

Diversity of Life 1

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10.4 Bacteria

They live on your body by the trillions, occupy habitats where no other organisms can survive (Figure 10.5), and devastate human populations with diseases such as plague and tuberculosis. Yet life on Earth would quickly end without them. *They* are bacteria, one of the most ancient lineages on Earth. Earth's oldest fossils, 3.5 billion years old, are of bacteria.



FIGURE 10.5

Bacteria can live in habitats where no other organisms can survive. These tiny bacteria were found in a 120,000-year-old ice core 3000 meters beneath a glacier in Greenland. They live in a habitat with subzero temperatures, high pressure, and very little oxygen or nutrients.

Bacteria are prokaryotes so diverse that it is hard to make generalizations about them. Some bacteria are autotrophs that, like plants, make their own food through photosynthesis. Others are chemoautotrophs that make food using chemical energy rather than energy from sunlight. Still others are heterotrophs that obtain food from organic matter. Heterotrophic bacteria are so diverse in what they eat that just about any type of organic molecule is food for some species of bacteria. Most bacteria are single-celled, but others gather in multicellular clusters. Bacteria come in varied shapes, including spheres, rods, and spirals. Many can move by using whiplike structures called *flagella*. Most bacteria are very small. However, a few are actually big enough to see with the naked eye! The largest bacteria known are *Thiomargarita namibiensis*, whose name means “sulfur pearls of Namibia.” (Discovered in Namibia, they grow in long strands like strings of pearls.) These giant bacteria are about the size of the period at the end of this sentence.

Bacteria typically reproduce asexually by dividing. However, most species exchange genetic material at least occasionally—when they take up small pieces of naked DNA from the environment, when bacterial viruses inadvertently transfer DNA between organisms, or when two bacteria join together and one passes DNA to the other. Under favorable conditions, bacteria can divide very quickly, as often as every 20 minutes.



This allows bacterial populations to grow rapidly when food is plentiful and conditions are good. In poor conditions, many bacteria form *spores*—tough, thick-walled structures that stay dormant until conditions improve.

Life on Earth would be impossible without bacteria because they play an important role in *decomposition*, the breaking down of organic matter. Without bacterial decomposition, carbon would stay trapped in dead organic matter, all the carbon dioxide in the atmosphere would eventually be used up, and photosynthesis would stop. Bacteria also help cycle other nutrients on Earth; some bacteria fix nitrogen, transforming it from its inorganic atmospheric form to varieties that can be used by living organisms.

Countless bacteria live in and on our bodies, particularly on the skin and in the mouth, respiratory tract, and intestines. A few of these are potentially harmful, but others benefit us by producing vitamins and by keeping more dangerous bacteria from invading our bodies. Bacteria are used to make foods such as cheese and yogurt, and some genetically engineered strains produce human insulin and other medically important molecules. Of course, other bacteria cause diseases, including tuberculosis, syphilis, and Lyme disease. The development of *antibiotics*, substances that kill bacteria, was a huge step forward in medicine.

READING CHECK

Some people get yeast (fungal) infections after taking antibiotics. Why?

CHECK YOUR ANSWER

Antibiotics kill “bad” bacteria as well as the normal “good” bacteria that live in our bodies. The “good” bacteria help keep yeast in check. With the good bacteria out of the way, yeast have a chance to grow.

You can learn more about bacteria here:

<https://www.livescience.com/51641-bacteria.html>

If you'd like to see photos of many different kinds of bacteria, check out this website here:

<https://www.atsu.edu/faculty/chamberlain/Website/gallery.htm>

One biologist finds bacteria so beautiful, he grows them in unique ways to create colorful art:

<https://ideas.ted.com/gallery-the-most-beautiful-bacteria-youll-ever-see/>



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