Laboratory Exercise 5

Cell Structure and Function

Materials Needed

Textbook
Animal cell model
Clean microscope slides
Coverslips
Flat toothpicks
Medicine dropper
Methylene blue (dilute) or iodine-potassium-iodide stain
Prepared microscope slides of human tissues
Compound light microscope

For Learning Extensions:
Single-edged razor blade
Plant materials such as leaves, soft stems, fruits, onion peel, and vegetables
Cultures of *Amoeba* and *Paramecium*

Safety

- Review all the safety guidelines inside the front cover.
- Clean laboratory surfaces before and after laboratory procedures.
- Wear disposable gloves for the wet-mount procedures of the cells lining the inside of the cheek.
- Work only with your own materials when preparing the slide of cheek cells. Observe the same precautions as with all body fluids.
- Dispose of laboratory gloves, slides, coverslips, and toothpicks as instructed.
- Precautions should be taken to prevent cellular stains from contacting your clothes and skin.
- Wash your hands before leaving the laboratory.

Cells are the "building blocks" from which all parts of the human body are formed. They account for the shape, organization, and construction of the body and are responsible for carrying on its life processes. Under the light microscope, with a properly applied stain to make structures visible, the **cell (plasma) membrane**, the **cytoplasm**, and a **nucleus** are easily seen. The cytoplasm is composed of a clear fluid, the *cytosol*, and numerous *cytoplasmic organelles* suspended in the cytosol.

The cell membrane, composed of lipids and proteins, forms the cell boundary and functions in various methods of membrane transport. The nucleus contains fine strands of DNA and protein called chromatin. Various cytoplasmic organelles, including mitochondria, endoplasmic reticulum, and Golgi apparatus, provide specialized metabolic functions.

Purpose of the Exercise

To review the structure and functions of major cellular components and to observe examples of human cells.

LEARNING OUTCOMES

After completing this exercise, you should be able to

1. Name and locate the components of a cell.
2. Differentiate the functions of cellular components.
3. Prepare a wet mount of cells lining the inside of the cheek; stain the cells; and identify the cell membrane, nucleus, and cytoplasm.
4. Examine cells on prepared slides of human tissues and identify their major components.

EXPLORE

Procedure—Cell Structure and Function

1. Review the section entitled "A Composite Cell" in chapter 3 of the textbook.
2. Observe the animal cell model and identify its structures.
3. As a review activity, label figure 5.1 and study figure 5.2.
4. Complete Part A of Laboratory Report 5.
5. Prepare a wet mount of cells lining the inside of the cheek. To do this, follow these steps:
   a. Gently scrape (force is not necessary and should be avoided) the inner lining of your cheek with the broad end of a flat toothpick.
   b. Stir the toothpick in a drop of water on a clean microscope slide and dispose of the toothpick as directed by your instructor.

