

This lab involves study of the laboratory exercise “*Microscopic Anatomy and Organization of Skeletal Muscle*”, completing the Review Sheet for the exercise, and taking the relevant quiz. You should also look at the Virtual Microscope and the other histology sites mentioned in the introduction to see a variety of skeletal muscle images.

Click on the sound icon for the audio file (mp3 format) for each slide. There is also a link to a downloadable mp4 video which can be played on an iPod.

You will note that there are more bones and contours in the lab manual than are identified in this PDF. The PDF focuses on only the most important.



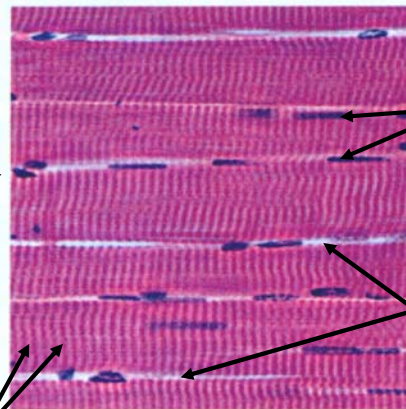
3 Types of Muscle Tissue A Comparison			
Muscle Type	Location	Characteristics	Control
Skeletal	Attached to the bones for movement	Long, cylindrical cells; multinucleated, striated	Voluntary
Cardiac	Muscle of the Heart	Short, branching cells, mononucleated, faintly striated. Forms functional syncytia.	Involuntary myogenic
Smooth Muscle	Single Unit: GI, Respiratory, & Genitourinary tract mucous membranes. Multi-unit: smooth muscle in blood vessel walls.	Small oblong cells, mononucleated, also may form a functional syncytium.	Involuntary myogenic

This chart shows a comparison of the three types of muscle.



Skeletal Muscle Characteristics

Skeletal muscle cells are long multi-nucleated cylinders, separated by connective tissue.



nuclei

Connective endomysium separates cells.

Striations are the dark bands perpendicular to cell length

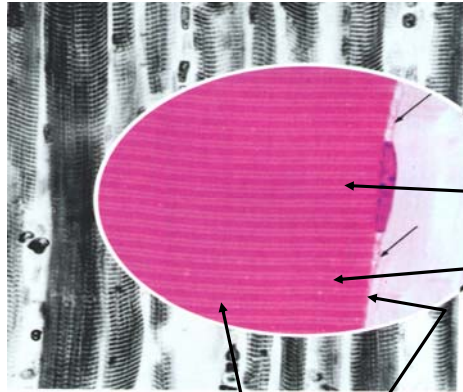


Myofibrils fill cell interior

Skeletal muscle consists of long cells which are separated from each other by a thin layer of connective tissue, the **endomysium**. This means that each cell must be innervated and stimulated separately by the voluntary nervous system. These long cells, sometimes as long as a foot, developed from individual **myocytes** which fused.



Skeletal Muscle photomicrographs



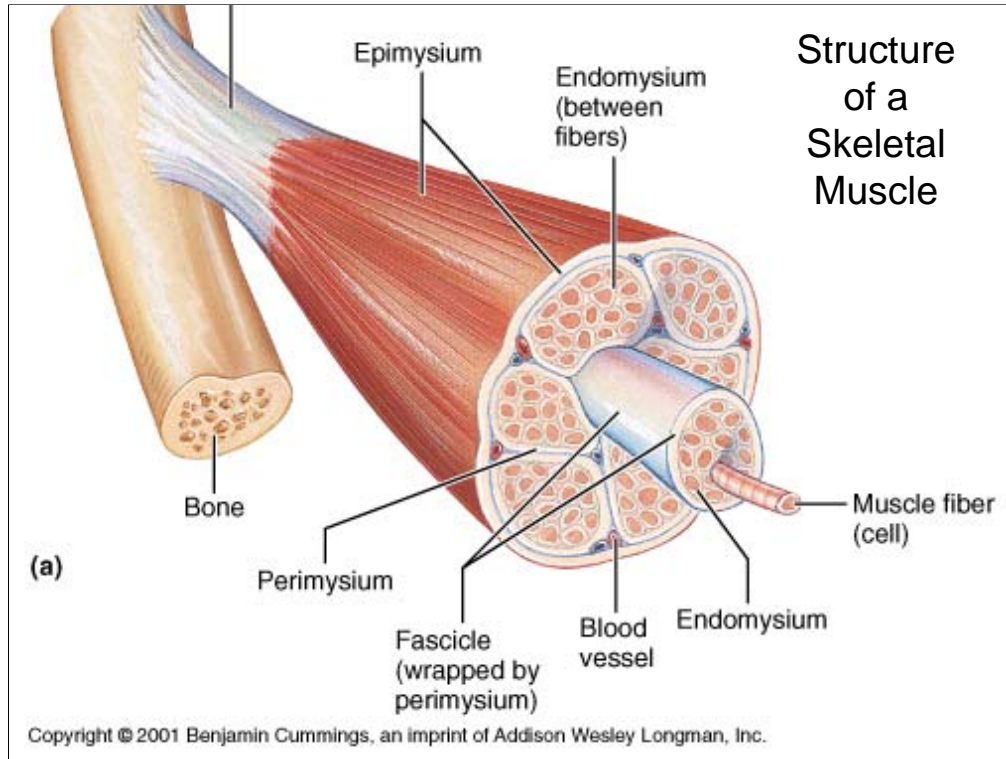
Z-line

The sarcolemma is the cell membrane

Striations reflect the arrangement of protein myofilaments within the cell. The dark bands are called A-bands, the light areas between are the I-bands.

