

Skeletal Muscle Tissue

Chapter 10

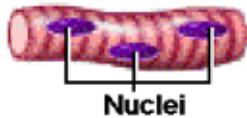
1. What are the functions of skeletal muscle, cardiac muscle, smooth muscle. Where in the body would you expect to find these muscles?
2. Compare and contrast the three muscle types; skeletal, cardiac, smooth.
3. What is the gross anatomy of skeletal muscle. Include the epimysium, perimysium, endomysium, fascicles, and myofilaments (actin and myosin).
4. How are muscles attached to the bone, what is the origin, what is the insertion and how do they relate to each other when a muscle contracts?
5. Describe the microscopic anatomy of a muscle fiber. Include the sarcolemma, T-tubules, sarcoplasmic reticulum.
6. Know the components of sarcomere: A-bands, I-bands, M-line, and Z-disc, H Zone, thick filaments and thin filaments.
7. What is the sliding filament theory, what happens to the components of the sarcomere listed above during muscle contraction?
8. Describe the basic structure of the thick (myosin) and thin (actin) filaments.
9. Describe the following components of the neuromuscular junction, and what are the functions of each: motor neurons, axon terminal, synaptic cleft, neurotransmitter (acetylcholine), acetylcholinesterase, acetylcholine receptor.
10. What is a Motor unit and how does the size of the motor unit affect muscle contraction?
11. Describe the following types of skeletal muscle fibers: fast fibers (fast glycolytic Type IIx), slow fibers (slow oxidative Type I), intermediate fibers (fast oxidative Type IIa).
12. Why is some muscle pale, what is dark muscle?
13. What is hypertrophy, how is it affected?

Anatomy Review: Skeletal Muscle Tissue

Comparison of Skeletal, Cardiac and Smooth Muscle Cells

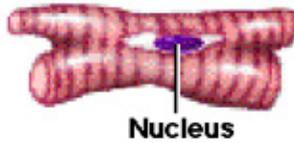
Skeletal Muscle Cell:

Elongated Cells
Multiple Peripheral Nuclei
Visible Striations
Voluntary



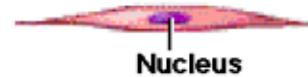
Cardiac Muscle:

Branching Cells
Single Central Nucleus
Visible Striations
Involuntary



Smooth Muscle Cell:

Fusiform-Shaped Cell
Single Central Nucleus
Lack Visible Striations
Involuntary

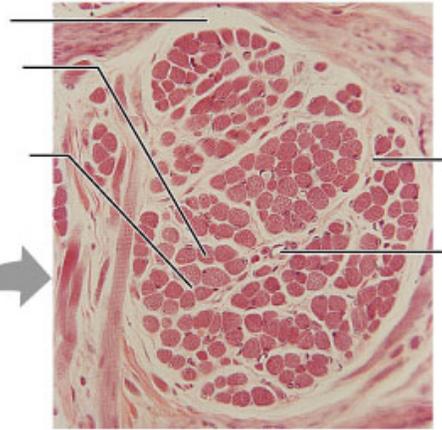
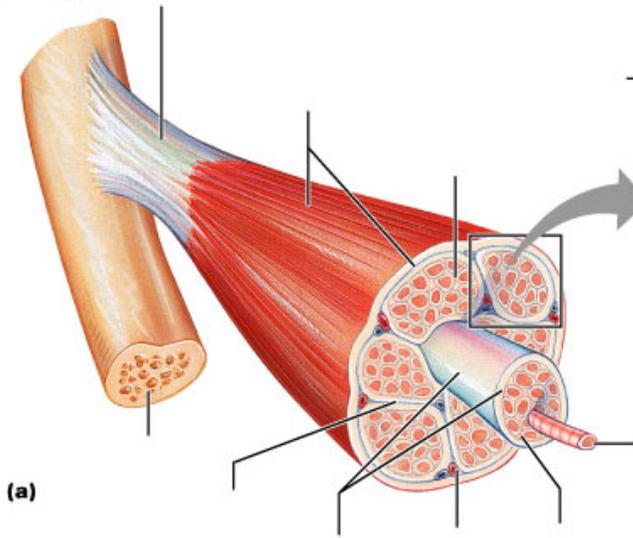
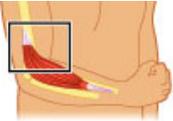


Internal Structure of a Skeletal Muscle

- Skeletal muscles are composed of connective tissue and contractile cells.
- The connective tissues surrounding the entire muscle is the epimysium. Bundles of muscle cells are called fascicles. The connective tissues surrounding the fascicles is called perimysium.

