

Cell Structure and Cell Types

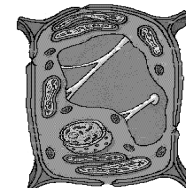
Introduction:

In this laboratory activity you will study biology from the viewpoint of the individual cell. Although the cell is considered to be the building block of all organisms, cells differ enormously in shape, size and capability. Prokaryotic cells are less complex, are usually found only in unicellular organisms and have more limited capabilities than eukaryotic cells. Multicellular organisms are made up of highly integrated aggregations of specialized eukaryotic cells, but some complex organisms consist of a single eukaryotic cell.

PURPOSE:

To examine the similarities and differences between plant and animal eukaryotic cells and prokaryotic cells using microscopic evidence.

PROCEDURE:



Part A. Basic Plant Cell Structure

1. Onion Epidermis

- a. Obtain a piece of a single piece of sliced onion bulb. Snap the piece in half and, using forceps, peel a bit of tissue-like, transparent epidermis from the inner layer. Mount the piece of epidermis in tap water on a glass microscope slide. Be certain that it is flat and not doubled over itself. Add a coverslip and *gently* press it down with a pencil eraser to remove as many air bubbles as possible.
- b. Observe the specimen under low power. If you see a confusing mass of overlapping cell parts, you probably do not have a good piece of epidermis. Scan your slide for a single layer of cells that resembles a brick wall. If you can not find such a view, then prepare another slide.
- c. As you view onion epidermis cells, note that the cell membrane is tight against the cell wall and too thin to be seen with a light microscope. Note also any signs of nuclei.
- d. Remove the slide from the microscope. Add a drop of iodine stain to the slide immediately next to the coverslip but not on top of it. With a small piece of paper towel, draw the stain under the coverslip by placing the towel on the opposite side of the stain and touching the water. This action should wick the water out from under the coverslip and draw the stain in.
- e. Observe the epidermis cells again under low power. Note that the cells are now colored, with the cell wall, nucleus and nucleoli stained more darkly than the cytoplasm. Try to distinguish between the cytoplasm and the large central vacuole.
- f. Observe the cells under high power to help you better distinguish cell structures.
- g. Make a sketch of a few onion cells. Label the **cell wall, cell membrane, cytoplasm, central vacuole, nucleus and nucleolus**.
- h. Wash and dry the slide and coverslip for the next specimen.

2. *Elodea*

- a. Break off a single leaf near the tip of an *Elodea* plant and prepare a wet mount. Position the slide so that you are observing the edge of the leaf near the tip. Observe the cells both under low power and high power. If you are viewing at the edge of the leaf you should see only one cell thickness. You should also see two types of cells. One type of cell has a smooth margin facing the environment; the second type, called a *spike cell*, has a projection out into the environment.
- b. The thick cell walls and the green chloroplasts are the most conspicuous structures. Sometimes a shadow of a nucleus can be seen. If you are patient and fortunate, you may see movement of the chloroplasts around the periphery of the cell. This movement, called *cyclosis*, is caused by cytoplasmic streaming.
- c. Make a labeled drawing of a few *Elodea* cells to demonstrate your observations. LABEL **cell wall, cell membrane, cytoplasm, nucleus, chloroplast**



Part B. Basic Animal Cell Structure

1. Cheek Cells

- a. Make a wet mount of cheek cell epithelium by gently scraping the inside of your cheek with a toothpick and transferring the material to the drop of water on the slide.
- b. Place a coverslip in the edge of the drop of water and gently lower the coverslip down on the slide. If done slowly and carefully, there will not be air bubbles under the coverslip. If air bubbles are present another preparation should be made. Observe the cells under both low and high power.
- c. Make another wet mount and stain with **methylene blue**. Do this by placing the stain on one edge of the cover slip and drawing it through with a piece of paper towel held at the other edge of the cover slip.
- d. Make a labeled drawing of a few cheek cells to demonstrate your observations. LABEL cell membrane, cytoplasm, and nucleus.

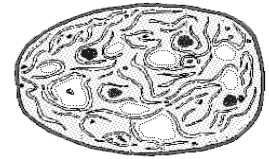
2. Human Blood Cells

- a. View the human blood first under low magnification and then turn to medium magnification. You will see both "purple" and "pink" stained cells. The "pink" cells are **red blood cells**. The "purple" cells are **white blood cells**. You may have to hunt for the white blood cells.
- b. Draw what you observe and label underneath the drawing properly.
- c. View the human blood cells under high magnification, remembering to use correct procedure for using a microscope.
- d. Draw what you observe, including at least one red blood cell and at least one white blood cell. Label the cell membrane, cytoplasm, chromatin, and nucleus.

Part B. Prokaryotic Cells

1. Bacteria

a. Obtain a prepared slide of bacteria. Since these prokaryotic cells are so small you will have great difficulty seeing them, even under high power. While searching for the specimens use the color of the stain to help you locate them.



b. After locating and observing the bacteria, observe them using high power.

c. Observe that the stained bacterial cells are of three major forms, spherical-shaped (called *coccus*), rod-shaped (called *bacillus*) and spiral-shaped (called *spirillum*).

d. Sketch a few bacterial cells, showing the three major structural forms. **Label the Types.**

DATA AND OBSERVATIONS:

Note: All drawings MUST be done in the following manner:

- On a piece of blank white paper, draw the specimen as seen under the microscope.
- The drawing **must be a minimum 4cm x 4 cm** in size.
- Beneath the drawing label the picture identifying the cells and give the magnification, such as "Cheek

Cells - 40X" OR Onion Cells with Iodine-100X."

- LABEL all identifiable organelles by printing horizontally. Use a **ruler** to draw a line to the object. The line **MUST TOUCH** the object labeled.
- Remember that detail is important in microscopic drawings.

QUESTIONS FOR DISCUSSION:

Part A:

Onion

- How do the cells of the onion compare with those of the cells you have seen before? Same? Different? How?
- How did the stain affect what you observed?

Elodea

- What is the general shape of an Elodea cell?
- What do you think the purpose of cyclosis is?

Part B:

Cheek

- Why are stains such as methylene blue used when observing cells under the microscope?
- Why is it possible to easily collect cells by gently scraping the inside of your cheek?

Blood

- What evidence do you have that human blood is not made of plant cells?
- Describe the shape of the red blood cells.
- How do the red blood cells compare to the white blood cells?
 - What is the function of each type of blood cell?
 - How does the structure of the red blood cell relate to its function?
 - How does the structure of the white blood cell relate to its function?

Part C:

Bacteria

- How does the size of the prokaryotic cells compare to the size of the eukaryotic cells?
- What cell parts were visible on the bacteria?

