

## Protists – Amoeba Anatomy

### Amoeba

The amoeba is a protozoan that belongs to the Kingdom Protista. The name amoeba comes from the Greek word "amoibe", which means change. Amoeba is also spelled ameba. Protists are microscopic unicellular organisms that don't fit into the other kingdoms. Some protists are considered plant-like while others are considered animal-like. The animal-like protists are known as protozoans. The amoeba is considered an animal-like protist because it moves and consumes its food. Protists are classified by how they move, some have cilia or flagella, but the amoeba has an unusual way of creeping along by stretching its cytoplasm into fingerlike extensions called pseudopodia. The word "pseudopodia" means "false foot". *Label* the pseudopodia. When looking at amoeba under a microscope, an observer will note that no amoeba looks the same as any other, the cell membrane is very flexible and allows for the amoeba to change shape. *Color and label* the cell membrane red. Amoebas live in ponds or puddles, and can even live inside people.

There are two types of cytoplasm in the amoeba, the darker cytoplasm toward the interior of the protozoan is called endoplasm, and the clearer cytoplasm that is found near the cell membrane is called ectoplasm. *Color and label* the ectoplasm light blue and the endoplasm pink. By pushing the endoplasm toward the cell membrane, the amoeba causes its body to extend and creep along. The amoeba also uses this method to consume its food. The pseudopodia extend out and wrap around a food particle in a process called phagocytosis. The food is then engulfed into the amoeba and digested by the enzymes contained in the amoeba's lysosomes. As the food is digested it exists in a structure called a food vacuole. *Color and label* the food vacuole green.

Also visible in the amoeba is the nucleus, which contains the amoeba's DNA. *Color and label* the nucleus purple. In order to reproduce the amoeba goes through mitotic division, where the nucleus duplicates its genetic material and the cytoplasm splits into two new daughter cells, each identical to the original parent. This method of reproduction is called binary fission. Another structure easily seen in the amoeba is the contractile vacuole. This organelle pumps out excess water so that the amoeba does not burst or lyse. *Color and label* the contractile vacuole yellow.

During unfavorable conditions, the amoeba can create a cyst, this hard walled body can exist for a long period of time until conditions become favorable again. *Label and color* the cyst dark blue. At this point it opens up and the amoeba emerges. Often cysts are created during cold or dry periods where the amoeba could not survive in its normal condition. Amoebas can cause disease. A common disease caused by the amoeba is called Amebic Dysentery. A person becomes infected by drinking contaminated water. The amoeba then upsets the person's digestive system and causes cramps and diarrhea. A person is most likely to be infected in countries where the water is not filtered or purified.

# There Is Algae in Your House!

Although fish and other seafood products make delicious, healthy meals for people all over the world, many American children would not mind if they never had to eat tuna casserole again. But they would mind if suddenly there were no more cheese, chocolate milk, peanut butter, pudding, frozen desserts and fruit drinks. What could such different foods have in common? Along with hundreds of other common foods and household items, they contain the protists known as seaweed.

Many kinds of seaweed are edible and rich in vitamins and iodine. They are as common in many Asian countries as green beans and carrots are in the United States. But until more people here develop a taste for sea vegetables, it is alginates, carrageenan, and beta carotene (seaweed products that act as stabilizers, thickeners, and colorants) that end up on our dining room tables.

Seaweeds are not really weeds but large forms of marine algae that grow in the coastal ocean waters of many countries. They include thousands of species ranging from microscopic plants called phytoplankton to giant floating or anchored plants.

The three main groups of seaweed are brown, red, and green algae. Each phylum provides important ingredients for the manufacture of food and other products.

**Carrageenan**, extracted from species of red algae, has been used as a stabilizing and gelling agent in foods such as chocolate, milk, instant puddings, frostings, and creamed soups. It is also used in cosmetics, pharmaceuticals, and industrial products.

**Agar**, made from red algae, is used to substitute gelatin, as an anti-drying agent in breads and pastry, and also for thickening and gelling. It is used in the manufacture of frozen dairy products, processed cheese, mayonnaise, puddings, creams, and jellies. A form of seaweed that has been dried and powdered to be used as a thickener in food. Traditionally used in Asia, it can be substituted for gelatin. It actually sets stronger than gelatin and does not require refrigeration to set up, so not as much of it is needed to achieve the required effect. It is often used in commercially produced ice cream as a thickener. This is the preferred thickener for vegetarians.

**Alginates** (Alginic acid) from brown algae thicken water-based products, also making them creamier and more stable over wide differences in temperature, pH, and time. A typical application is in preventing ice crystals from forming in ice cream. This chemical also is used as a stabilizer or emulsifier in a variety of products. This means they help liquids to stay mixed together without separating. Dressings, sauces, and beverages are important PGA applications. For sodium alginate the applications include cheese sauces, fruit fillings, instant flans and mousses, icings and glazes, and restructured foods such as onion rings, pimentos, and meats

**Beta-Carotene**, green algae's pigment, is used as a natural yellow-orange food colorant and may help prevent certain types of cancers.

## Protists – Ciliate Anatomy

### Paramecia

The Genus *Paramecium* is commonly found throughout the world, in fresh and marine water containing bacteria and decaying organic matter. *Paramecium* is a small unicellular organism. It is elongated and ranges in size from 120 to 300 microns. The outside of the cell is covered with a tough pellicle. The posterior half is slightly wider than the anterior half and is bluntly pointed, while the anterior end is rounded. On its underside there is a large and long groove running about half the length of its body. The outer surface of the organism is covered with many hundreds of minute hair-like projections called cilia.

This large ciliate protozoan that lives in stagnant freshwater has an oral groove on one side that leads inward to the gullet and eventually the mouth.

Paramecia have two nuclei --- a larger macronucleus and a smaller micronucleus. The macronucleus, which is relatively large and located near the center of the organism, controls most of the metabolic functions of the cell.

The micronucleus, which lies partly within a depression on the oral side of the macronucleus, is involved primarily in reproductive and hereditary functions.

Because paramecia live in water, they require an organelle to pump out excess water so they do not lyse (burst). These organelles are the contractile vacuoles, usually one at each end, each surrounded by several radiating canals which collect water from the surrounding cytoplasm. The contractile vacuoles serve a critical function of osmoregulation, as water tends to accumulate inside the cytoplasm due to osmotic pressure. These structures are absent in marine *Paramecium*. Food vacuoles, which are round in shape, contain enzymes to digest the other smaller protozoans that the paramecium feeds on. These vacuoles can be seen at the mouth where the food is loaded into them for digestion. Undigested food leaves through the anal pore. At the base of the cilia are defensive structures called trichocysts. These structures can discharge their contents as long threads.