

Co and Benjamin
Laboratory Manual in Animal Histology
2nd Ed

Laboratory Manual in Animal Histology (Biology 134)



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EXERCISE 1: THE CELL

Introduction

The basic building block of all organisms is the cell. A typical animal cell consists of a plasma membrane, the cytoplasm containing the organelles and a nucleus. Different cell types exhibit varied morphologies which reflect their specific functions.

Objectives

At the end of this exercise, the student should be able to:

1. distinguish the different types of animal cells;
2. correlate the structures of the cells with their respective functions; and
3. differentiate the structures observed under the light microscope (LM) from those observed under the electron microscope (EM).

The Animal Cells

Observe some representative cells of the animal and analyze their parts and structures that are visible under the light microscope.

1. Columnar cell - small intestine slide

Under LPO, find the innermost layer surrounding the lumen of the organ. It is a single layer of column-like cells with a single basal nucleus. **What is the shape of the nucleus?**

Note that the surfaces of the cells have a short array of linear protrusions. These are called striated border. **What is the function of these structures?**

2. Adipocyte - Skin slide

A very large cell (about 100 μm) usually occurring in cluster. The large cytoplasm appears as a round space delineated by a thin rim of cytoplasm. Note the dark nucleus at the periphery of the cell. **What accounts for its peripheral position?**

3. Red Blood Cell - Blood Smear slide

Very tiny cell (8-9 μm in diameter) and most numerous among the other blood cells. It is a biconcave cell with the central part that seems hollow. **Why?** Look for the nucleus. **Did you find one?**

4. Egg Cell - Frog's Ovary slide

Focus on the central region of the ovary and observe a round, large cell with intensely basophilic cytoplasm. Just beneath the plasma

membrane is a thin “foamy” layer. **What structures composed such layer?**

The central nucleus has numerous nucleoli located at the periphery of the nuclear membrane. **What is the function of the numerous nucleoli?**

5. Sperm cell - Rat's Testis slide

The numerous round structures are the seminiferous tubules containing the spermatogenic cells. Under HPO, focus on the innermost layer of cells near the lumen, these are the spermatozoa or the sperms. They are the smallest but longest among the other cells.

Using OIO, identify the parts of these cells:

- ❖ **Head** - densely-stained **nucleus** containing the genetic materials or DNA.
- ❖ **Tail** – elongated **flagellum** that is directed towards the lumen of the testis.
- ❖ **Neck** – usually invisible with LM, located between the head and tail parts.

6. Skeletal Muscle fiber - Longitudinal and transverse sections of the muscle.

Longitudinal section - cells are long and cylindrical with dark stripes along its length. The cross-striations are alternating dark and light bands on the muscle fibers. Beneath the plasma membrane, at the periphery of the cell are the nuclei. **How many nuclei can you find in a cell?**

Transverse section- each muscle fiber appears as polygonal structure with many nuclei at the periphery. Inside each muscle fiber are numerous “stippled” or dot-like structures that correspond to the myofibrils of the muscle fiber.

7. Nerve cell or neuron - Nerve smear slide

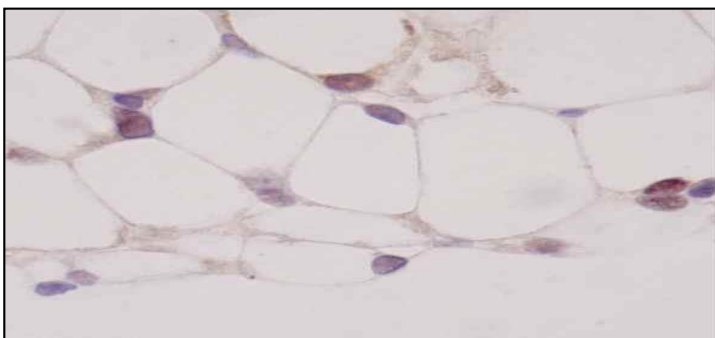
A neuron is composed of the following parts:

- i. **Soma** – the cytoplasm of the cell which appears stellate due to cytoplasmic processes arising from it.
- ii. **Nerve Fibers** – the cell processes
 - a. **Dendrites** – short, numerous cell processes extending from the soma.
 - b. **Axon** - single, long process extending from one region of the soma. It is not always evident in the smear except if stained specifically.

