25a A&P: Muscular System - Mechanism of Contraction

25a A&P: Muscular System - Mechanism of Contraction Class Outline

5 minutes	Attendance, Breath of Arrival, and Reminders
10 minutes	Lecture:
30 minutes	Lecture:
15 minutes	Active study skills:
60 minutes	Total

25a A&P: Muscular System - Mechanism of Contraction

Class Reminders

Quizzes:

- 30a Kinesiology Quiz
  - Supraspinatus, infraspinatus, teres minor, subscapularis, pec minor, & serratus anterior
- 31a Quiz (20a, 20b, 21b, 22a, 23a, 24b, 29b, and 30a, 24a, 25a, 26a, 27a, 28a, 29a, 30b, and 31b)

Assignments:

- 30a Review Questions
  - Packet A: 141-158

Preparation for upcoming classes:

- 26a A&P: Muscular System - Fiber Types, Actions, and Contractions
  - Trail Guide: pectoralis minor
  - Packet E: 45-48
- 26b Hydrotherapy: Cold Water Treading, Aromatic Hot Towel Treatment
  - Packet G: 21-24

Classroom Rules

Punctuality - everybody's time is precious

- Be ready to learn at the start of class; we'll have you out of here on time
- Tardiness: arriving late, returning late after breaks, leaving during class, leaving early

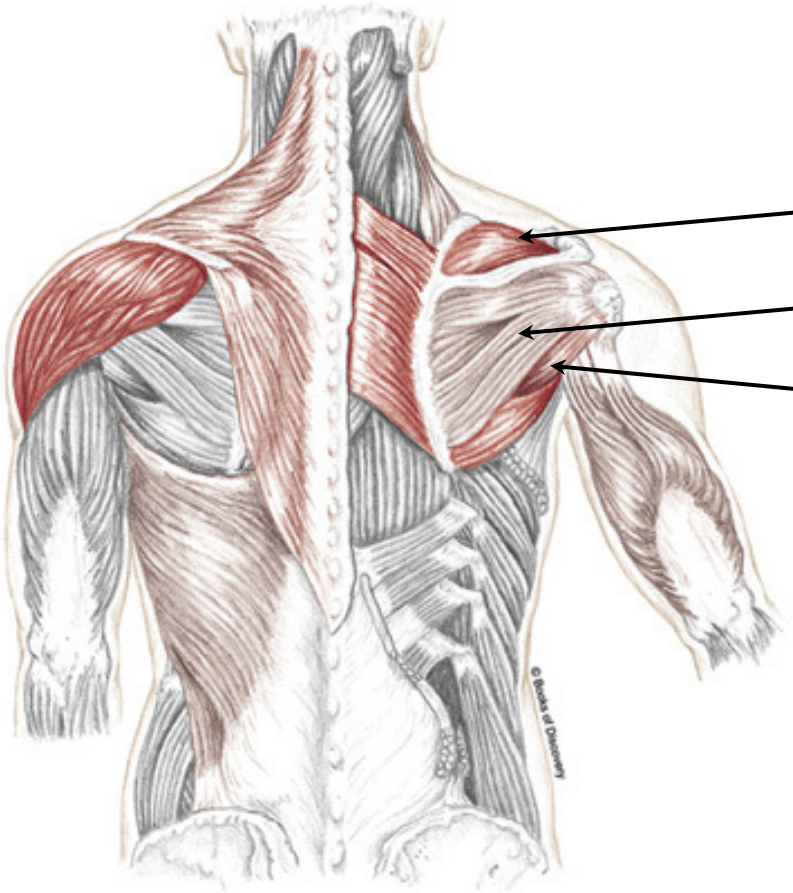
The following are not allowed:

- Bare feet
- Side talking
- Lying down
- Inappropriate clothing
- Food or drink except water
- Phones that are visible in the classroom, bathrooms, or internship

You will receive one verbal warning, then you'll have to leave the room.

