

Lecture 10: Hierarchical Structure of Muscle Tissue

Bio 6 Human Anatomy Worksheet: Muscle Tissue by Wendy Riggs

- Compare and contrast the characteristics of the three types of muscle tissue.
- Describe the organization of muscle tissue from cell to whole muscle to groups of muscles.
- Name the connective tissue layers that surround each cell, fascicle, muscle, and group of muscles and
- indicate the specific type of CT that composes all these layers.
- Identify the required individual (axial) muscles, and for each, know its origin, insertion, major action.

Muscle Tissue

Muscle tissue SHORTENS and does WORK (work = force x distance). The hierarchical structure of muscle tissue is key to understanding muscle function at every organizational level

1. Muscle tissue has a special structure that specifically enables its unique function: contraction
2. Muscle contraction usually means SHORTENING of the muscle cells along their LONG AXIS.
3. 3 classifications of muscle tissue:
 - A. Skeletal muscle (aka voluntary striated)
 - i. Attaches to BONE ORGANS (most of the time) and controls movements
 - ii. Encircles orifices
 - iii. "Guards" entrances and exits...
 - iv. Thermoregulation
 - B. Smooth muscle (involuntary, non-striated)
 - i. Found in the viscera (blood vessel walls, gut walls, pipes of urogenital and respiratory systems...)
 - ii. Play a role in maintaining blood pressure homeostasis
 - C. Cardiac muscle (involuntary, striated)
 - i. Found only in the heart
 - ii. Pumps blood and maintains blood pressure

Skeletal Muscle Structure

Details about skeletal muscle...

1. A skeletal muscle organ is the muscle that we are familiar with, such as the biceps brachii. The entire muscle organ is covered in a connective tissue sheath called the epimysium (dense irregular CT).
2. If you examine a cross section of a skeletal muscle organ, you'll see it is made up of bundles of tissue, called FASCICLES. Each fascicle is surrounded by a connective tissue sheath called the perimysium (dense irregular CT).
3. Each fascicle is a bundle of muscle cells, or MYOFIBERS. Myofibers are multinucleate cells and are filled with long cylindrical packages of contractile proteins called MYOFIBRILS. Myfibers are surrounded by the endomysium (areolar CT).
4. A single myofibril consists of many MYOFILAMENTS stacked together. The fundamental unit of the myofibril is the SARCOMERE.
5. Thick and thin myofilaments are organized in a way that enables muscle contraction. Watch this video (cheezy music, but good overview of myofilament function): <http://youtu.be/xhgDbjrrmFg>

Skeletal muscle action

1. Skeletal muscles attach to bones and span joints.
2. Contraction of the muscle organ leads to movement at a joint.
 - A. The bone that moves the most when the muscle contracts is the INSERTION.
 - B. The bone that moves the least when the muscle contracts is the ORIGIN.
 - C. We're less concerned with "origin and insertion" than that you know the ATTACHMENTS and the ACTION of

each

required muscle.

Lab 10: Muscle Tissue and Axial Musculature

Part 1: Histology: Muscle Tissue

Use the designated slides to study the listed structures characteristic of the different muscle tissues. Always draw the images you see.

1. Smooth Muscle Tissue, c.s. and l.s. (HD 1-2)

A. smooth muscle fibers/ cells

B. nuclei

C. connective tissue

2. Skeletal muscle c.s. and l.s. (HD 2-22), or striated muscle, l.s. (HD 2-21)

A. muscle fiber

B. nuclei

C. A band

D. I band

E. Z line

F. endomysium

G. perimysium

H. epimysium

3. Cardiac muscle (H 3-33)

A. branching cardiac fiber

B. nuclei

C. intercalated disks

D. connective tissue

Part 2: Axial Musculature (18 muscles)

Axial musculature is the musculature associated with the axial skeleton. Understanding the actions of individual muscles requires that you first appreciate the role of joint structure and muscle fiber orientation in movement. When you are comfortable with these concepts, use the tables and figures in M&O Ch. 11 to help you find each of the following muscles on the cadavers and/or the bisected head. For each, you must learn its origin, insertion, and major action.

Muscles of the face

	Attachment 1	Attachment 2	Major Action	Other Comments
Platysma				
Orbicularis Oris				

Orbicularis Oculi				
Buccinator				
Frontalis				
Zygomaticus				

Muscles of the back

	Attachment 1	Attachment 2	Major Action	Other Comments
Erector spinae				

Muscles of the mastication

	Attachment 1	Attachment 2	Major Action	Other Comments
Masseter				
Temporalis				

Muscles of the Neck

	Attachment 1	Attachment 2	Major Action	Other Comments
Sternocleidomastoid				
Splenius				

Muscles of the Thorax and Abdomen

	Attachment 1	Attachment 2	Major Action	Other Comments
External intercostals				
Internal intercostals				
External oblique				
Internal oblique				
Transversus abdominus				
Rectus abdominus				
Diaphragm				

External Brain 10: Axial Muscles

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Study Questions

1. Label images or DRAW pictures that include ALL required lab structures.
2. If this muscle were to contract and shorten, what would happen to the I band? The A band?
3. For each of the muscles that require attachments and actions, draw a clear image of the muscle, in addition to the bumps on the bones where the muscle attaches. Then illustrate the change, when contraction (shortening) takes place.