

MYOLOGY

I. GROSS ANATOMY OF SKELETAL MUSCLE

- A. Comprised of fascicles
- B. Each fascicle is made up of muscle fibers=muscle cells=myofiber
- C. Each skeletal muscle is an organ
- D. Attachments = dense regular CT; 2 forms
 - 1. Tendons: cable like attachments
 - 2. Aponeuroses: sheet like attachments
- E. Connective Tissue Wrappings (all are the same type of tissue, names only denote location)
 - 1. Entire muscle (composed of fascicles) is surrounded by epimyseium (“on top of muscle tissue”)
 - 2. Each fascicle (group of muscle fibers) is surrounded by perimysium
 - 3. Each muscle fiber wrapped in endomysium

II. MICROSCOPIC ANATOMY OF SKELETAL MUSCLE

- A. General Microscopic Structure
 - 1. Each fiber (cell) is composed of myofibrils
 - 2. Each myofibril is composed of myofilaments
 - a. thick myofilaments: contain the protein myosin (larger diameter)
 - b. thin myofilaments: contain primarily the protein actin (smaller diameter)
 - 3. Muscle cell membrane: sarcolemma (sarc= “muscle”)

4. Cytoplasm: **sarcoplasm**

5. It has cellular organelles like lysosomes, ribosomes, and endoplasmic reticulum (called sarcoplasmic reticulum)

- Sarcoplasmic reticulum are very branched and smooth (**SMOOTH ER**)

a. function of sarcoplasmic reticulum (SR): stores Calcium ions (Ca^{++}) and releases these ions as needed for muscle contraction

6. Transverse tubules (T-tubules)

a. function: can conduct a **nerve impulse** rapidly to the interior of the muscle cell; these also act as a means of getting **nutrients** into the cell and **waste** products out. (**bidirectional**)

B. Banding Pattern (Striation Pattern) of a Sarcomere (contractile unit of myofibril) when it is relaxed

1. Light bands: I-bands (I - LIGHT)

a. thin myofilaments only

2. Dark bands: A-bands (A = DARK)

a. thick and thin myofilaments

3. Z-line (Z-disc): dark line in the middle of an I-band

(demarks a sarcomere)

(essentially where the thin myofilaments attach)

4. H-zone: a lighter, central region in the middle of an A-band

a. only thick myofilaments

5. Sarcomere - runs from Z-line to Z-line (functional contractile unit) Sarcomeres shorten during contraction

III. CONTRACTION OF SKELETAL MUSCLE

A. Sliding Filament Model of Contraction

- Muscle stimulated by nerve
- Thick and thin myofilaments **slide** over one another
- Length of each sarcomere shortens, muscle contracts

(myofilaments do NOT change length)

1. Nerve impulse carried from brain/spinal cord to muscle by the axon of a motor neuron
2. Axon meets muscle fiber at the neuromuscular junction (myoneural junction)

3. Axon releases a chemical neurotransmitter called acetylcholine which binds to sarcolemma

4. A nerve impulse is generated in the sarcolemma and it passes down the T-tubules. As a result, the sarcoplasmic reticulum releases calcium ions (Ca^{++})

5. Calcium ions (Ca^{++}) bind to thin myofilaments

a. This helps thick myofilaments attach to the thin myofilaments

6. Myofilaments slide over one another; sarcomere shortens; muscle contracts

7. When the nerve impulse stops, Ca^{++} returns to the sarcoplasmic reticulum and the myofilaments slide back to their resting state

Calcium ions are stored in the _____.

- a. Sarcolemma
- b. Transverse (T-) tubules
- c. Sarcoplasmic reticulum*****
- d. Myofibril
- e. Endomysium