

Protozoa Hatchery Kit

This kit contains the materials needed to hatch a culture of various live protozoa and algae species. As they hatch, you can study these organisms with the aid of a microscope. A 40-100x microscope is sufficient to study movement of all but the smallest protozoa. A 400x microscope is recommended to observe their cell structure and eating habits.

Materials in this kit include:

- 1 vial protozoa dry culture mixture
- 2-3 wheat grains (protozoan food) included in vial
- 1 plastic pipet for transferring protozoa
- 1 plastic disposable cup for culturing protozoa

Hatching Instructions

1. Fill the plastic disposable cup with spring or natural bottled water and add the contents of the dry protozoan culture. Do not stir or shake the cup once the mix has been added.
2. The protozoan culture vial includes 2-3 grains of wheat. Make sure the wheat grains are included in the cup to provide food for the protists.
3. Place the culture in a place where the temperature stays a fairly constant 65-75°F and the light is not bright. Do not place near a window, heater, refrigerator, stove, or any place where temperature changes occur.
4. Fill a glass or jar with spring or natural bottled water at the same time and keep it nearby so you can replace evaporated water in your culture if necessary.
5. Do not cover the culture as this will upset the air directly above the water. Protozoa are living organisms and need oxygen.

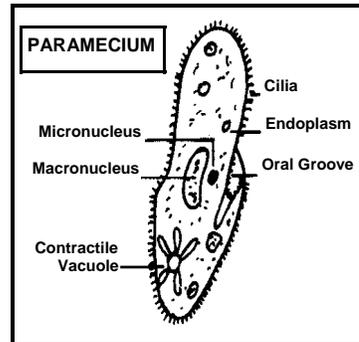
Observation Instructions

1. Protists will usually begin to appear after 24 hours. Each day, use the pipet to take a sample of the water near the material floating on the surface of the water. Place 1-2 drops on a plain microscope slide. Gently place a coverslip over the water drop.
2. Examine the slide with your microscope starting at 40x (4x objective). Most protists have little color and are very difficult to see in bright light, so turn your microscope diaphragm to the lowest light setting. It will take patience to adjust the lighting and focus the microscope. Initially you will see very tiny dots moving around on the slide. Some move very rapidly, others more slowly. Some will be round in shape, others more oblong. Once you find an area of protist activity on the slide, turn the magnification up to 100x or even 400x to see them better.

3. If no animals are visible, try again each following day. Many conditions, such as water hardness, temperature, and water acidity, can affect the growth and development rate of these organisms.
4. Each succeeding day you will typically find more and different varieties of protozoa in your culture. Initially, smaller species will be prevalent. As the days pass larger species will appear. You will also see different algae forms appear. Gradually, food and water conditions will change, affecting the growth and development rates of the different protozoa.

Identifying Protozoan Types

Paramecium: Under 100x you will see elongated organisms similar to the one pictured, darting about rapidly. You can slow down the movements of the paramecium by taking a piece of lens or tissue paper and gently pulling the fibers apart until it almost rips. Place a piece of the paper on a slide and place a drop of culture at this point. The paramecia will be trapped by the fibers and will be confined to a small area, allowing you to see them better.



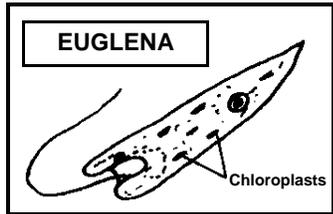
Ciliate movement: If you can reduce the light entering the microscope and increase the magnification, you will see tiny hair-like threads completely encircling the paramecium. These are called cilia. The cilia act as tiny oars to propel the paramecium through the water.

Eating method: Under high power you'll see the funnel-like opening going from one end of the paramecium to its middle, covered with cilia. These cause a water current that sweeps tiny particles into its mouth. At the end of the mouth is a food vacuole. This collects food until it is a certain size and then it detaches itself from the mouth and floats inside the cell to feed the animal. Many food vacuoles can be found in a paramecium at one time.

Defenses: Add a drop of methylene blue or food coloring to a drop of culture. Cover with a cover slip. You'll notice that the dye has killed the paramecium, but if you look closely, you'll see long hairs called trichocysts (trick-o-sists). Scientists believe the paramecium uses these to defend itself from its enemies.

Asexual reproduction: When a paramecium grows large, it splits into two identical paramecia and each swims away as if nothing had happened. Under ideal conditions a paramecium can split every hour. That means after one day one paramecium can reproduce over 8 million paramecia!

