

What is a Protist?

There is no such thing as a typical protist. In fact, Kingdom Protista contains the most diverse organisms of all the kingdoms. There are single-celled (unicellular) protists as well as many-celled (multicellular) protists. Some are microscopic, others are very large. Some can make their own food, some cannot. Protists have only one thing in common—they are all eukaryotes. That means most of their metabolic processes (chemical reactions) take place inside their membrane-bound organelles. Other than that, organisms classified as protists are quite different from each other.

Some protists, called protozoans, seem to be like animals except that they only have one cell. Others, called algae, seem to be like plants except they do not have roots, stems, or leaves. Algae are photosynthetic and autotrophic. Unicellular algae are the basis of aquatic food chains and produce much of the oxygen in Earth's atmosphere. Still other protists seem to be like fungi except that they do not have the same kind of cell walls that fungi have. You can see why protists have been difficult to classify.

What is a protozoan?

A **protozoan** is a unicellular animal-like protist. Protozoans are found in moist environments. If you were to pick up wet decaying leaves from the edge of a pond and place them under a microscope, you would discover the small world inhabited by protozoans. Protozoans are a diverse group, but all feed on other organisms or dead organic matter. This means they are all heterotrophs. 🍷

Diversity of Protozoans

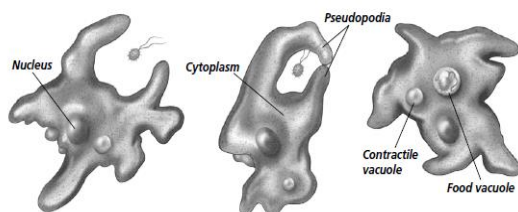
Protozoans have been separated into four groups: amoebas, flagellates, ciliates, and sporozoans. Three of the groups—amoebas, flagellates, and ciliates—are grouped according to the way they move. The fourth group, sporozoans, are grouped together because they are parasites. 🍷

Can amoebas change their shape?

Amoebas send out extensions of their plasma membranes to move and feed. These extensions are called **pseudopodia** (sew duh POH dee uh). Amoebas can do this because they do not have a cell wall. The shape of the amoeba changes as pseudopodia form. The illustration below shows how an amoeba feeds on small organisms. The pseudopodia surround the food.

Because amoebas live in moist places, nutrients dissolved in the water can pass directly through the cell membrane and into the organism. Freshwater amoebas (and other protozoans) sometimes absorb too much water. They have pumps in the cytoplasm that collect and pump out excess water. These pumps are called

contractile vacuoles. Remember that protozoans are found in moist environments. Amoebas that live in the sea are part of plankton. Plankton is an assortment of organisms, many of which are microscopic,



A As an amoeba approaches food, pseudopodia form and eventually surround the food.

B The food becomes enclosed in a food vacuole.

C Digestive enzymes break down the food, and the nutrients diffuse into the cytoplasm.

that float in the ocean and form the base of the ocean's food chain. One group of amoebas, called radiolarians, are an important part of marine plankton.

Most amoebas reproduce by asexual reproduction. In asexual reproduction, the amoeba divides into two cells, producing identical offspring.

How did flagellates get their name?

Flagellates (FLAJ uh luts) got their name because they are protists that have one or more flagella. Flagella are whip-like organelles that move from side to side and enable the protozoans to move about. Some flagellates are parasites. One type causes sleeping sickness in humans. Another flagellate lives inside the guts of termites. This protozoan produces an enzyme that digests wood, allowing the termite and the flagellate to use nutrients from the wood.

What are the ciliates?

Ciliates got their name from cilia, the hairlike projections that cover their bodies. They beat the cilia to move through the watery places in which they live.

Paramecia are one of the largest unicellular organisms. The illustration on page 210 shows the parts of a paramecium. You can see that it has many organelles and structures. Many structures may work together to perform one important life function. For example, a paramecium uses its cilia, oral groove, gullet, and food vacuoles for digestion.

Paramecia reproduce asexually by dividing into two cells. They also are able to reproduce through conjugation, which is a form of sexual reproduction. In an earlier chapter you learned that conjugation happens when an organism places its genetic material in another organism. In this process two paramecia join and exchange genetic material. Then they separate and each one divides through asexual reproduction, passing on the new genetic mixture.

What are the sporozoans?

Most of the organisms in the group of protozoans called sporozoans produce structures called spores. A **spore** is a reproductive cell with a hard outer coat that produces a new organism without fertilization.

All sporozoans are parasites. They usually live inside a host organism at the site of a steady food supply, such as in the animal's blood or intestines. Malaria is a disease caused by a sporozoan. Usually occurring in tropical climates, malaria is spread by certain types of mosquitoes. When an infected mosquito bites someone, the sporozoan that causes malaria is passed from the mosquito to the person it bites.

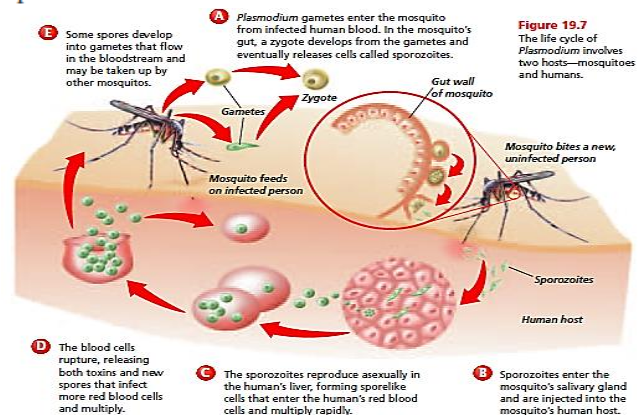


Figure 19.7 The life cycle of *Plasmodium* involves two hosts—mosquitoes and humans.

E Some spores develop into gametes that flow in the bloodstream and may be taken up by other mosquitoes.

A *Plasmodium* gametes enter the mosquito from infected human blood. In the mosquito's gut, a zygote develops from the gametes and eventually releases cells called sporozoites.

D The blood cells rupture, releasing both toxins and new spores that infect more red blood cells and multiply.

C The sporozoites reproduce asexually in the human's liver, forming sporelike cells that enter the human's red blood cells and multiply rapidly.

F Sporozoites enter the mosquito's salivary gland and are injected into the mosquito's human host.