

## MIGHTY MICROBES

### PART 1 MEET THE MICROBES

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Microbes or microorganisms are mostly single cells too small to be seen by the naked eye. Yet these microbes are found everywhere on earth on almost surface, underground or underwater and even in the air! Microbes live on our skin, in our gut, in the lure of a deep-sea anglerfish, the top of Mt. Everest, Antarctica, and the deepest part of the ocean. Some microbes make us sick and many others keep us healthy. Microbes are an important part of every food web. Overall, microbes keep the world healthy by performing some important tasks.

#### Microbes belong to four major groups: Bacteria, Fungi, Protozoa, and Viruses

**Bacteria:** Bacteria are single-celled organisms. They are so small, about 1,000 could fit on this line: (8mm long). Though many of us think of bacteria as "germs" that make us sick, they are so much more and essential to our survival. Bacteria are found everywhere. Some thrive in the frigid Arctic or Antarctic. Others live deep in the sea near in the heat of hydrothermal vents. Many live on and inside animals, including humans. Bacteria help cows digest the grass they eat. A person has more than 500 bacteria species inside their mouth. Bacteria help us digest food, fight cancer, and more. We use bacteria to make cheese and yogurt. Deep-sea anglerfish have a symbiotic relationship with bacteria. The luminescent bacteria live in the anglerfish's lure (called an esca) and provide the glow the anglerfish uses to attract prey. Other types of bacteria digest natural oil seeps and played important roles in the "decomposition" (breaking up complex compounds to simpler building blocks) and cleanup of the Deep Horizon Oil Spill (2010) in the Gulf of Mexico.

(Read more about bacteria, Microbe World:  
[www.microbeworld.org/types-of-microbes/bacteria](http://www.microbeworld.org/types-of-microbes/bacteria))

**Fungi:** Mushrooms, yeast, mildew, and mold are all kinds of fungi. Fungi live in the soil, plants, animals, water, and even in the air. People use yeast to make bread rise. Fungi help dispose of decomposing plants and animals, on land and in the water. Fungi are an important

**Size comparison.** In one teaspoon of soil, there are about a billion bacterial cells and 120,000 fungal cells

part of the marine environment by decomposition and can be found in and around algae, corals, mud, sand, detritus, and more. Scientists have also discovered oil-eating fungi.

(Read more about fungi, Microbe World:  
[www.microbeworld.org/types-of-microbes/fungi](http://www.microbeworld.org/types-of-microbes/fungi))

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## Mighty Microbes Background information (continued)



**Protozoa:** Protozoa are single celled microbes which have more complex cells and lifestyles than bacteria. Protozoa prefer a moist environment. They're found in all kinds of soil. They also live in water including the deep sea. Depending on the kind, protozoa eat bacteria, other kinds of protozoa, sometimes fungi, and organic matter sloughed off living things. Protozoa range in diameter from 1/5,000 of an inch to 1/50 of an inch. However, very little is known about protozoa.

(Read more about protozoa, Microbe World:  
[www.microbeworld.org/types-of-microbes/protista/protozoa](http://www.microbeworld.org/types-of-microbes/protista/protozoa))

**Viruses:** Viruses are smaller than bacteria. Viruses are basically DNA or RNA molecules (rather than cells like bacteria), surrounded by a simple coat or shell made up of protein. A virus invades the cells of living things then multiplies within it. Viruses can make a living thing or even kill it. They often infect bacterioplankton (planktonic bacteria), killing them. So these kinds of viruses add to the food web. There are also viruses, called phage, that infect bacteria.

(Read more about viruses, Microbe World:  
[www.microbeworld.org/types-of-microbes/viruses](http://www.microbeworld.org/types-of-microbes/viruses))

Microbes are important to our survival. Yet we know so little about them.

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PART 2 MIGHTY MARINE MICROBES

**Mighty Marine Microbes**

Ocean microbes help the earth breathe by producing about 40% of the oxygen we breathe. Microbes filter that amount of carbon dioxide through photosynthesis. Others remove methane. Some microbes can "eat" oil from the ocean. Just as microbes form partnerships (called symbiosis) with animals on land, they form very close partnerships with marine animals like sponges and corals in the ocean. For example shallow water corals depend on microbes called zooxanthallae. (Pronounced: zō-zahn-thell-ēē) Zooxanthallae provide energy and color for the coral. The Great Barrier Reef would not be possible if zooxanthallae were not there help. These little giants helped create the Great Barrier Reef. A reef so big it can be seen from space!

Little is known about microbes. Scientists, like Dr. Jose Lopez from Nova Southeastern University, are just beginning to discover more.

**DEEPEND Research and Dr. Jose Lopez's Lab:**

Dr. Jose Lopez’s lab has mostly worked on the marine organisms that live on the bottom of the ocean (like sponges and corals). His lab’s DEEPEND research focuses on the microbes that float in the water called “plankton.” (They are also known as bacterioplankton. Some are called phytoplankton because they photosynthesize.) Because bacterioplankton are some of the smallest organisms, they form the foundation of most food chain or webs.

A simple food chain would look like this: A bigger organism like a protozoan eats the bacteria, then a small worm or larvae eats the protozoan, a small crustacean eats the worm, and then a small fish eats the crustacean, which in turn gets eaten by larger and larger fish. A bird or shark may also eat the fish. This chain began with the tiny microbe – thank you microbes!

There are thousands of species of bacteria in the ocean. Scientists still do not understand how to grow many of them in a lab. That makes precise research difficult. However, the latest technology that allows us to study the DNA of larger ocean animals also allows us to study the smallest organisms in the sea, too. Scientists, like Dr. Lopez and his team can now read many microbiome genetic (DNA) sequences to give us at least some clue on the names of some of the microbes. DNA can tell us a lot of information about family ties (genealogies). This is a primary role for our microbial research within DEEPEND.

Though they are small, microbes are not small players when it comes to life on earth.

Read more about microbe groups, [Microbe World: www.microbeworld.org/types-of-microbes](http://www.microbeworld.org/types-of-microbes)

Thank you Dr. Jose Lopez, Nova Southeastern University

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Hagfish Day!