Rotator Cuff

Trail Guide, page 74



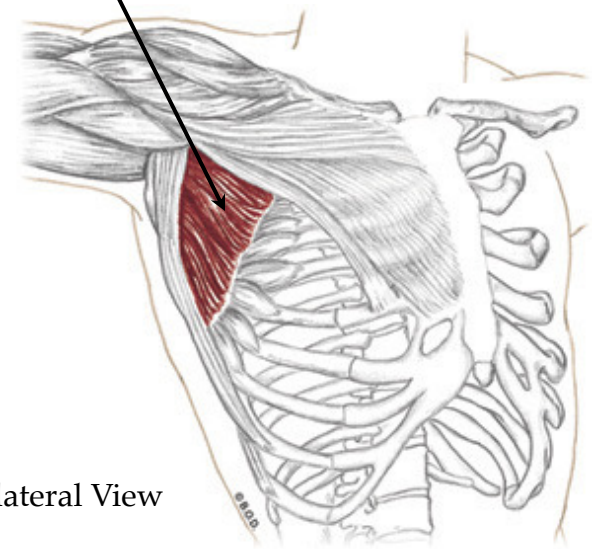
Posterior View

Supraspinatus S

Infraspinatus I

Teres Minor T

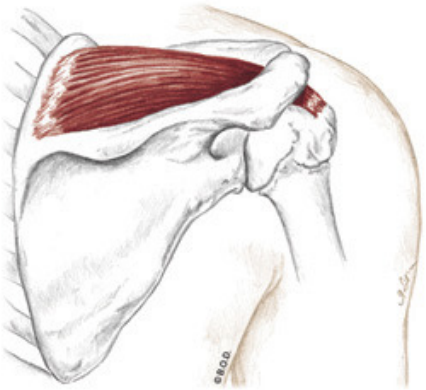
Subscapularis S



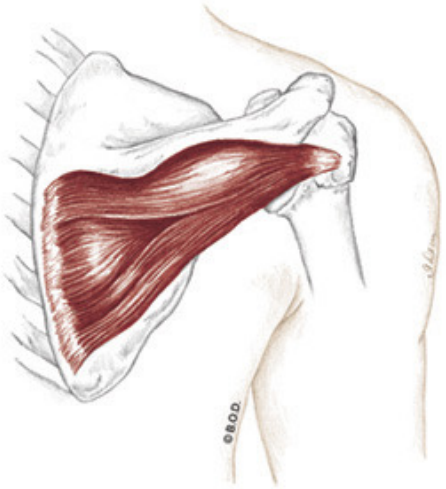
Anterolateral View

Rotator Cuff

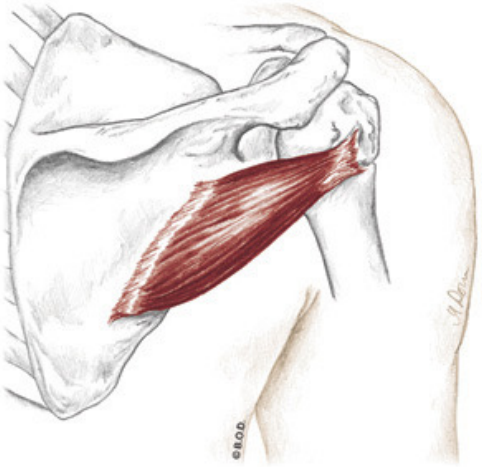
Trail Guide, Page 74



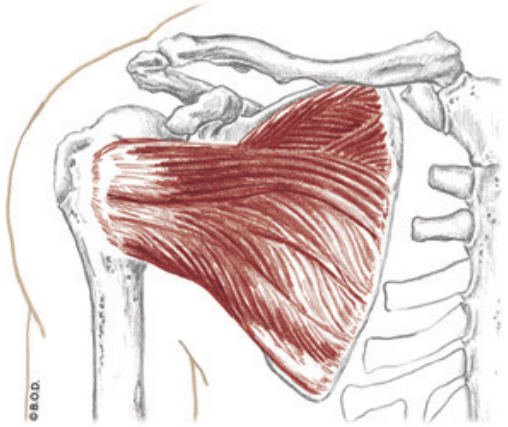
Supraspinatus
Posterior View



Infraspinatus
Posterior View



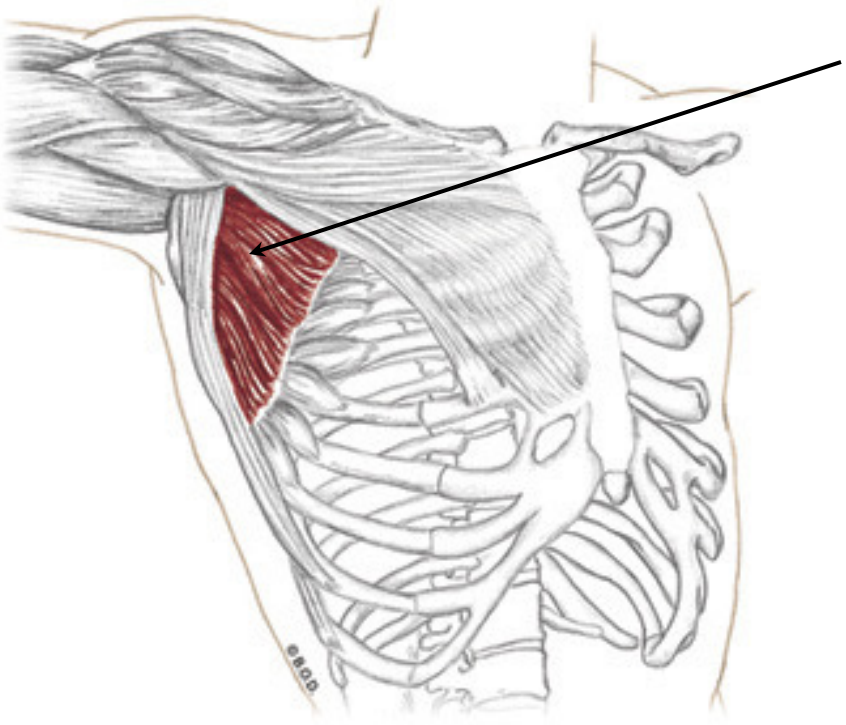
Teres Minor
Posterior View



Subscapularis
Anterior View

Subscapularis

Trail Guide, Page 74



Anterolateral View

Subscapularis is located on the scapula's anterior surface.

Only a small portion of its muscle belly is accessible.

Subscapularis is the only rotator cuff muscle that attaches to the lesser tubercle of the humerus.

What do you use subscapularis for?

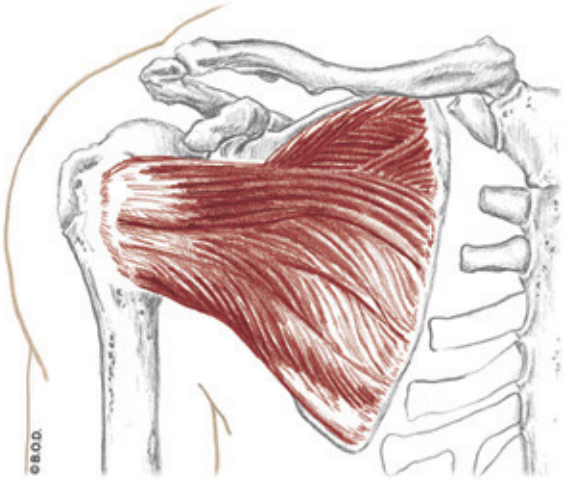
Subscapularis, page 75

A Medially rotate the shoulder joint (glenohumeral joint)

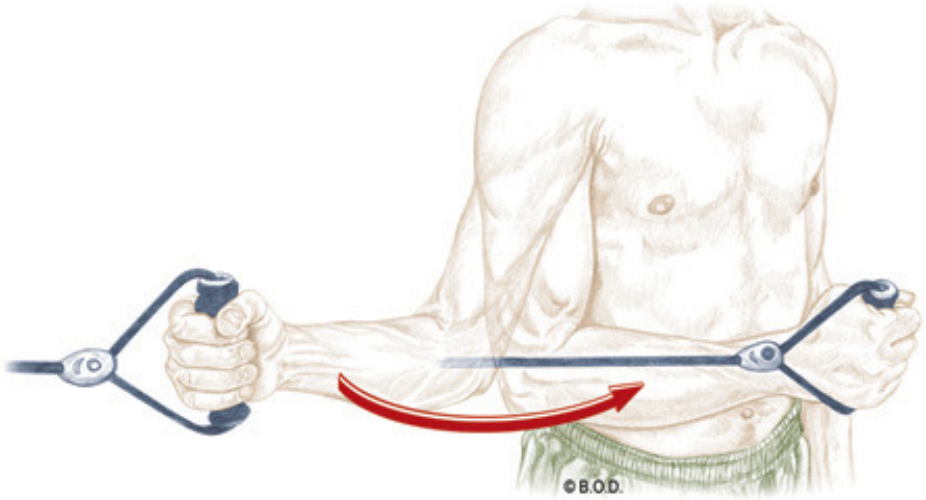
Stabilize the head of the humerus in glenoid cavity

