ACHIEVE3000®
THE LEADER IN DIFFERENTIATED INSTRUCTION®

Printed by: Jessica Christian
Printed on: March 16, 2020

Germs 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 city dwellers might want to open a window.

Photo credit and all related images: 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.

Scientists traveled from remote villages in Peru to a large Brazilian city to begin tracking the effects of urbanization on the diversity of bacteria in people's homes. In other words, they wondered, "Do city homes have different types of bacteria than rural homes?" It's a small first step in a larger quest to understand how different environmental bacteria help shape what's called the microbiome. That's the trillions of bacteria that share our bodies and play a critical role in our health.

Everyone carries a unique assortment of microbes. They exist on the skin, in the nose, and in the gut. This microbial zoo begins forming at a person's birth. It aids in digestion. It protects us from illness. Some of these bacteria are good, while others are harmful. What influences 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 have suggested that immune-related 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 immune-related illnesses.

Increasingly, scientists studying the microbiome are investigating indoor spaces. They are looking at 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 microbial communities of 10 houses and their inhabitants from each of three Peruvian locations. One was a village of hunter-gatherers. Another was a slightly more modern rural 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 typically shared open-air huts. These huts have no outside walls. In rural villages, homes had walls, but the room dividers didn't reach the roof. In the city, homes were larger, with standard rooms and smaller families.

The team discovered that as people living in the Amazon rainforest become more urbanized, the kinds of bacteria in their homes change. The more crowded jungle and rural homes in the study contained bacteria mostly found in nature, such as those commonly found in soil and water. But the urban homes contained bacteria that typically live on people.

The researchers discovered that the more urbanized a home, the more human bacteria live on its walls and floors. This is true even though urban dwellings have fewer people living in them. In fact, in city dwellings, the researchers could tell just by the microbial fingerprints 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."

Unlike the less urban homes that are open to air circulation, urban walls were acting as traps as people shed bacteria, the team reported. Dominguez-Bello was shocked by the findings. She insisted that the windows in her New York office be unsealed so she could open them.

These results are similar to those from research done in U.S. homes and hospitals about the role of ventilation, said microbiologist Jack Gilbert of the Argonne National Laboratory and University of Chicago. Gilbert was not involved in Dominguez-Bello's study. But he has conducted a study of his own. Gilbert 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

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

diversity *(noun)* variety

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

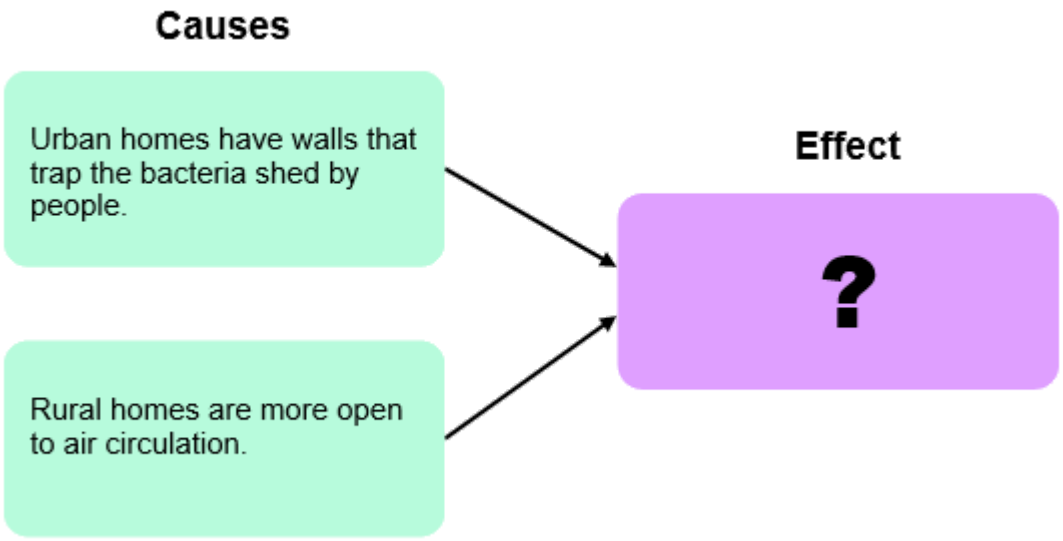
producer *(noun)* an organism that captures energy from sunlight; it changes sunlight into chemical energy; this energy is stored in energy-rich carbon compounds

ventilation *(noun)* a way of supplying fresh air in an enclosed place

Activity

PART 1

Question 1



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

- (A) Jack Gilbert conducted research on the role of ventilation in hospitals and homes.
- (B) Some bacteria protect people from illnesses, while other bacteria are harmful.
- (C) Diet and medicine play a role in the balance of good and harmful bacteria.
- (D) The more urbanized a home, the more human bacteria live on its walls and floors.

Question 2

What is this Article mainly about?

- (A) Research that was conducted on the causes of childhood illnesses in countries like Peru and Brazil
- (B) Research that was conducted on rural versus urban diets that can change the balance between good and bad bacteria
- (C) Research that was conducted on the types of bacteria found in homes at different locations
- (D) Research that was conducted on the types of microbiomes that are found in many U.S. hospitals and urban homes

Question 3

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

(A) Diversity and lack

(B) Rural and urban

(C) Ventilation and circulation

(D) Microbial and environmental

Question 4

Which of these is a statement of opinion?

(A) Urban homes have more human bacteria on the walls and floors than homes in rural locations.

(B) The bacteria found in rural homes were the same as those found in nature.

(C) The balance of good and harmful bacteria depends on things like environmental exposure.

(D) It is better to live in remote, rural locations than to live in urbanized locations.

Question 5

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

(A) Jack Gilbert probably blames the rise in asthma on the bacteria found in water and soil.

(B) Maria Gloria Dominguez-Bello probably urges people in big cities to keep their windows closed.

(C) Maria Gloria Dominguez-Bello probably tells families with young children to avoid having pets.

(D) Jack Gilbert probably wasn't surprised by the results of the study done in the Amazon rainforest.

Question 6

The Article states:

> **Scientists traveled from *remote* villages in Peru to a large Brazilian city to begin tracking the effects of urbanization on the diversity of bacteria in people's homes.**

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

(A) Reserved

(B) Reformed

(C) Removed

(D) Related

Question 7

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

(A) In a book about modern technology

(B) In an article about visiting Peru and Brazil

(C) In a book about bacteria and health

(D) In an article about installing ventilation systems

Question 8

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

(A) Some have suggested that immune-related 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.

(B) Increasingly, scientists studying the microbiome are investigating indoor spaces.

(C) To track the effects of urbanization, Dominguez-Bello's team studied the microbial communities of 10 houses and their inhabitants from each of three Peruvian locations.

(D) The scientists also looked at the bacteria in homes in the Brazilian city of Manaus.