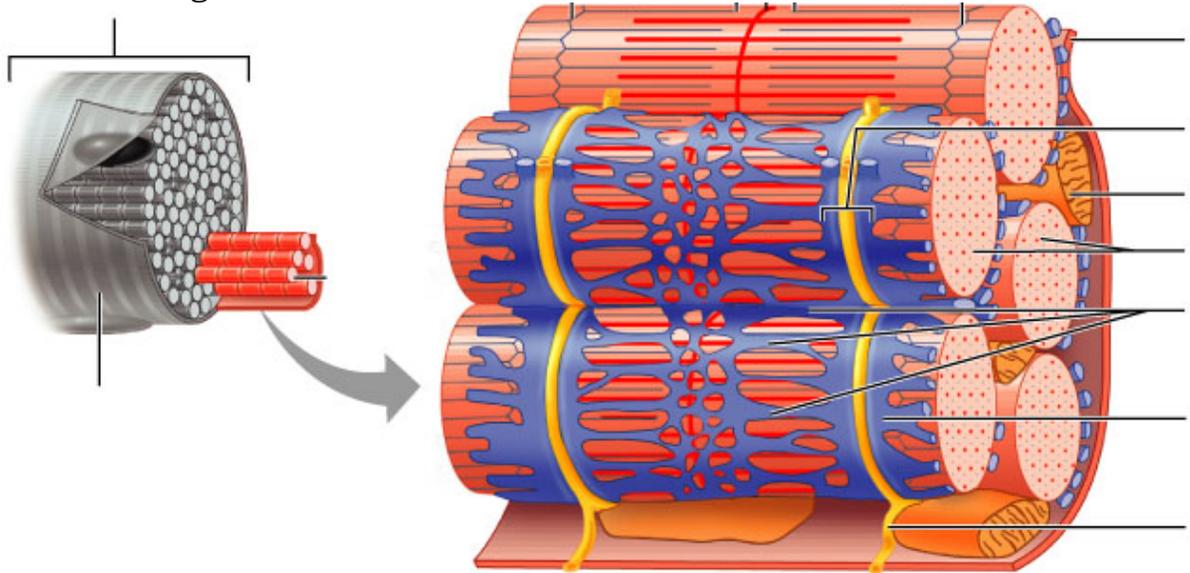
Internal Structure of a Fascicle

- Important Points About Endomysium:
 - Made of connective tissue.
 - Surrounds individual muscle cells.
 - Functions to electrically insulates muscle cells from one another.
- Three connective tissue layers of the muscle (endomysium, perimysium, and epimysium):
 - Bind the muscle cells together.
 - Provide strength and support to the entire muscle.
 - Are continuous with the tendons at the ends of the muscle.
- Label this diagram:



Internal Structure of a Skeletal Muscle Cell

- Label this diagram:



Muscle fibers: Alternative name for skeletal muscle cells.

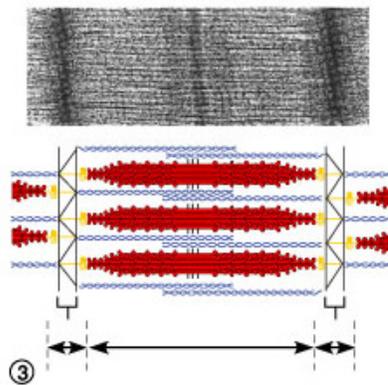
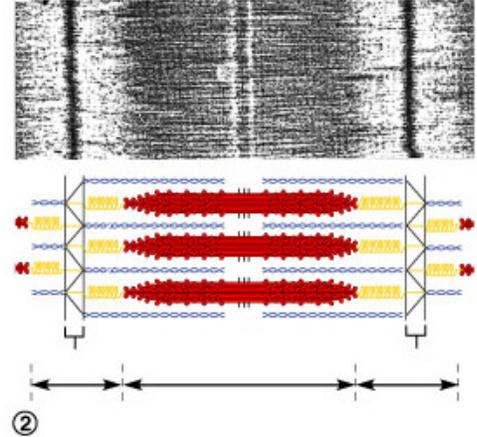
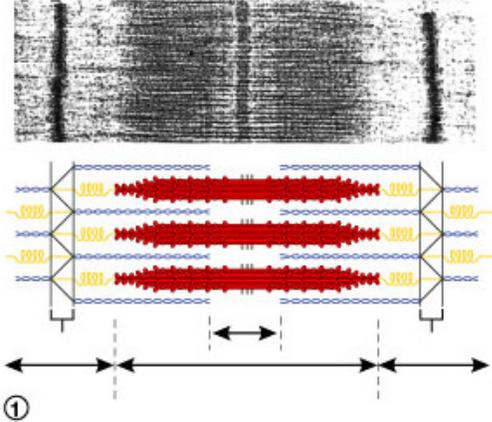
- **Sarcolemma:** Plasma membrane of the muscle cell.
- **Sarcoplasmic reticulum (SR):** Interconnecting tubules of endoplasmic reticulum that surround each myofibril.
- **T tubules:** Invaginations of the sarcolemma that project deep into the cell.
- **Cytosol:** Intracellular fluid.
- **Mitochondria:** Sites of ATP synthesis.
- **Myofibril:** Contains the contractile filaments within the skeletal muscle cell.