O Subscapular fossa of the scapula

I Lesser tubercle of the humerus



Anterior View



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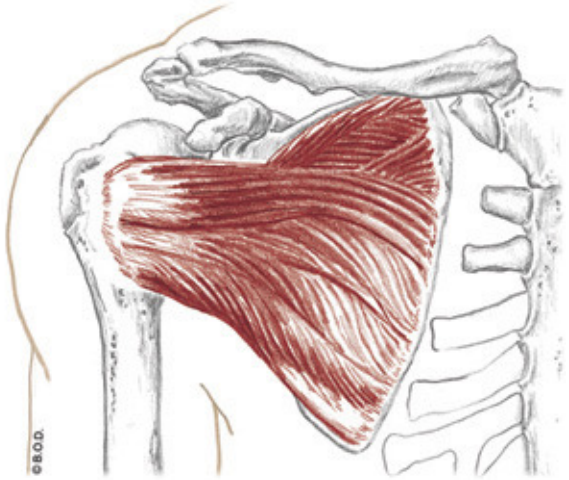

Anterior View

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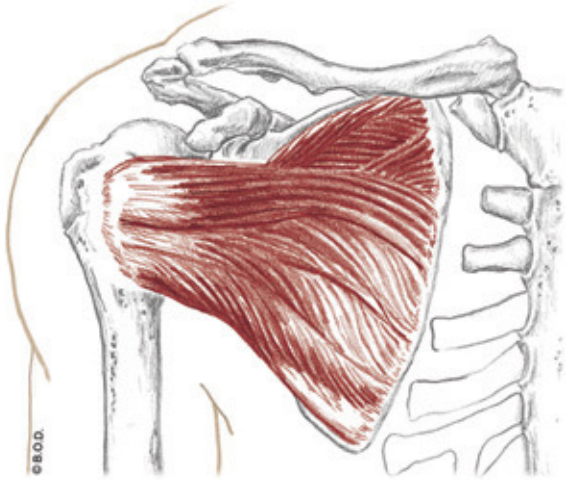
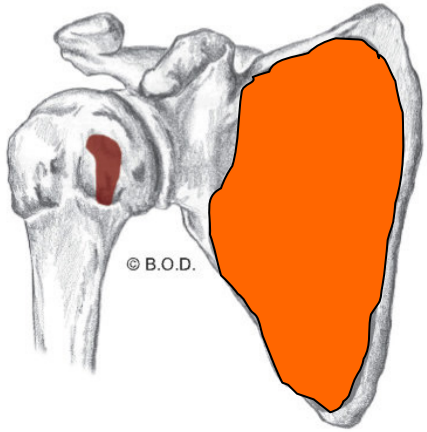


Anterior View



Subscapularis, page 75

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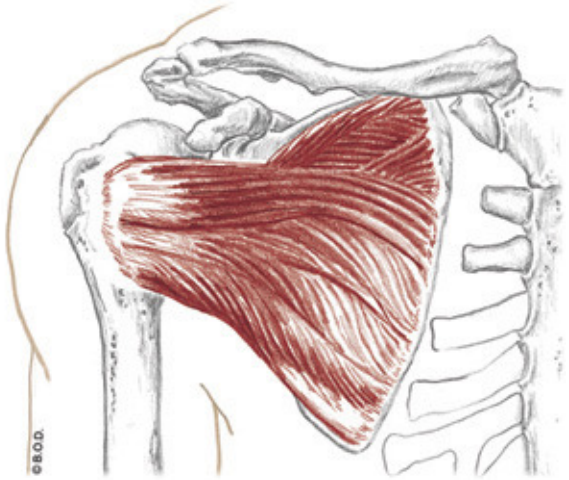
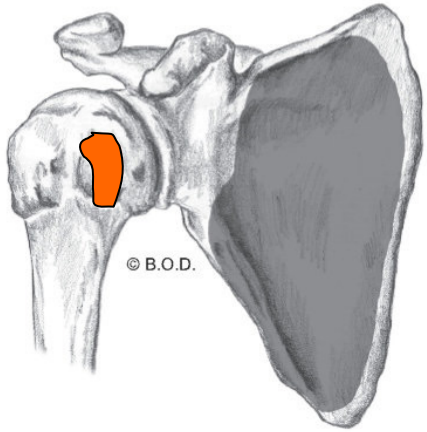
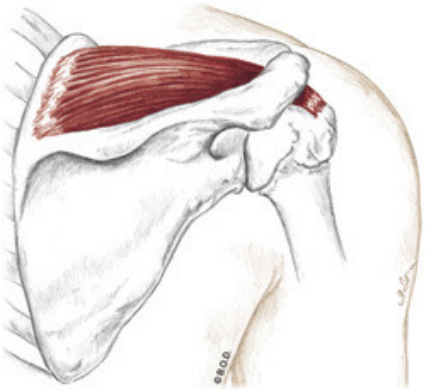


