Name _____ Class _____ Date_____

Protists Feast on Yeast

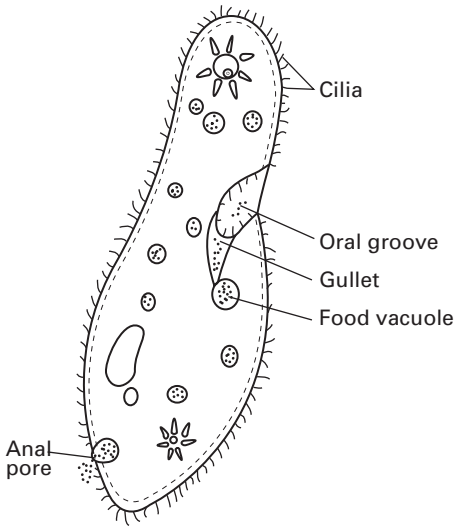
Observing Feeding in Paramecia

Question How do protists such as *Paramecium* eat?

Lab Overview In this investigation you will add dyed yeast to a culture of paramecia, then observe how the paramecia eat the yeast.

Introduction To begin the investigation you will read information about how *Paramecium* consume and digest their food. Then you will use this information and a few simple objects to build a model demonstrating how *Paramecium* feed.

Background Paramecia are unicellular organisms covered with cilia, which function in feeding and locomotion (moving from one place to another). An indentation along one side of the cell, the oral groove, is lined with cilia that sweep food into the cell. The end of the groove is sometimes called a gullet. The cell's plasma membrane bulges inward and pinches off a sac containing food, called a food vacuole. Food vacuoles merge with lysosomes (sacs containing digestive enzymes) and circulate throughout the cell. As the food is digested, nutrients diffuse from the vacuole into the cell. Later, undigested contents are released from the paramecium through a hole called the anal pore.



Paramecium

In this lab you will watch paramecia feed on yeast (a unicellular fungus). The yeast cells are dyed red so that you can see them enter the paramecia. As the yeast cells are digested in the vacuoles, the acidic environment of the vacuole will cause the red dye to turn blue.

Prelab Activity Do the following mini-activity, and then answer the Prelab Questions.

Membrane Model

Design a model showing how paramecia ingest food using the following materials.

- plastic grocery bag (paramecium)
- 4 small objects (yeast cells)
- rubber band

While designing your model keep the following rules in mind:

- The objects cannot enter through the opening of the bag.
- You can insert your hands into the opening of the bag to manipulate the "paramecium."
- The inside of the bag cannot come in contact with the outside environment.
- The objects should enter the bag at the same time.

Sketch or describe your model in the space below.

Prelab Questions

1. The method you modeled is actually called endocytosis. You might recall from Chapter 6 that endocytosis enables cells to ingest certain particles. What do you think needs to happen next in order for the paramecium to get the nutrients from the captured yeast? Explain your choice.
   a. The yeast is released into the cytoplasm of the paramecium.
   b. Digestive enzymes break apart the yeast cell into smaller molecules the paramecium can use.
   c. The yeast is pushed out of the paramecium.
   d. The yeast grows inside the paramecium and provides it with nutrients.

Name _____ Class _____ Date_____

2. When the food vacuoles turn blue, what does this indicate?

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Materials

- *Paramecium* culture
- transfer pipette
- well slide with cover slip
- toothpick
- yeast paste (dyed with Congo red)
- microscope
- colored pencils

Procedure

Part A: Observing Ingestion of Yeast

1. Use a transfer pipette to draw up a small amount of the *Paramecium* culture. Be sure to draw up some of the sediment at the bottom of the dish, where most of the paramecia are found.

2. Place 2 drops of the *Paramecium* culture in the indentation of the well slide.

3. Use the point of a toothpick to pick up a tiny speck of the dyed yeast paste. Use the toothpick to swirl the speck of yeast paste into the drop of *Paramecium* culture on the slide.

4. Place the cover slip over the well and put the slide on the microscope stage.

5. Focus on low power first. Adjust the lighting as needed to see the paramecia. Move the slide around to find one or two paramecia that are trapped in yeast paste.

6. Switch to medium power (100×). You can do most of your observations at medium power. If the paramecia you are observing are not moving around much, you can switch to high power to observe more details.

7. Observe the yeast cells. How is the movement of the paramecium's cilia affecting them? Record your observations below.

Observations

8. Look for red spots of dyed yeast inside a paramecium. Does the paramecium ingest the yeast one at a time or several at a time? Write your observations in the space provided.

Observations

Part B: Observing Digestion of Yeast

1. Turn off the microscope light. Wait 5–10 min for the digestive enzymes to start to digest the yeast.
2. Look again for a paramecium that is stuck in the yeast paste. Look for any vacuoles in the cell that have turned blue. Draw a sketch of the paramecium using different colored pencils to distinguish the red yeast cells and blue vacuoles. Label the sketch appropriately.

Sketch

Analysis and Conclusions

1. Describe how paramecia ingest and digest food.

Name _____ Class _____ Date_____

2. Based on the action of the digestive enzymes in lysosomes, why do you think it is important that digestion take place within food vacuoles?

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3. Why did you focus on paramecia that were stuck in yeast paste? If you did not find any stuck in the paste, how did that affect your investigation?

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Extension

Not all protozoans ingest food in the same way as *Paramecium*. If your teacher makes available a culture of a protist that feeds on *Paramecium* you can compare the feeding method of this protist and the method of *Paramecium*. Place one drop of a *Paramecium* culture and one drop of the predator culture on a well slide. Place a cover slip on top. View the slide through a microscope and focus on low power. Once you have found paramecia and a predator in the same field of view, switch to medium power and observe what happens. Draw detailed sketches of your observations.