Structure of a Myofibril

- Myofibrils: Contractile units within muscle cells.
 - Made of myofilaments called thin filaments and thick filaments.
 - Thin and thick filaments are made mainly of the proteins actin and myosin.

Arrangement of Myofilaments

- Label the diagram:



- **A bands:** Dark areas that correspond to the areas where thick filaments are present.
 - **I bands:** Light areas that contains only thin filaments.
 - **Z line:** A protein disk within the I band that anchors the thin filaments and connects adjacent myofibrils.
 - **H zone:** Located in the middle of each A band, this lighter stripe appears corresponding to the region between the thin filaments.
 - **M line:** Protein fibers that connect neighboring thick filaments.
 - **Sarcomere:** The region of the myofibril between two Z lines.

Study Questions on Anatomy Review: Skeletal Muscle Tissue

1. What is the main function of skeletal muscles?
2. List the three types of contractile cells of the body.
3. Match the following types of contractile cells to their shape (branching, elongated, spindle-shaped):

_____ a. Skeletal muscle cells

_____ b. Cardiac muscle cells

_____ c. Smooth muscle cells

4. Match the following types of contractile cells to the characteristics of their nuclei and presence or absence of striations:

Cardiac Muscle Cells Smooth Muscle Cells

Skeletal Muscle Cells

_____ a. presence of visible striations & single, centrally-located nuclei

_____ b. presence of visible striations & multiple peripheral nuclei

_____ c. absence of visible striations & single, centrally-located nuclei
number of nuclei

5. What is the name of the structure that attaches skeletal muscles to bones?
6. Bundles of skeletal muscle cells are called _____.
7. The connective tissue which immediately surrounds a muscle is called _____ and the connective tissue around the fascicles is called _____.
8. What is the function of endomysium?

9. Match these terms to their description:

Triad
T tubules
Terminal cisternae
Sarcolemma
Muscle fibers
Mitochondria
Sarcoplasmic reticulum
Myofibril

- _____ a. Sac-like regions of the sarcoplasmic reticulum that contain calcium ions.
- _____ b. Sites of ATP synthesis.
- _____ c. Plasma membrane of the muscle cell.
- _____ d. Alternative name for skeletal muscle cells.
- _____ e. Interconnecting tubules of endoplasmic reticulum that surround each myofibril.
- _____ f. A group of one T tubule lying between two adjacent terminal cisternae.
- _____ g. Invaginations of the sarcolemma that projecting deep into the cell.
- _____ h. Contains the contractile filaments within the skeletal muscle cell.

10. What are the names for the two types of filament in a myofibril?

11. What creates the skeletal muscle cell's striated appearance?

12. Match the following:

A band I band H zone

- _____ a. Contains only thin filaments.
- _____ b. Contains only thick filaments.
- _____ c. Contains both thin and thick filaments.

13. Perpendicular to the myofilaments are the Z lines and the M lines. The Z lines connect the _____ filaments and the M lines connect the _____ filaments.

14. The region of the myofibril between two Z lines that is the contractile unit of a muscle cell is called a _____ .
15. Arrange the following from smallest structure to largest structure:
Muscle cell or muscle fiber
Fascicle
Myofilaments
Whole skeletal muscle
Myofibril

Answers to Questions on Anatomy Review: Skeletal Muscle Tissue

1. Movement of the body.
2. Skeletal muscle cells, cardiac muscle cells, and smooth muscle cells.
3. a. elongated b. branching c. spindle-shaped
4. a. Cardiac Muscle Cells b. Skeletal Muscle Cells c. Smooth Muscle Cells
5. Tendons
6. Fascicles
7. Epimysium, perimysium
8. Electrically insulates muscle cells from one another.
9. a. Terminal cisternae
b. Mitochondria
c. Sarcolemma
d. Muscle fibers
e. Sarcoplasmic reticulum
f. Triad
g. T tubules
h. Myofibril
10. Thin filaments and thick filaments.
11. The arrangement of thick and thin myofilaments, which form light and dark alternating bands.
12. A band: c I band: a H zone: b
13. Thin, thick
14. Sarcomere
15. Myofilaments, Myofibril, Muscle cell or muscle fiber, Fascicle, Whole skeletal muscle