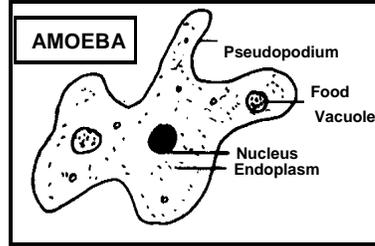
Euglena: **Flagellate movement:** At the back of the euglena is a hair-like whip called a *flagellum*. As the animal moves the flagellum back and forth it is able to swim much like a snake swims through water. Euglena can also crawl across flat surfaces like caterpillars.



Eating method: While most protozoa capture their food like the paramecia, euglena are different. Inside euglena are small blackish-green chloroplasts. Euglena can manufacture their own food by using minerals and light much in the way a plant gets its nutrition.

Even today some scientists are not sure if euglena are animals or plants. After you have studied euglena under the microscope make a list of reasons why you think euglena are plants or animals.

Amoeba: Amoeboid movement: Notice the amoebas seem to flow along the slide. This type of movement is called amoeboid movement (a-me-boyd); the amoeba uses *pseudopodia*, or temporary foot-like extensions, to move. Our white blood cells move in our bodies in the same way.



Eating method: The amoeba encircles its food with its body and absorbs it into a food vacuole similar to the paramecium. The amoeba takes its food from the vacuole and inedible parts are left behind.

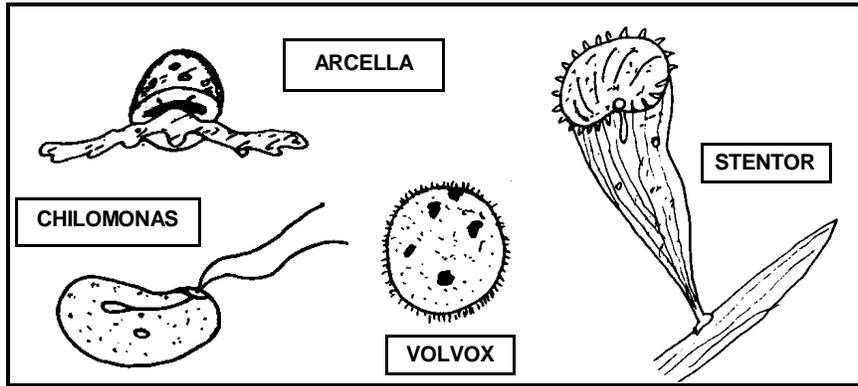
Other Protozoa:

See how many of the organisms illustrated below you can find, or use the more detailed dichotomous key to identify your protozoa.

Volvox:

This is a type of unicellular green algae that exists in colonies. The volvox colony is green, round-shaped, and hollow, with dark spots scattered throughout. Under high power, daughter colonies within the parent colony will be visible.

Algae are tiny plants that contain chlorophyll, and are usually classified by color (green, red, brown, yellow, and blue-green). Some other algae you might see are *anabaena* and geometrically-shaped *diatoms*.



Other Experiments with Protozoa

When observing protozoa, use a sketchbook to take notes and draw pictures of each different type that you see. Be sure to note whether they are in colonies, what colors they are, etc. Add a few fibers from a cotton balls to your slide to slow down the protists for better viewing.

- 1. Type of Movement:** Look to see if the animal moves by flowing (as an amoeba), with cilia (as a paramecium), by flagellum (as a euglena), or is stationary.
- 2. How it Eats:** See if you can find out how the animal eats. Does it allow food to flow into its mouth, encircle its food, or manufacture it?
- 3. Effect of Light:** Put a light on one side of the slide. Does the animal move toward or away from the light, or is it unaffected by the light? What happens when you bring the light closer? Euglena are attracted to medium-strength light, but high intensity repels them.
- 4. Chemical Effects:** Add a drop of salt solution to one side of the slide. Do the protozoans go nearer to or further from the salt? Try the same with vinegar.
- 5. Temperature Effects:** What happens if you place your culture in the refrigerator for an hour? What about a warm water-bath? Take a sample and use your microscope to observe any changes.

The Basic Parts of the Animal Cell

A typical animal cell has many parts. A few of these have already been mentioned. Below is a description of some other parts and their uses. See if you can find them on your specimens.

Nucleus: Sometimes this is difficult to see in a living cell. Try a drop of methyl blue on your slide. This will kill the animals but the nucleus will become very clear. In the nucleus are chemicals that control the growth and reproduction of the cell. It is here that the genes of an animal are found.

Endoplasm: The fluid-like material that makes up the major part of the cell is called the endoplasm. It is here that all movement and nutrition take place.

Cell Membrane: This is the outer covering of the cell. It gives shape and form to the animal. Some protozoa, such as the paramecium, have cilia connected to the cell membrane.

Vacuoles: The circular structures inside the cell are called vacuoles. There are food vacuoles that hold food for digestion, contractile vacuoles that expand and contract to keep the pressure inside the cell constant, and many others.

Stigma: These are light-sensitive spots found on euglena.