Anterior View

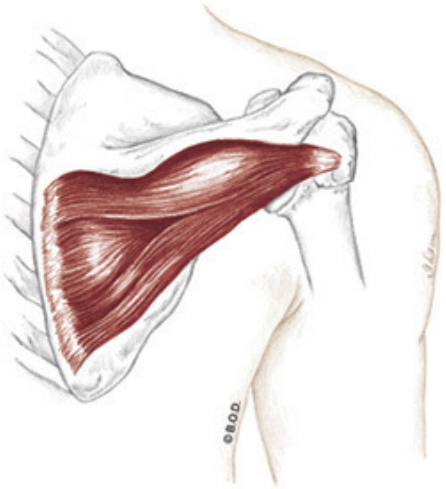


Rotator Cuff

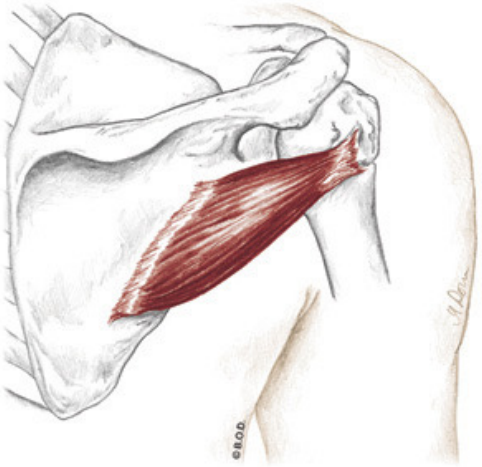
Trail Guide, Page 74



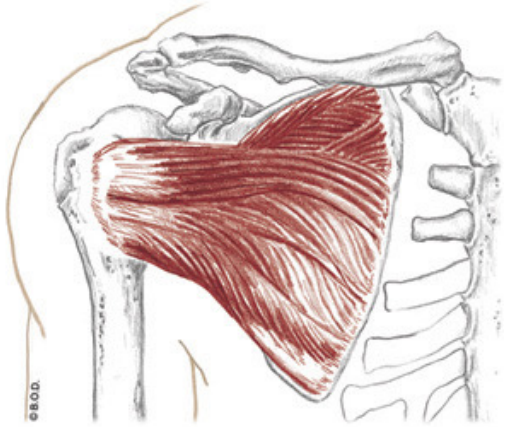
Supraspinatus
Posterior View



Infraspinatus
Posterior View



Teres Minor
Posterior View



Subscapularis
Anterior View

25a A&P: Muscular System - Mechanism of Contraction

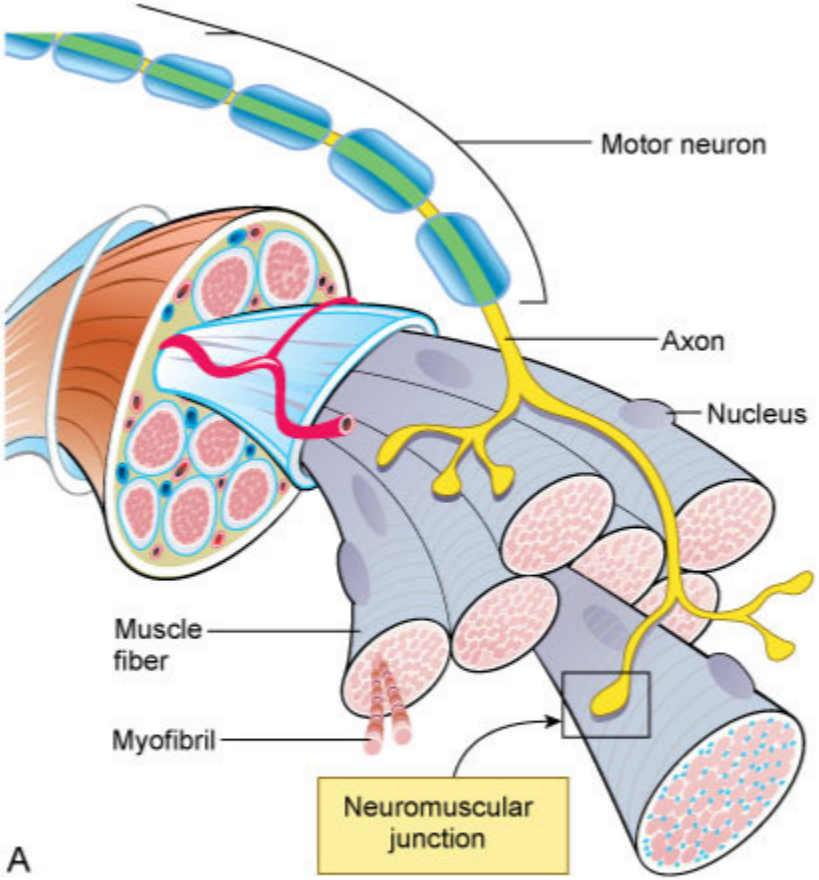
E-41

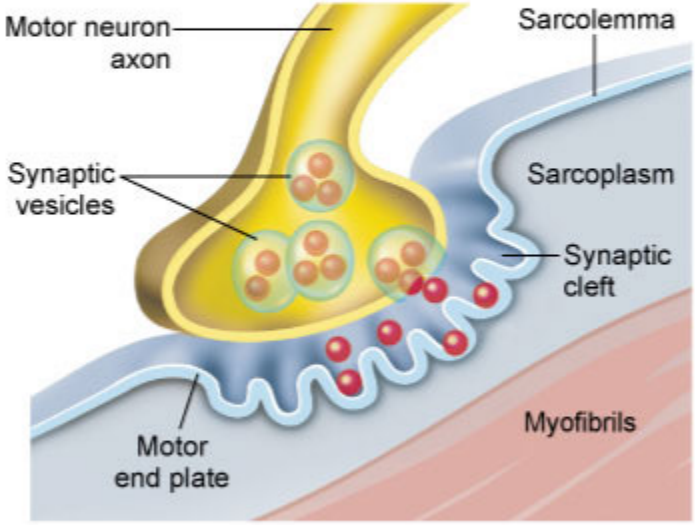
Mechanism of Contraction

"Sliding Filament Mechanism"

Mechanism of Contraction
"Sliding Filament Mechanism"

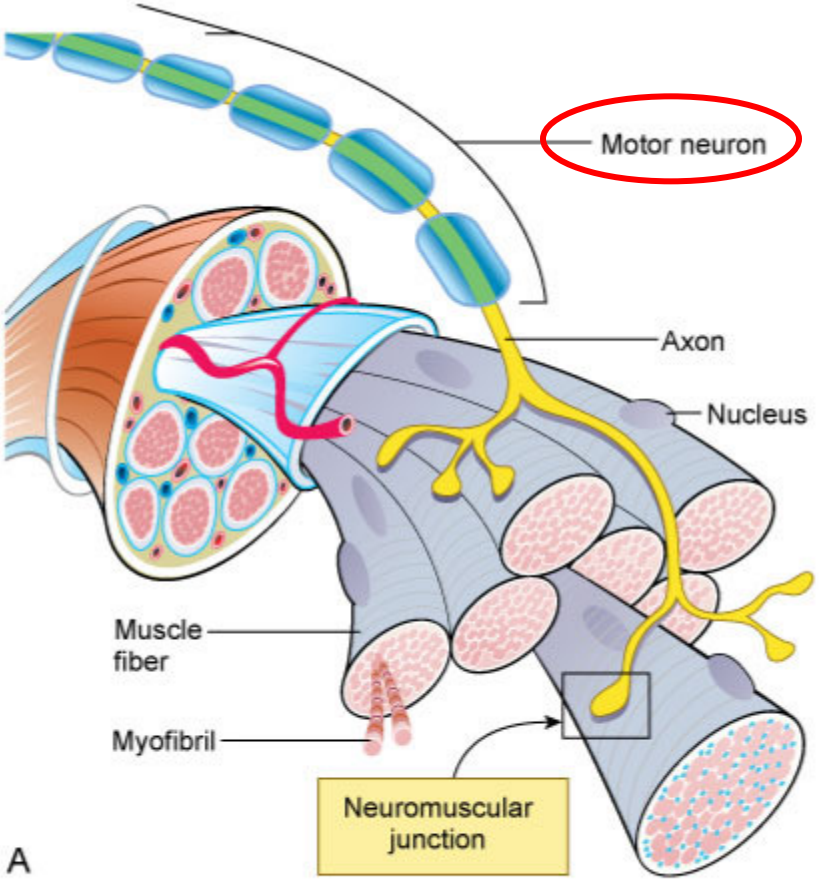
Nerve impulse Electrical signal that conveys information along a neuron.