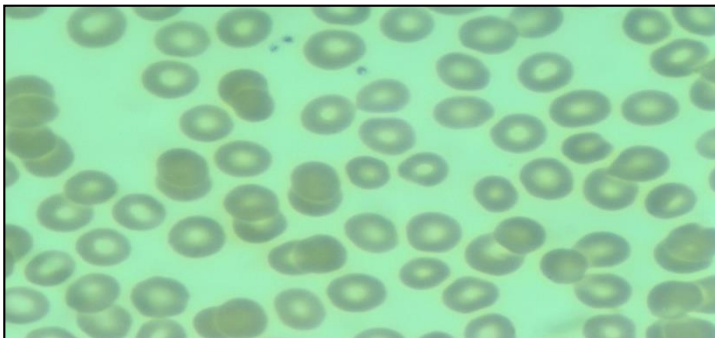
Illustrations



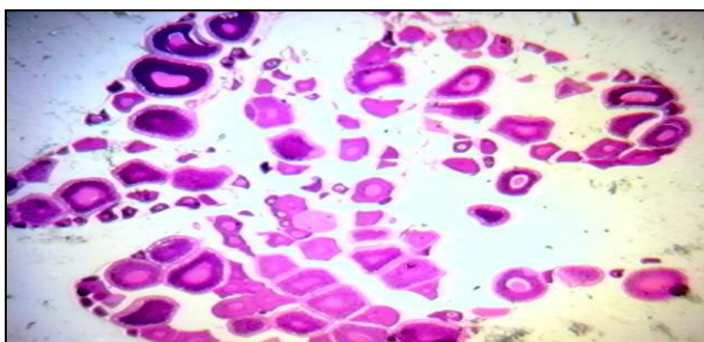
Columnar cell



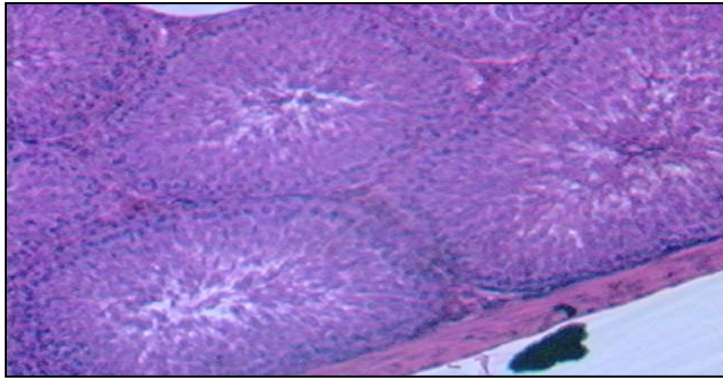
Adipose cell



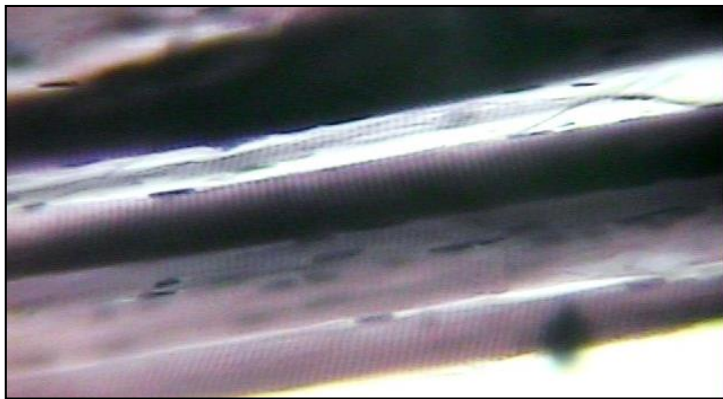
Human Red Blood cell



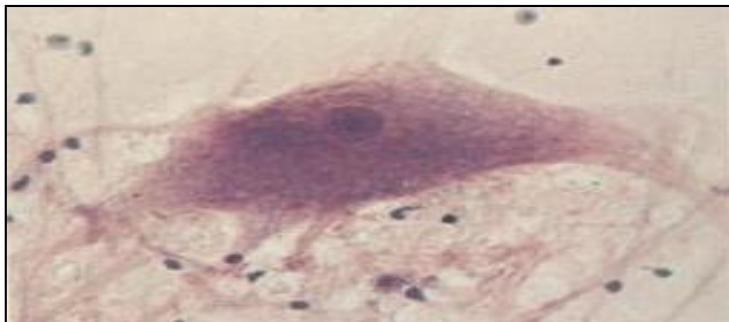
Frog's Egg cell



Rat's Sperm cell



Skeletal cell



Nerve cell

Guide Questions

1. What parts or structures are common to all the cells you have studied? If one of these structures is absent, what might be the consequence?

2. Among the cells studied, which is the most unique? Justify your answer.

3. What is the functional significance of the following:

a) The brush border of the columnar cell

b) The peripheral location of the nucleus of adipose cell

c) The absence of nucleus in RBC

d) The presence of many nucleoli in the frog's eggs

e) Dense or heterochromatic nucleus of the sperm cell

f) The transverse striations of the skeletal muscle cell

g) The nerve processes of a neuron

4. Cite other cells comparable to those you have studied.
