


Laboratory Exercise 10




Muscle and Nervous Tissues



Pre-Lab

1. Carefully read the introductory material and examine the entire lab content.
2. Be familiar with muscle tissues and nervous tissue (from lecture or the textbook).
3. Visit www.mhhe.com/martinseries1 for pre-lab questions.



Materials Needed

Compound light microscope
Prepared slides of the following:
Skeletal muscle tissue
Smooth muscle tissue
Cardiac muscle tissue
Nervous tissue (spinal cord smear and/or cerebellum)

For Learning Extension Activity:
Colored pencils

Muscle tissues are characterized by the presence of elongated cells, often called muscle fibers, that can contract to create movements. Many of our muscles are attached to the skeleton, but muscles are also components of many of our internal organs. During muscle contractions, considerable body heat is generated to help maintain our body temperature. Because more heat is generated than is needed to maintain our body temperature, much of the heat is dissipated from our body through the skin.

The three types of muscle tissues are skeletal, smooth, and cardiac. Skeletal muscles are under our conscious control and are considered voluntary. Although most skeletal muscles are attached to bones via tendons, other locations include the tongue, facial muscles, and voluntary sphincters. Functions include body movements, maintaining posture, breathing, speaking, controlling waste eliminations, and protection. Smooth muscle is considered involuntary and is located in many visceral organs, the iris, blood vessels,

respiratory tubes, and attached to hair follicles. Functions include the motions of visceral organs, controlling pupil size, blood flow, and airflow, and creating “goose bumps” if we are too cold or frightened. Cardiac muscle is located only in the heart wall. It is considered involuntary and functions to pump blood.

Nervous tissues occur in the brain, spinal cord, and peripheral nerves. The tissue consists of two cell types: neurons and neuroglia. Neurons, also called nerve cells, contain a cell body with the nucleus and most of the cytoplasm, and cellular processes that extend from the cell body. Cellular processes include one to many dendrites and a single axon (nerve fiber). Neurons are considered excitable cells because they can exhibit signals called action potentials (nerve impulses) along the neuron to another neuron or a muscle or gland. Neuroglia (glial cells) of various types are more abundant than neurons; they cannot conduct nerve impulses, but they have important supportive and protective functions for neurons.

Purpose of the Exercise

To review the characteristics of muscle and nervous tissues and to observe examples of these tissues.

Learning Outcomes

After completing this exercise, you should be able to

1. Differentiate the special characteristics of each type of muscle tissue and nervous tissue.
2. Sketch and label the characteristics of muscle tissues and nervous tissues that you were able to observe.
3. Indicate a location and function of each type of muscle tissue and nervous tissue.
4. Identify three types of muscle tissues and nervous tissue on microscope slides.

Procedure—Muscle and Nervous Tissues

1. Study the muscle characteristics in table 10.1.
2. Complete Part A of Laboratory Report 10.
3. Using the microscope, observe each of the types of muscle tissues on the prepared slides. Look for the special

TABLE 10.1 Muscle Tissue Characteristics

Characteristic	Skeletal Muscle	Smooth Muscle	Cardiac Muscle
Appearance of cells	Unbranched and relatively parallel	Spindle-shaped	Branched and connected in complex networks
Striations	Present and obvious	Absent	Present but faint
Nucleus	Multinucleated	Uninucleated	Uninucleated (usually)
Intercalated discs	Absent	Absent	Present
Control	Voluntary	Involuntary	Involuntary

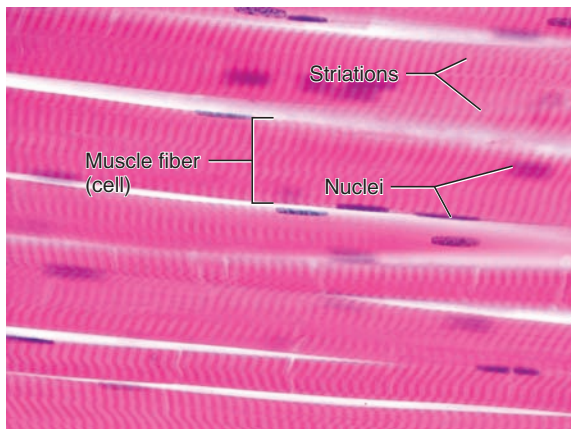
features of each type. Compare your prepared slides of muscle tissues to the micrographs in figure 10.1.