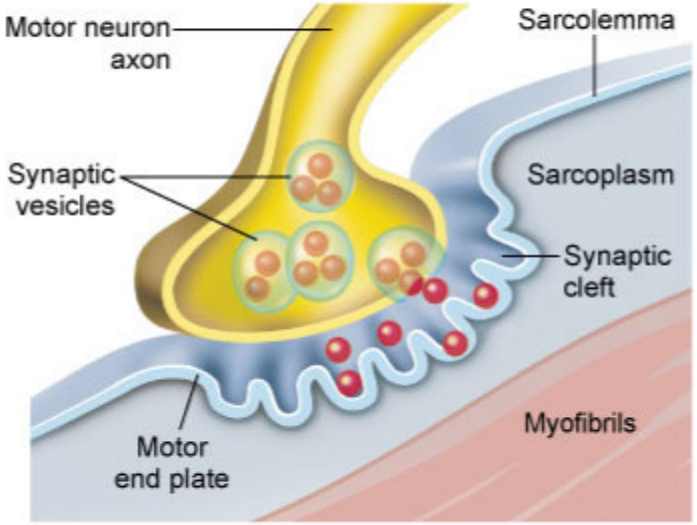




Mechanism of Contraction
"Sliding Filament Mechanism"

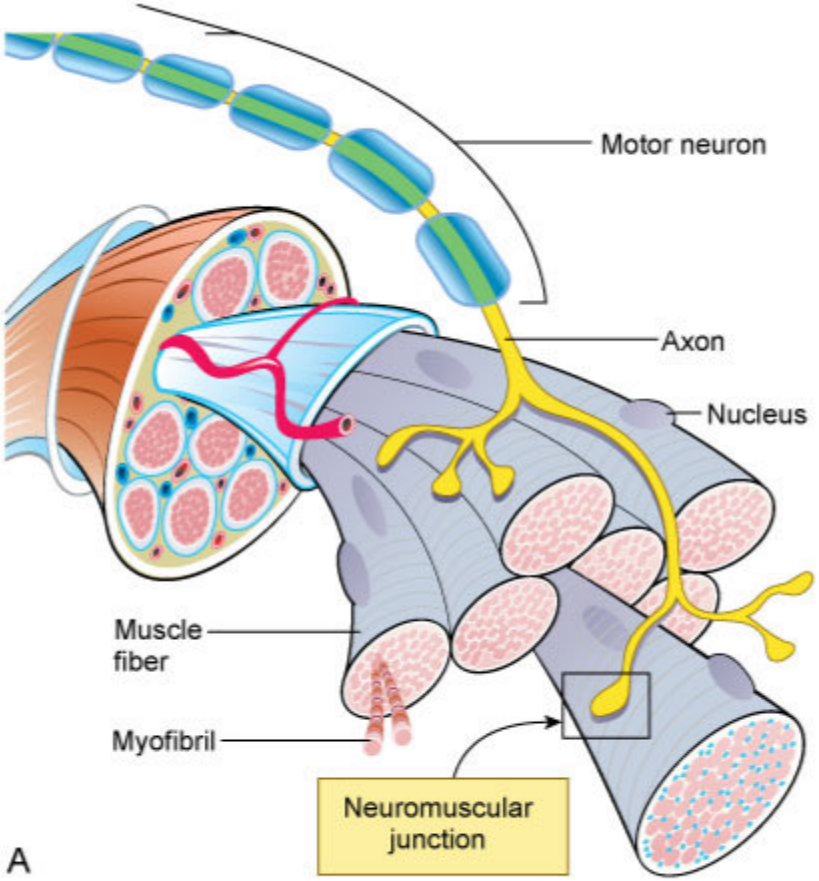
Motor neuron Neuron that sends a nerve ___impulse___ to a muscle cell.

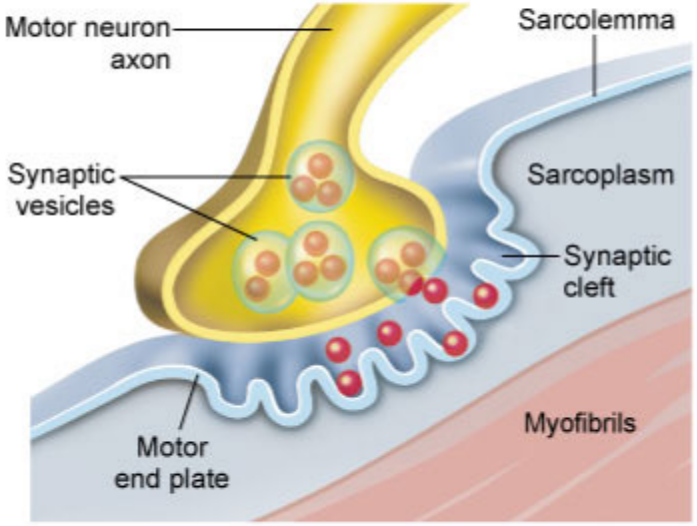




Mechanism of Contraction
"Sliding Filament Mechanism"

Motor unit Single motor neuron plus all the muscle ___fibers___ it innervates.

