The Human Microbiome
A World Inside You

There’s a world filled with strange creatures. The creatures of this world are invisible, and they’re not human. Aliens sometimes threaten to invade the world these creatures call home.

This world is not a far-off planet: it’s your body! The creatures are called microorganisms, and your body is home to more than 100 trillion of them. Microorganisms live on your skin, in your gut, in your nose and mouth, and pretty much everywhere else on and in your body.

Your Body: Home Sweet Home for Bacteria

The microorganisms living in and on your body range from fungi to eyelash mites, but most of them are bacteria. Bacteria are among the smallest microorganisms on Earth. Most are made of a single cell—that’s the tiny structure that makes up all living things. However, bacteria are not all the same. They come in different shapes, use different things as food, and live in different places. Thousands of different kinds of bacteria live in and on your body.

Even though they are tiny, bacteria are living things with the same basic needs that all living things share. The human body provides bacteria with the food and living space they need—that’s what makes our bodies such a good environment for bacteria. One word for an environment and the organisms living there is biome, so we call the bacteria living in and on the human body “the human microbiome.” All together, the bacteria living in an average human’s microbiome weigh

Your tongue is covered with bacteria like the ones in this photo, which was taken through a microscope. Bacteria are some of the smallest microorganisms that live in and on your body: these bacteria are actually 10,000 times smaller than they look in this photo! The bacteria colored green in this photo are 1 micrometer long, about 100 times too small to see with the naked eye. (The colors are not real: they were added to make the photo easier to see.)

This microscopic animal is an eyelash mite. It is harmless, and lives next to the roots of eyelashes. The photo was taken through a microscope, and shows the mite about 300 times larger than its actual size. This mite is about 210 micrometers in length. You might just barely be able to detect an eyelash mite with the naked eye in perfect conditions—if it weren’t nearly transparent!
about 2 to 5 pounds. The number of bacteria in the microbiome of one human is millions of times greater than the number of people living on Earth!

**Helpful Bacteria and Alien Invaders**

Most bacteria in the human microbiome won’t hurt you. In fact, the opposite is true. Many bacteria do important jobs for the human body. For example, bacteria living in your gut help break down food that your body couldn’t digest otherwise. Other bacteria help protect your body from infection, which helps to keep you healthy. All these helpful bacteria use the food and shelter your body provides. You depend on these bacteria, and they depend on you.

Unfortunately, not all bacteria are helpful. Harmful bacteria can invade the human microbiome through cuts, spoiled food, and even the air we breathe. An invasion of harmful bacteria or other microorganisms is called an infection, and infections can make people very sick. For example, a type of bacteria called *C. jejuni* produces a poison that harms cells from the human gut. When those cells can’t function, the gut can’t repair itself. This kind of *C. jejuni* infection can cause diarrhea, vomiting, and fever—all the symptoms of food poisoning.

**Antibiotics and the Microbiome**

Often, doctors treat infections with antibiotics. Antibiotics are medicines that kill bacteria. Antibiotics can stop dangerous infections, and they save millions of lives every year.

However, antibiotics don’t just kill harmful bacteria—they kill helpful bacteria, too. A person who has just taken antibiotics has fewer bacteria than normal. Helpful bacteria will grow back in time, but often the bacteria that return are different from the ones that were there before. Taking antibiotics changes a person’s microbiome.
Your Own Little World

Your body is the whole world to the bacteria of your microbiome. It’s an environment that provides microorganisms with everything they need, including food and space to live. What you do affects your bacteria, and they affect you, too. Your body is a world in miniature—a microbiome.

This microscope photo shows some bacteria in their natural environment: the human gut. The gut includes the intestines and stomach. In the photo, the bacteria appear 3,750 times larger than actual size. These bacteria are about 2 micrometers in length—nearly 50 times too small to see. (People added the colors in this photo to make the bacteria easier to see.)

Chart 1: Bacteria in a Healthy Gut Microbiome

Total number of bacteria: about 90 trillion

This pie chart compares the relative amounts of different kinds of bacteria in a typical healthy human’s gut.