

Lab: Cell Structure and Function

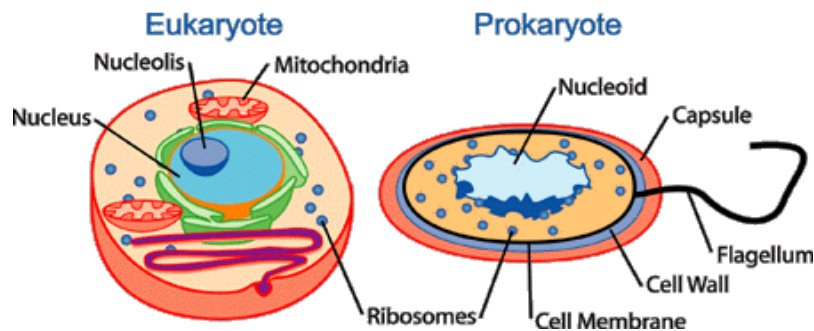
Cells are the basic unit and structure of all living organism. Although there are many differences between types of cells, all cells have similar structure and function. The study of cell structure and function is known as **cytology**. We will be using compound light microscopes to observe some of the structures of different types of cells. We will also be observing organelles. **Organelles** are sub cellular structures that have specialized functions and are located in the **cytoplasm**.

As you observe different types of cells, try to relate the structure of that cell or cell organelle to its function.

Lab Objectives:

- Draw and label cell organelles observed under a light microscope
- Identify similarities and differences of prokaryotic and eukaryotic cells
- Identify similarities and differences of plant and animal cells

Part I: Comparing Prokaryotic and Eukaryotic Cells



Prokaryotic cells are bacteria cells. They are cells that have a plasma membrane that is supported by a cell wall and a capsule. Most prokaryotic cells have flagella, whip like structures used for locomotion and pili, small hair like structures that help bacteria stick to surfaces or to other bacteria for to exchange genetic material. Inside the plasma membrane contains cytoplasm where **ribosomes**, **mesosomes** and **chromatin bodies** are found. Ribosomes are nonmembrane bound organelles made up of ribosomal RNA and protein and carry out protein synthesis. In prokaryotes, ribosomes are suspended in the cytosol. Mesosomes are structures which are extensions of the plasma membrane. Most important, chromatin bodies which contain the cell's DNA. Are found in the nucleoid, a region central to the cell, **and not enclosed by a membrane**.

Eukaryotic cells are cells that contain a membrane-bound nucleus and other organelles. Eukaryotes are larger than prokaryotes and have organelles that are more specialized, making them more complex than prokaryotes.

In this lab you will observe these differences. Using a light microscope, you will only be able to observe some of organelles of each type of cell. Use your text to identify these structures. Draw your observations on the worksheet provided.

Make sure to:

- Draw with great detail
- Label all structures visible
- Identify what magnification was used
- be as neat as possible

Materials: Compound microscope, microscope slides, cover slips, forceps, single edged razor blade, flat edged toothpicks, paper towel, iodine solution, methylene blue stain, onion, prepared microscope slides of cyanobacteria, yogurt, your textbook for reference, observation worksheet, lab questions worksheet.

Part I

Procedures:

Prokaryotes: Bacteria

Cynobacteria:

1. Place a prepared slide of cyanobacteria on the microscope stage and focus on low power.
2. Turn the nosepiece to the high power objective and observe the cells.
3. Draw your observations and label the cellular structures.
4. Answer questions #1 and #2.

Yogurt:

1. Using a flat toothpick, place a small dab of yogurt on a microscope slide.
2. Mix the small dab of yogurt with a drop of water and place a cover slip on top.
3. Examine the yogurt first on the low power objective and then on the high power objective.
4. Observe the masses of rod shaped cells and their external structure.
5. Draw your observations and label the structures.
6. Answer questions # 3 and #4.

Eukaryotes: Plant Cells

Onion Cells: Onion bulbs are organized tissue that, under the appropriate conditions, will give rise to an entire plant. The curved pieces that flake away from a slice of onion are called scales. On the underside of each scale is a thin membrane called the epidermis.