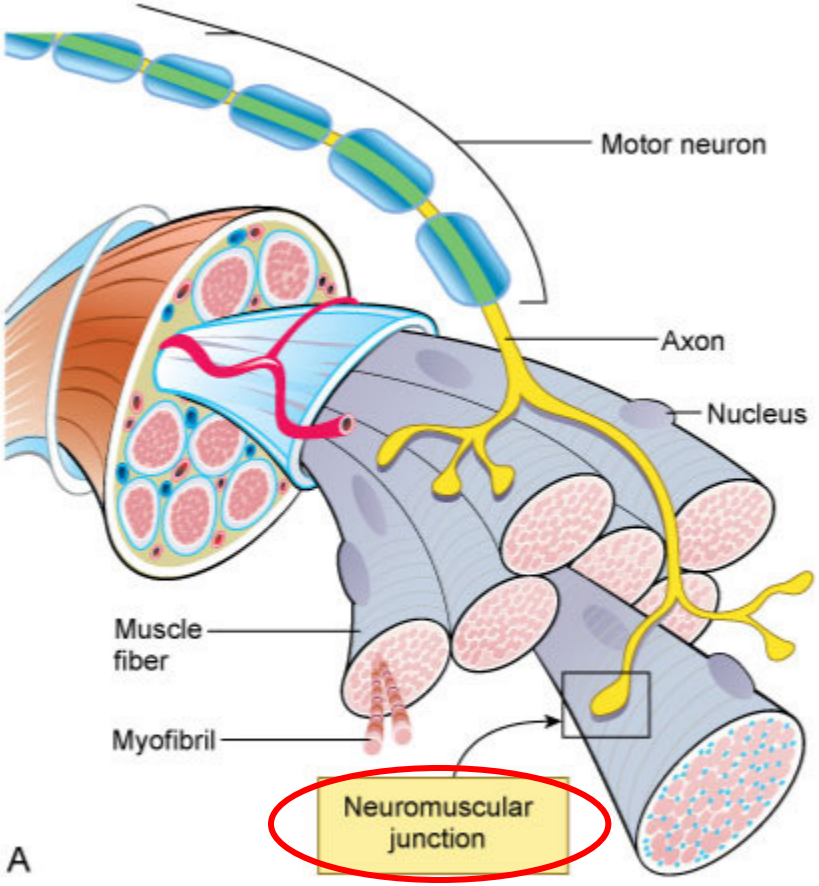


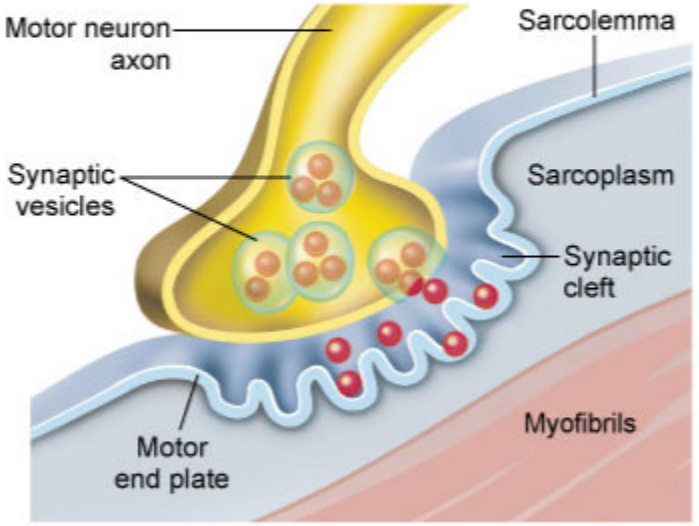


Note: one motor neuron can innervate 2 to 2000 muscle fibers.

Mechanism of Contraction
"Sliding Filament Mechanism"

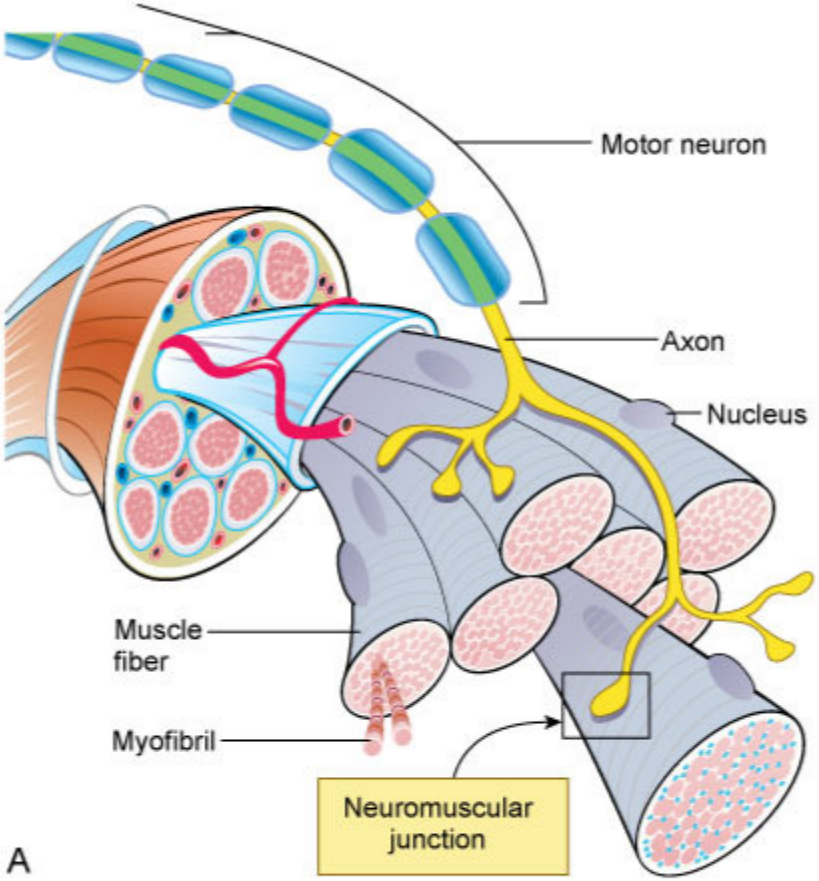
Neuromuscular junction Junction between a ___motor___ neuron and the cell wall of the muscle fiber.

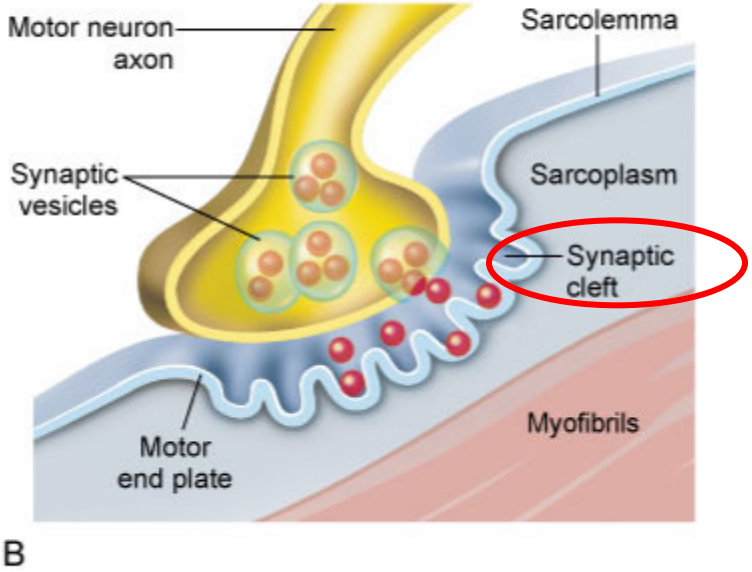




Mechanism of Contraction
"Sliding Filament Mechanism"

