

Organelle of the Day-Vacuole

In today's lab we are going to feed stained yeast cells to paramecia and watch the formation, movement and color change of food vacuoles as the digestive enzymes break down the yeast. We will also be observing the action of the cilia, the over-all movement of the organism and, if we are lucky, the action of the contractile vacuole. First of all let's learn a little about this organism called a paramecium.

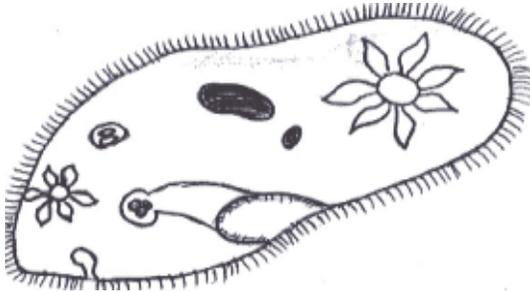
Find the pages in your book that discuss the paramecium. The paramecium is a member of the Kingdom* Protista. This kingdom contains some organisms that are animal-like, and some that are plant like. Animal-like protists are called protozoan, and plant-like protists are called algae. Protozoans can be grouped according to the way they move. Some move using short hair-like projections called cilia, others by flagella that are long whip-like hairs, and still others move by extending their plasma membranes in what is called a pseudopod, or false foot.

The paramecium is covered by numerous short, hair-like structures called _____ that allow the organism to move and to direct food into its oral groove. The oral groove is found in the middle of the paramecium. The cilia that line the oral groove direct _____ into the organism's gullet. When the food reaches the gullet, it is enclosed in a food _____. In the food vacuole enzymes break down food and nutrients diffuse into the _____. The process of breaking down food takes place over a period of time with the vacuoles circulating in the cytoplasm. At the same time, the food vacuole also collects waste, which it carries to the anal pore. Because paramecia live in freshwater, which is a hypotonic environment, water constantly enters the cell by the process called _____. To take care of this influx of water, the paramecium's two, star-shaped contractile vacuoles pump out the excess water. If it were not for these contractile vacuoles the paramecium would _____.

In today's lab, using the microscope, you are going to observe paramecia feeding on yeast that has been stained with **Congo red**, which will allow you to see the movement of food vacuoles and the digestion process. Because Congo red is blue at pH 3 and orange-red at pH 5, you will be able to see evidence of chemical changes in the food vacuoles as they move from the gullet through the cytoplasm to the anal pore. In addition to the food vacuole, you may see one or two contractile vacuoles. It may be a bit difficult to see them under the microscope, but you need to be patience. When the

*Kingdom Protista is an eclectic collection of organisms that have been grouped together for a variety of reasons, including the fact that they don't fit anywhere else.

contractile vacuole takes in water from the cell, the full vacuole appears circular, and when vacuole contracts to expel the water, it appears star-shaped. These actions help keep the paramecium's internal environment stable.



In order to get up close and personal with a paramecium carefully follow this procedure.

1. Get a clean slide and cover slip.
2. With a toothpick place three small (REALLY SMALL!) dots of **methyl cellulose** in the middle of the slide. (The purpose of the methyl cellulose is to slow down the paramecia so that we can more easily observe them.)
3. Using a pipette draw up a small portion of paramecium culture (follow teacher's instructions on how to do this) and put it on top of the methyl cellulose
4. Using a clean toothpick place a drop of the **Congo red stained yeast** in the drop of paramecium culture.
5. Carefully place a clean cover slip on the slide.
6. Place the slide under the microscope using the lowest power.
7. Locate paramecia and observe their movement.
8. With one or two individual paramecia in the center of your field of view, change to a higher power objective. Using the fine adjustment bring the paramecia into focus.
9. Locate the **oral groove** and observe the **cilia** as they beat and move yeast grains toward the **gullet**.
10. Identify **food vacuoles** and watch them migrate through the cell, changing color as the yeast is digested.
11. Draw and label several of the paramecia you have observed including all of the detail you can.

Paramecia

Magnification _____

Use a ruler to draw lines and label the following structures: food vacuole, plasma membrane, cilia, contractile vacuole and oral groove. The average length of a paramecia is about 0.15 mm. Calculate the actual magnification of your drawing. Remember measure your drawing in millimeters and then divide it by 0.15 mm. Write the magnification at the bottom of your drawing.

12. Wash off the microscope slide, dry it thoroughly, and put it in the location that your teacher directs you.
13. Turn off your microscope. Make sure it is on the lowest power, and use a slightly damp paper towel to wipe off the stage of your microscope.

Questions:

1. Describe the process by which the paramecia obtain food. Be sure to include the structures used by the paramecia.
2. Recent dumping of hazardous waste has released a toxin into the water that interferes with the function of the contractile vacuole in paramecia. Explain the effect this would have on the paramecia and why.
3. Why does the Congo red stain change color as the paramecium digests the yeast?