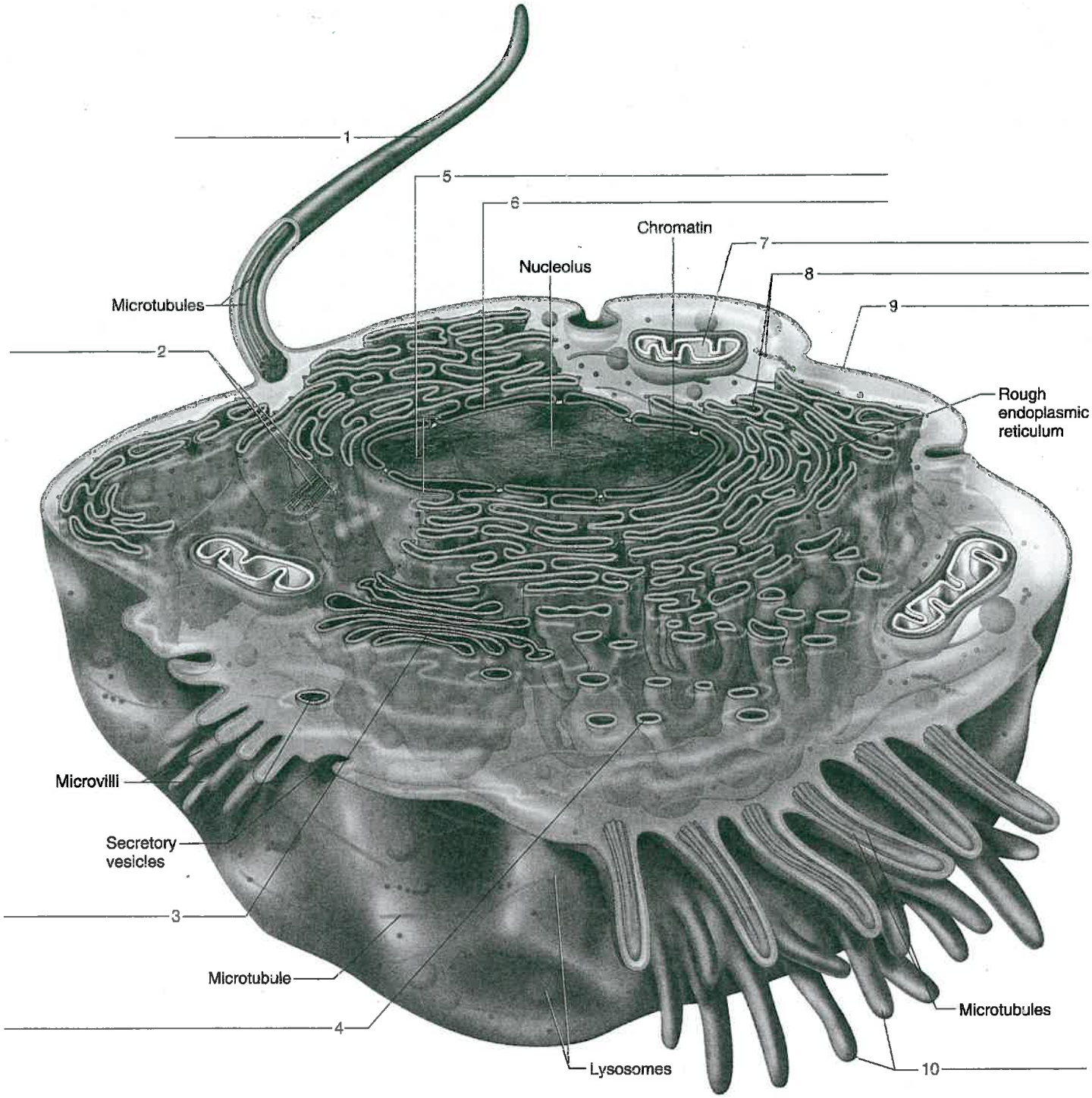

Figure 5.1 Label the structures of this composite cell. The structures are not drawn to scale.

c. Cover the drop with a coverslip.
d. Observe the cheek cells by using the microscope. Compare your image with figure 5.3. To report what you observe, sketch a single cell in the space provided in Part B of the laboratory report.

6. Prepare a second wet mount of cheek cells, but this time, add a drop of dilute methylene blue or iodine-potassium-iodide stain to the cells. Cover the liquid with a coverslip and observe the cells with the microscope. Add to your sketch any additional structures you observe in the stained cells.
7. Answer the questions in Part B of the laboratory report.
8. Using the microscope, observe each of the prepared slides of human tissues. To report what you observe, sketch a single cell of each type in the space provided in Part C of the laboratory report.
9. Complete Parts C and D of the laboratory report.

