

Co and Benjamin  
Laboratory Manual in Animal Histology  
2<sup>nd</sup> Ed

# **Laboratory Manual in Animal Histology (Biology 134)**



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## EXERCISE 4: THE MUSCLE TISSUES

### Introduction

Muscle tissue is composed of differentiated cells containing contractile proteins. The cells comprising this tissue are mesodermally-derived except the iris muscles. Their capacity to bring about movement is caused by various properties of this tissue such as excitability, contractility, conductivity and flexibility.

### Objectives

At the end of the exercise, the students should be able to:

1. identify and differentiate the types of muscle tissue; and,
2. correlate their structures to those observed under the electron microscope.

### Types of Muscle Tissue

#### A. **Smooth Muscle**- section of small intestine

Outer region/Longitudinal - cells appear to be fusiform in shape and lack striations. The cytoplasm of the muscle fiber is dark and an oval nucleus is seen in the center of the cell.

Inner region/circular- Notice that the nuclei of the cells in this region have different shapes and sizes. **What account for such differences in morphology?**

#### B. **Skeletal Muscle**- longitudinal and cross section of skeletal 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 are the nuclei. **How many nuclei can you find in a cell and where are they located?**

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.

Skeletal muscles are usually arranged in regular fashion surrounded by an external sheath of dense connective tissue. The *epimysium* surrounds the entire muscle, the *perimysium* envelopes bundle of muscle fibers and the *endomysium* surrounds individual muscle fiber.

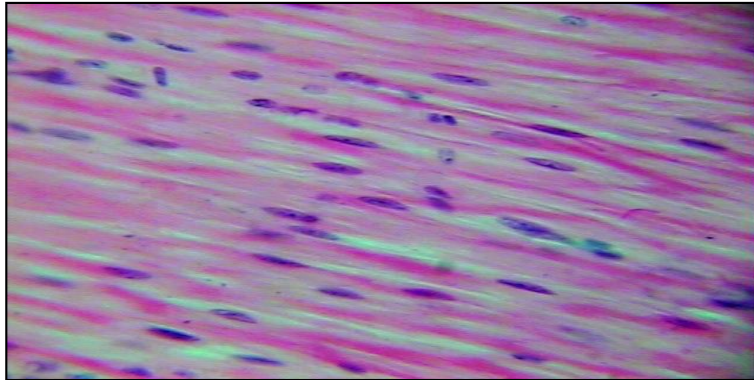
#### C. **Cardiac Muscle**-longitudinal and cross section of cardiac muscle

Cardiac cells have cross striations and appear elongated and branched.

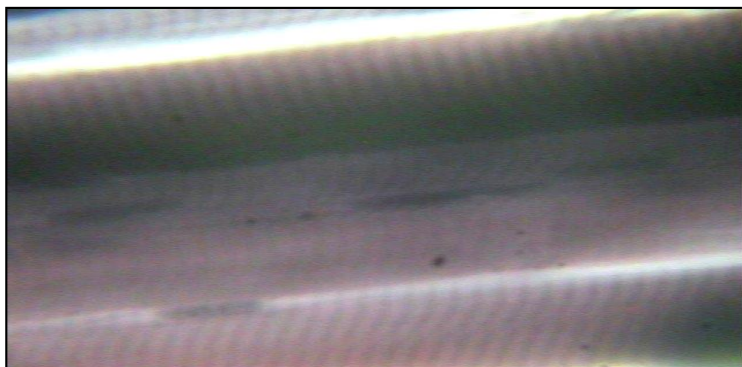
**How many nuclei can be seen and where are they located?**

Notice the darkly-staining transverse lines that cross the chains of cardiac cells at irregular intervals. **What are these structures? For what purpose do they serve?**

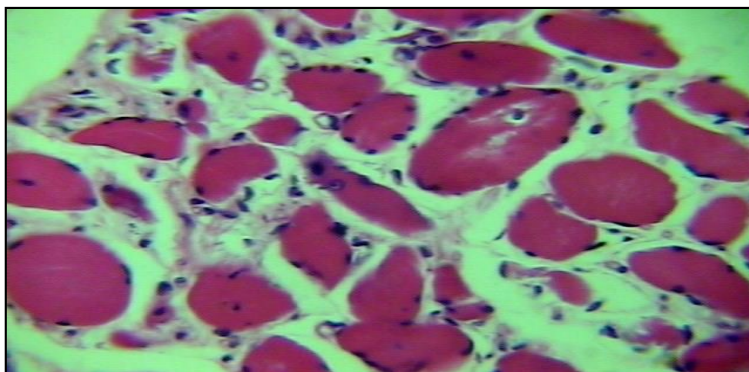
### Illustrations



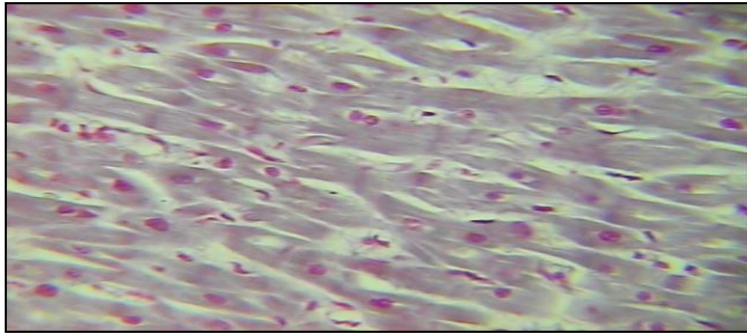
Smooth muscle



Skeletal muscle (l.s.)



Skeletal muscle (c.s.)



Cardiac muscle

**Guide Questions**

1. Differentiate the three types of muscles.

Criteria	Smooth	Skeletal	Cardiac
Shape			
Size			
Number of Nucleus			
Location of Nucleus			
Location in the Body			
Electron Microscope Features			

2. What junctional specializations are present in the intercalated discs?

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3. Trace the development of the muscles. How did they become different from one another? Draw the different stages of muscle development. Label them.

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