Z lines run through the middle of each I-band. The unit from one Z line to the next is a sarcomere.

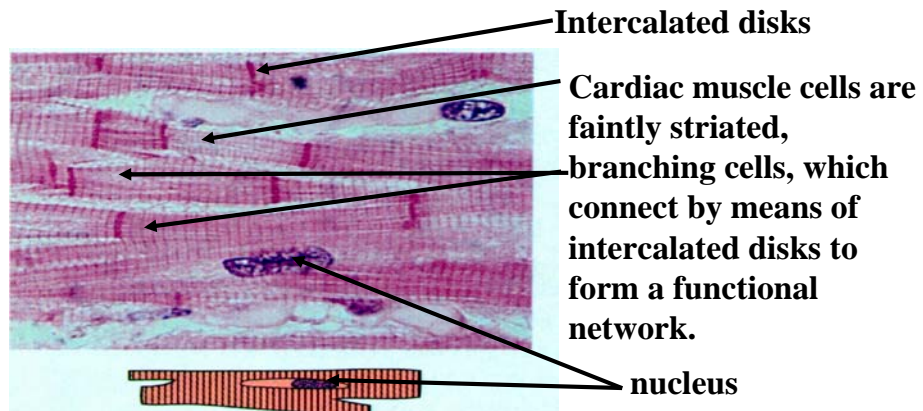
The striations visible externally are a function of the arrangements of the proteins internally. You will be learning about this arrangement and its function in lecture.



The hierarchy of connective tissues associated with a skeletal muscle provide a continuous connection between muscle cells and their action on a bone or other attachment. At the same time cells are effectively separated from one another and each is controlled by a separate nerve fiber.



Cardiac Muscle Characteristics



Cardiac cells are branched, mono-nucleated cells

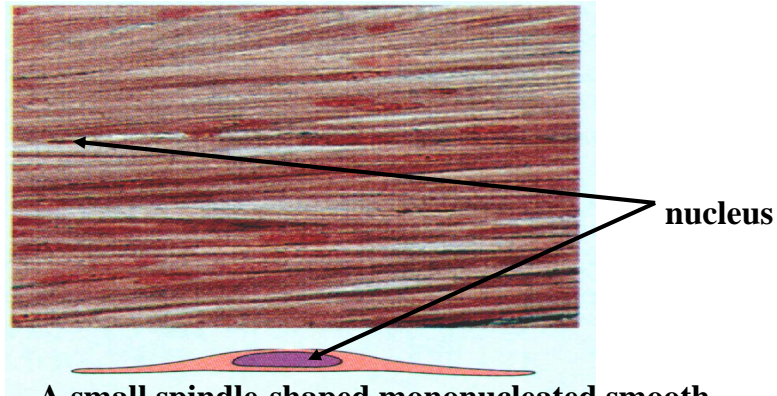
The action potential travels through all cells connected together in the syncytium causing them to function as a unit.

Cardiac muscle cells are short branching cells which connect together to form a functional unit, called a **syncytium**. There are two of these in the heart, facilitating contraction of the two atria together and the two ventricles together.



Smooth Muscle Characteristics

Smooth muscle cells connect to form single-unit syncytia similar to cardiac muscle. But impulses and contractions occur much more slowly in smooth than in cardiac muscle.



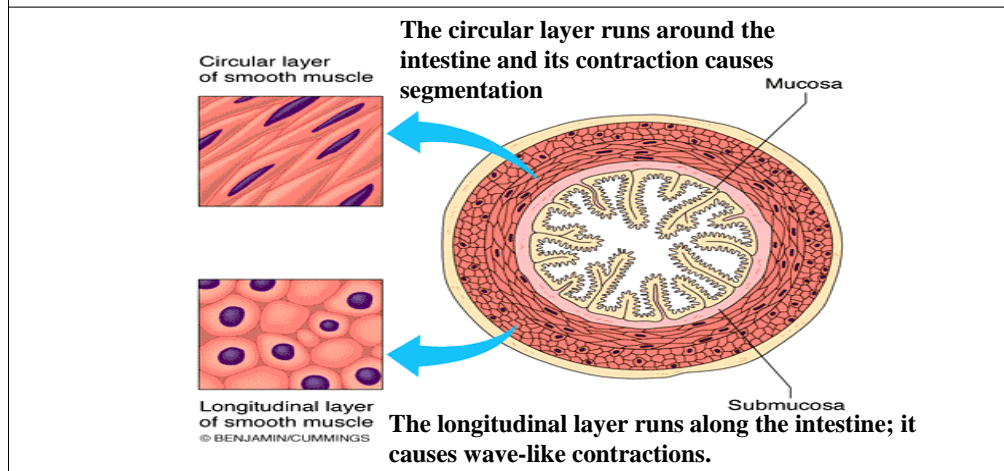
A small spindle-shaped mononucleated smooth muscle cell.

Individual smooth muscle cells are oblong, but it is always found as part of a tissue layer, e.g. in mucous membranes, or as a distinct band of cells, e.g. a sphincter.



Smooth Muscle Arrangement

In the intestine smooth muscle forms two distinct layers, one running along, the other running around the organ. Together these layers cause wave-like peristalsis which propels the contents.



Here's an example of how many of the tissues you've studied would fit together in an organ. The intestine consists of a mucous membrane covered by a serous membrane.



Lab Protocol

1. After studying the lab exercise and this PDF, complete the Review Sheet which accompanies the lab exercise.
2. Find examples of each muscle type in one or more of the histology sites mentioned in the introduction.
3. Take the quiz on the muscle organization and histology.