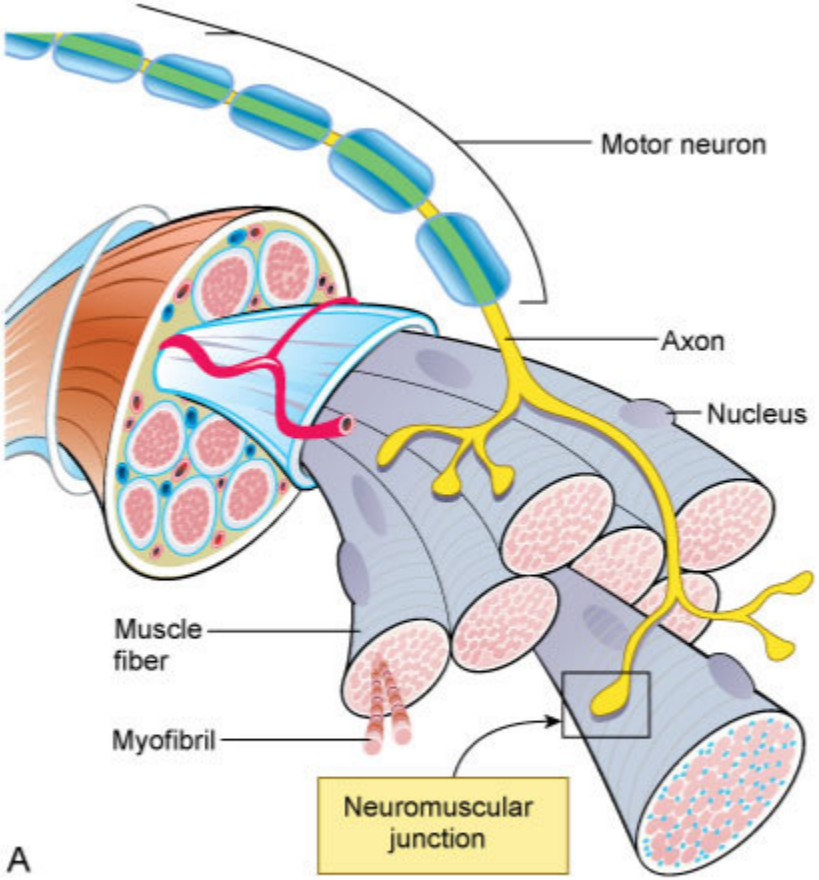
Synaptic cleft (AKA: synaptic gap) Space between the end of a motor neuron and another neuron, a muscle cell, or gland.

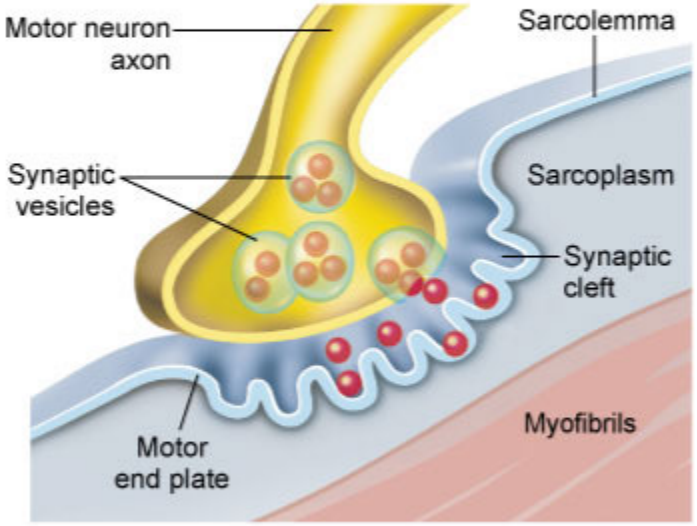




Mechanism of Contraction
"Sliding Filament Mechanism"

Acetylcholine Neurotransmitter that crosses the synaptic cleft.





Mechanism of Contraction
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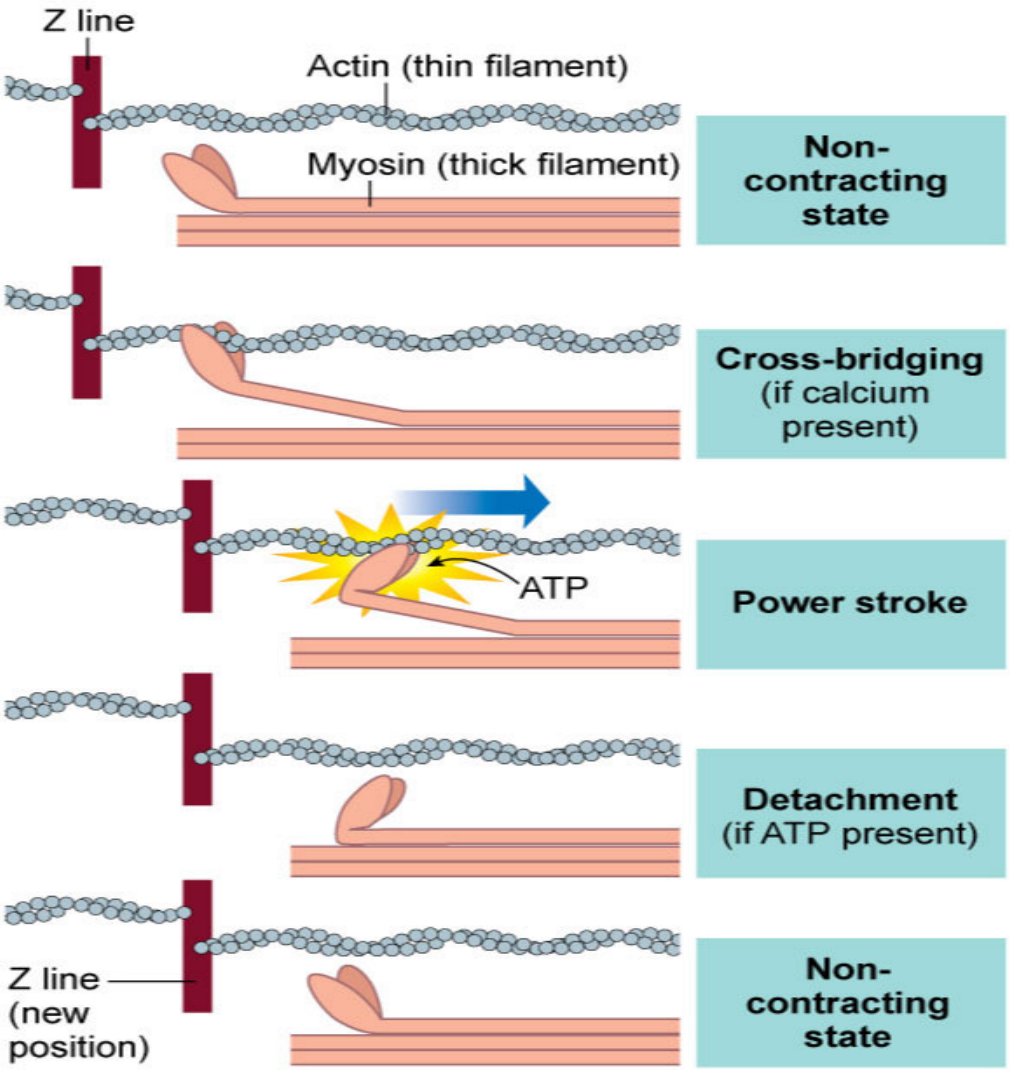
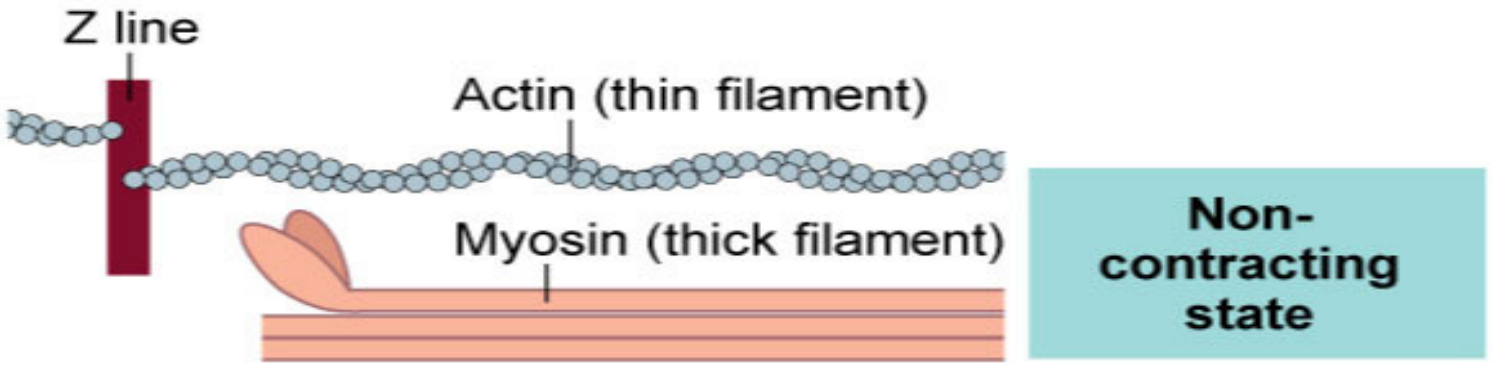