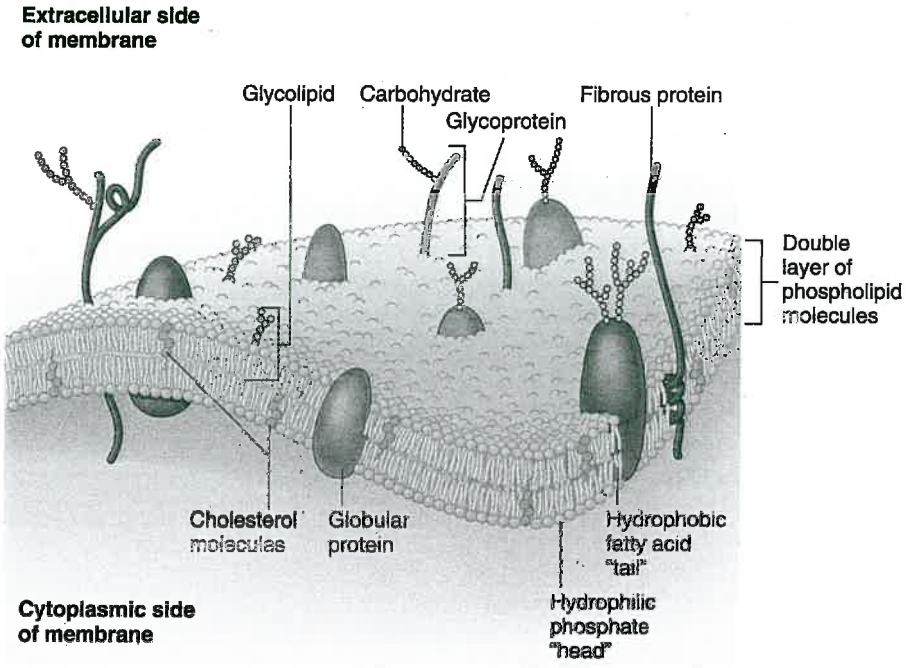

Figure 5.2 Structures of the cell membrane.

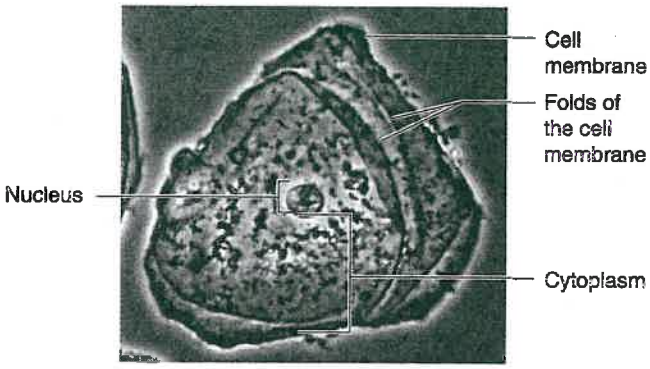

Figure 5.3 Stained cell lining the inside of the cheek as viewed through the compound light microscope using the high-power objective (400×).

Critical Thinking Application

The cells lining the inside of the cheek are frequently removed for making observations of basic cell structure. The cells are from stratified squamous epithelium. Explain why these cells are used instead of outer body surface tissue.

Learning Extension

Investigate the microscopic structure of various plant materials. To do this, prepare tiny, thin slices of plant specimens, using a single-edged razor blade. (*Take care not to injure yourself with the blade.*) Keep the slices in a container of water until you are ready to observe them. To observe a specimen, place it into a drop of water on a clean microscope slide and cover it with a coverslip. Use the microscope and view the specimen using low- and high-power magnifications. Observe near the edges where your section of tissue is most likely to be one cell thick. Add a drop of dilute methylene blue or iodine-potassium-iodide stain, and note if any additional structures become visible. How are the microscopic structures of the plant specimens similar to the human tissues you observed?

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How are they different? _____

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Learning Extension

Prepare a wet mount of the *Amoeba* and *Paramecium* by putting a drop of culture on a clean glass slide. Gently cover with a clean coverslip. Observe the movements of the *Amoeba* with pseudopodia and the *Paramecium* with cilia. Try to locate cellular components such as the cell membrane, nuclear envelope, nucleus, mitochondria, and contractile vacuoles. Describe the movement of the *Amoeba*.

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Describe the movement of the *Paramecium*.

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