal is covered with bacteria. These bacteria break down the matter in dead bodies and waste materials. Other organisms can then use these broken-down

materials to build their bodies.

- Bacteria live in your intestines. They help you break down food. They also help you get vitamins, such as vitamin K.
- Cities use bacteria to break down sewage. Bacteria are found in sewage-treatment plants. They live on the material broken down in liquid sewage. These bacteria help clean the water. When water is clean enough, it is sent out into rivers or oceans. Other bacteria can break down oil.
- Bacteria can change materials that do not come from living things. Then, other organisms can use them. For example, some bacteria can change nitrogen gas to nitrogen compounds. The nitrogen can then be useful to plants. This process is called *nitrogen fixation*. Plants use these nitrogen compounds in making proteins. Proteins are an important part of every cell.

Harmful Bacteria

In the late 1800s, scientists discovered that bacteria cause some diseases. Much of the scientific research into harmful bacteria came about because bacteria caused disease in humans. Tuberculosis, cholera, and strep throat are examples of disease caused by bacteria. Bacteria also may cause disease in many other animals and in plants.

Bacteria can cause disease in three ways:

- They can take over parts of the body. They will multiply in body tissues. Then, they will destroy cells.
- They can poison the body. They do this by making harmful chemicals. The chemicals are then released into the body.
- They can poison the body with chemicals that are part of the bacteria themselves.

One way to fight bacterial disease is with vaccinations. Vaccines help prepare an organism to fight diseases it might get in the future. Humans get vaccinations for bacterial diseases. Cats and dogs do as well.

Dictionary

circulation (*noun*) the flow of something through a space

decomposer (*noun*) an organism that feeds on and breaks down dead plant or animal matter

exposure (*noun*) the act of coming into contact with something

microbe (*noun*) a very small organism that can be seen only with a microscope

parasite (*noun*) an organism that absorbs nutrients from the body of another organism; a parasite often harms the organism

producer (*noun*) an organism that captures energy from sunlight; it changes sunlight into chemical energy; this energy is stored in energy-rich carbon compounds

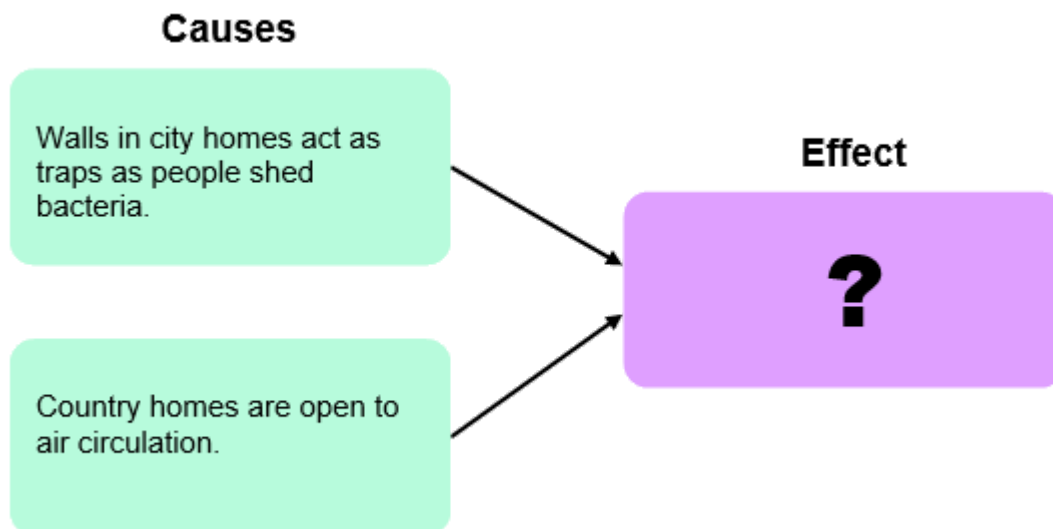
research (*noun*) close, careful study

urbanization (*noun*) the process by which towns and cities are formed and become larger

Activity

PART 1

Question 1



According to the Article, which best replaces the question mark in the diagram above?

- (A) A team of scientists found many people living in the Amazon rainforest.
- (B) In the jungle, some huts had outside walls but were more open on the inside.
- (C) The more urbanized a home, the more human bacteria live on its walls and floors.
- (D) Some bacteria protect people from illness, but other bacteria are harmful.

Question 2

The Article talks mainly about _____.

- (A) The types of diets that can change the balance between good and bad bacteria
- (B) The types of bacteria found in homes from different locations
- (C) The types of bacteria found in the Amazon rainforest
- (D) The types of diets that prevent childhood illnesses in countries like Brazil

Question 3

Which two words are the closest **antonyms**, as they're used in the Article?

- (A) Scientist and microbiologist
- (B) Similar and different
- (C) Condition and illness
- (D) Crowded and modern

Question 4

Which of these is an opinion?

- (A) Urbanized homes have more human bacteria on the walls and floors.
- (B) In the jungle, large families sometimes share open-air huts.
- (C) Bacteria found in country homes are also found in nature.
- (D) It is better to live in the country than to live in the city.

Question 5

Based on the Article, the reader can tell that _____.

- (A) Maria Gloria Dominguez-Bello probably tells families with young children to avoid having pets.
- (B) Maria Gloria Dominguez-Bello probably urges people in big cities to keep their windows closed.
- (C) Jack Gilbert probably wasn't surprised by the results of the study done in the Amazon rainforest.
- (D) Jack Gilbert probably blames the rise in asthma on the bacteria found in water and soil.

Question 6

The Article states:

Some say that conditions such as asthma and allergies are on the rise in some parts of the world because of a lack of early contact with once-common bacteria. This idea seems to be *strengthened* by the fact that children who grow up on farms or around animals tend to have fewer of those illnesses.

Which would be the closest **synonym** for the word *strengthen*, as it is used above?

- (A) Deny
- (B) Simplify
- (C) Support
- (D) Question

Question 7

Sharon wants to read more about microbes. She would find **most** of the information _____.

- (A) In an advanced math book
- (B) In a Peruvian travel guide
- (C) In a Brazilian history book
- (D) In a life science book

Question 8

Which statement from the Article best supports the idea that not all microbes are harmful?

- (A) Increasingly, scientists studying the microbiome are looking at indoor spaces.
- (B) Some say that conditions such as asthma and allergies are on the rise in some parts of the world because of a lack of early contact with once-common bacteria.
- (C) It's a small first step in a larger effort to understand how different environmental bacteria help shape what's called the microbiome.
- (D) They tracked the effects of urbanization on the kinds of bacteria in people's homes.