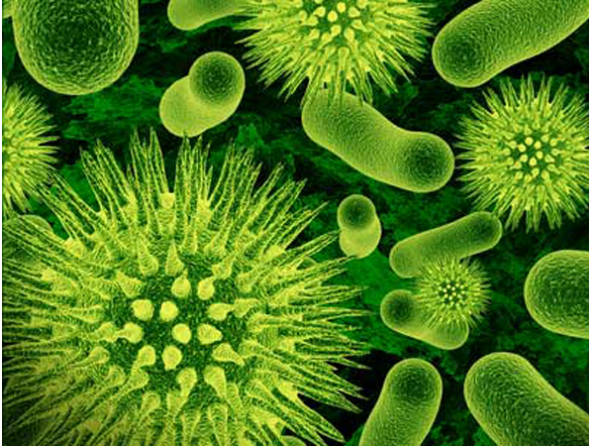


Could Humans Live Without Bacteria?

By Molika Ashford, Life's Little Mysteries Contributor
12 August 2010 2:18 PM ET



Almost 200 species of bacteria live on the average person's skin. Credit: Irochka | Dreamstime

The idea that trillions of bacteria are swarming over your skin and through your body is enough to give anyone the creepy crawlies.

But as long as humans can't live without carbon, nitrogen, protection from disease and the ability to fully digest their food, they can't live without bacteria, said Anne Maczulak, a microbiologist and author of the book "Allies and Enemies: How the World Depends on Bacteria" (FT Press, 2010).

Most people learn about bacteria in the context of disease, so it's easy to think about the harm they do. "It's a challenge to think about all the ways they help us because it tends to be more of a complex, multi-step process" Maczulak said.

Tiny recyclers

In soil and in the ocean, bacteria are major players in the decomposition of organic matter and the cycling of chemical elements such as carbon and nitrogen, which are necessary for human life.

Because plants and animals can't create some of the nitrogen molecules we need to live, soil bacteria and cyanobacteria (blue-green algae) play an absolutely indispensable role in turning atmospheric nitrogen into ammonium or nitrates — the forms of nitrogen that plants can absorb to create amino acids and nucleic acids, the building blocks of DNA. We eat the plants and reap the benefits.

Bacteria also play a role cycling another important substance for human life — water. In recent years, scientists from Louisiana State University have found evidence that bacteria represent many, if not most, of the

tiny particles that cause clouds to precipitate into falling snow and rain.

Bacteria and the body

On and inside the human body, bacteria offer still other benefits. In the digestive system, they help us break down food, like plant fibers, that we're not so good at handling ourselves.

"We get more nutrition out of our food because of bacteria," Maczulak said.

Bacteria in the digestive system also supply us with needed vitamins like biotin and vitamin K, and are our primary source for some of these nutrients, according to Maczulak. Experiments done on guinea pigs have shown that animals raised in a sterile environment without any bacteria are malnourished and die young.

Outside the body, the forest of bacteria on the skin (almost 200 separate species on a normal person, according to researchers at New York University) dominates the environment of the skin and its resources, keeping other bacteria from being able to establish a foothold, according to Maczulak.

And in or out, exposure to bacteria has been shown to be an important part of the development of our immune systems. Exposure to bacteria, both benign and harmful, is what primes the immune system to respond to pathogenic invaders later in life, according to Gerald Callahan, a microbiologist at Colorado State University. Research published in the *New England Journal of Medicine* has also shown that children who are sheltered from bacteria have a higher chance of developing asthma and allergies.

This is not to say beneficial bacteria can't also be dangerous. Usually, helpful bacteria and harmful bacteria are mutually exclusive, Maczulak said. But there is overlap, notably in the bacteria that inhabit the body.

"Staph bacteria is a good example because it's all over our skin," Maczulak said. A colony of *Staphylococcus aureus* living on the arm might be plugging along, crowding out intruders without harming the body, but if you get a cut or your immune system is compromised, those bacteria can run amok causing an infection.

The number of bacterial cells in the body is commonly estimated at 10 times the number of human cells.

"That's caused a lot of scientists to describe us as more bacteria than human," Maczulak said. It's a little creepy, "but it helps you visualize how large a role these organisms play."