- As you observe each type of muscle tissue, prepare a labeled sketch of a representative portion of the tissue in the laboratory report.
- Observe the prepared slide of nervous tissue and identify neurons (nerve cells), neuron cellular processes,

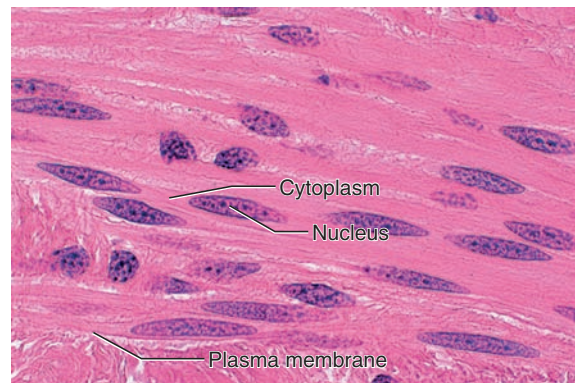
and neuroglia. Compare your prepared slide of nervous tissue to the micrograph in figure 10.1.

- Complete Part B of the laboratory report.
- Test your ability to recognize each of these muscle and nervous tissues by having your laboratory partner select a slide, cover its label, and focus the microscope on this tissue. Then see if you correctly identify the tissue. **A**

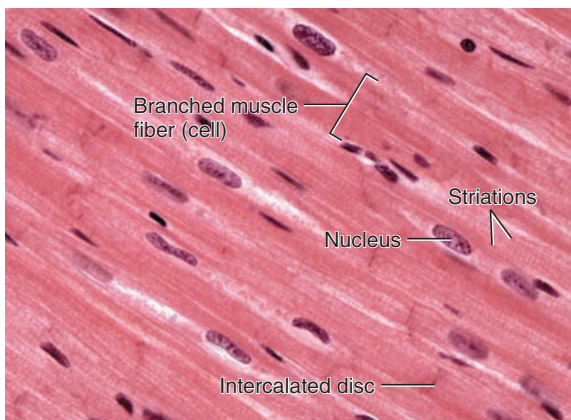
FIGURE 10.1 Micrographs of muscle and nervous tissues.



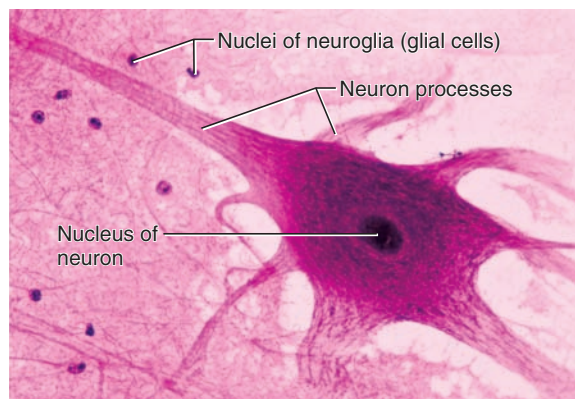
(a) Skeletal muscle



(b) Smooth muscle (from small intestine)



(c) Cardiac muscle (from heart)



(d) Nervous tissue

Laboratory Report

10

Name _____

Date _____

Section _____

The **A** corresponds to the Learning Outcome(s) listed at the beginning of the laboratory exercise.

Muscle and Nervous Tissues

Part A Assessments

Match the tissues in column A with the characteristics in column B. Place the letter of your choice in the space provided. (Some answers may be used more than once.) **A** **3**

Column A

- a. Cardiac muscle
- b. Nervous tissue
- c. Skeletal muscle
- d. Smooth muscle

Column B

- b 1. Coordinates, regulates, and integrates body functions
- a 2. Contains intercalated discs
- d 3. Muscle that lacks striations
- a 4. Striated and involuntary
- c 5. Striated and voluntary
- b 6. Contains neurons and neuroglia
- c 7. Muscle attached to bones
- a 8. Muscle that composes heart
- d 9. Moves food through the digestive tract
- b 10. Transmits impulses along cellular processes

Part B Assessments

In the space that follows, sketch a few cells or fibers of each of the three types of muscle tissues and of nervous tissue as they appear through the microscope. For each sketch, label the major structures of the cells or fibers, indicate the magnification used, write an example of a location in the body, and provide a function. **1 2 3**

<p style="text-align: center;">(sketches)</p> <p style="text-align: center;">Skeletal muscle tissue (____x)</p> Location: _____ Function: _____	<p style="text-align: center;">Smooth muscle tissue (____x)</p> Location: _____ Function: _____
<p style="text-align: center;">Cardiac muscle tissue (____x)</p> Location: _____ Function: _____	<p style="text-align: center;">Nervous tissue (____x)</p> Location: _____ Function: _____



Learning Extension Activity

Use colored pencils to differentiate various cellular structures in Part B.