1. Obtain a piece of onion and remove one of the scales from it. Use forceps to pull away the epidermis from the inner surface. Be careful not to wrinkle the membrane. Place a drop of water on the center of a microscope slide, cut a piece of membrane about 0.5 cm square with a single-edged razor blade. CAUTION: Handle the razor blade with care. Using a toothpick to straighten out any wrinkles, place the membrane sample in the drop of water. Take a cover slip, and carefully place it over the sample, lowering it at an angle to the slide. This helps keep air from being trapped under the cover slip. You have just made a wet mount.
 2. Examine the epidermis first with the medium power objective of your microscope. Unstained specimens are often seen well with less light. Try reducing the illumination by adjusting the diaphragm of the microscope. Then examine it under high power.
 3. To stain your specimen, remove your slide from the microscope stage. Place a drop of iodine on the side of the cover slip, touching its edge. CAUTION: iodine is toxic. Draw the water from underneath the cover slip with a scrap of paper towel placed edge to the opposite side of the cover slip from the iodine drop. The stain will be drawn under the cover slip to replace the water that the paper towel scrap absorbs.
 4. Place the slide back on the microscope stage and observe as before. The iodine will stain the nucleus so it can be seen more clearly.
 5. Draw your observations and label the visible structures
 6. Answer questions #5-9
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Part II: Comparing Plant and Animal Cells

Eukaryotes: Animal Cells

Human Epithelial Cells (cheek cells) are flat cells found inside your mouth. Since we are animals, these are examples of animal cells. Prepare a slide of epithelial cells from your oral cavity, by the following procedure.

1. Take a flat toothpick (a NEW one) and using the large end, scrape the inside of your cheek 3 or 4 times.
2. Gently make a smear in the center of a clean slide, about the size of a dime. Carefully place 1 drop of methylene blue stain on the center of the smear.
3. Place a cover slip over the drop of stain.
4. Examine the cells, first under middle power, then under high power. At first, the field of view will be light blue and the cells will be a slightly darker blue. After a few minutes, the field will lighten and the cells will become slightly purple.
5. Answer questions # 10-25

Lab Questions: Answer all questions in your lab notebook.

Bacteria

1. Describe the structure of cyanobacteria.
2. What organelles are present?
3. Describe the structure of the bacteria found in yogurt.
4. How are these two bacteria different? Similar?

Onion Cells

5. What is the general shape of a typical onion cell?
6. What does the nucleus look like under high power?
7. Within an individual cell, where are the cytoplasm and the nucleus found?
8. On your observation sheet label the following structures in one cell: **nucleus, cell wall, central vacuole, and cytoplasm.**
9. What observable characteristics can be used as evidence for classifying a specimen as a plant? Use information from your textbook to help you with this question.

Comparing Prokaryotes and Eukaryotes

10. Using your observations, how are prokaryotes and eukaryotes similar in structure?
11. Explain what differences you observed between prokaryotes and eukaryotes.
12. How might these differences affect their functions as living organisms?
13. How do prokaryotes and eukaryotes differ as for complexity?

Cheek Cells

14. Inside the mouth, these cells are joined together in a sheet. Why are they scattered here?
15. How are these animal cells different from the plant cells you observed?
16. Draw a few cells and label the cell membrane, nucleus, and cytoplasm.

Comparing Plant and Animal Cells

17. What are the similarities and differences between plant and animal cells?
18. How do the shape and size of cheek cells differ from the onion cells?
19. Why are the shapes of the plant cells more consistent than the animal cells?
20. List the organelles that are common to animal and plant cells.
21. List the organelles that are found in plant cells and but **not** in animal cells.
22. Are there any organelles that are found in animal cells but not in plant cells?
23. What is the purpose of using stains when observing cells under a microscope?
24. What is the difference between unicellular and multicellular organisms?
25. Identify the unicellular and multicellular organisms you observed today.

Sources Cited:

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