Mechanism of Contraction
"Sliding Filament Mechanism"

Non-Contracting State: "Two protein molecules, troponin and tropomyosin, are positioned on thin myofilaments to block myosin binding sites. Without these regulatory proteins, muscles would be in a constant state of contraction."

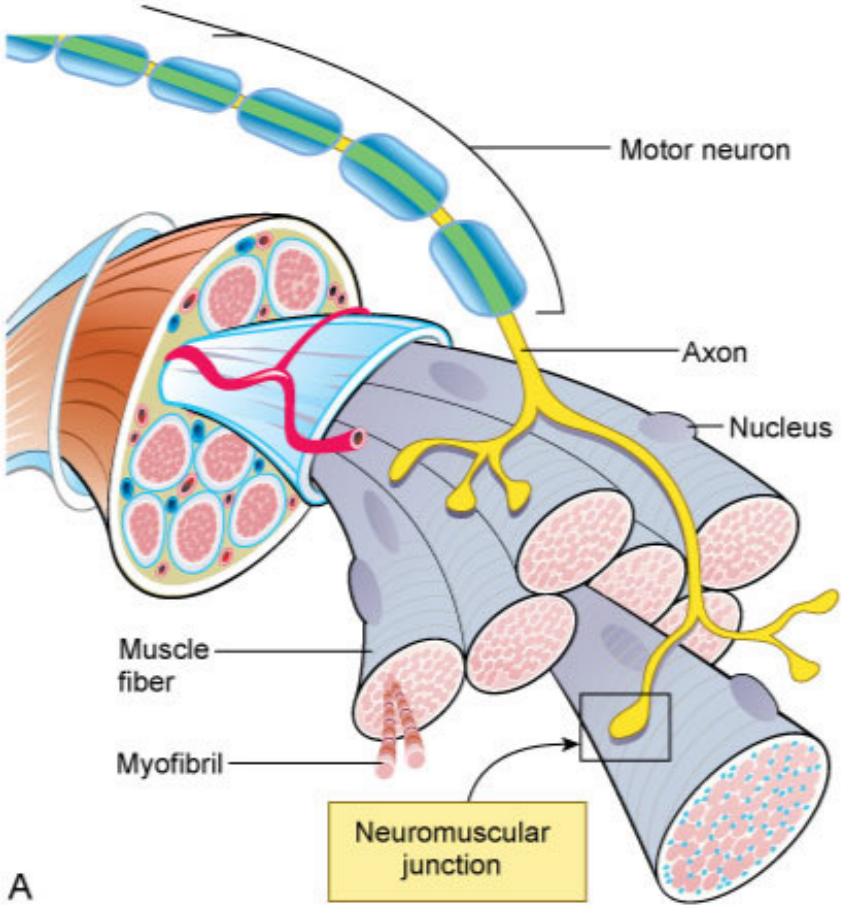


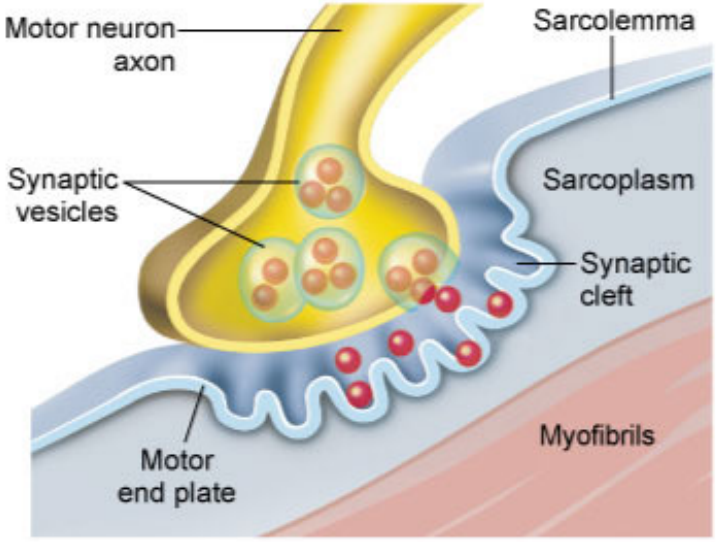
Mechanism of Contraction
"Sliding Filament Mechanism"

Excitation of the Sarcolemma: "The contraction of a skeletal muscle begins with a nerve impulse sent from the central nervous system. When the nerve impulse reaches the neuromuscular junction, calcium ions are released from the sarcoplasmic reticulum."

Mechanism of Contraction
"Sliding Filament Mechanism"

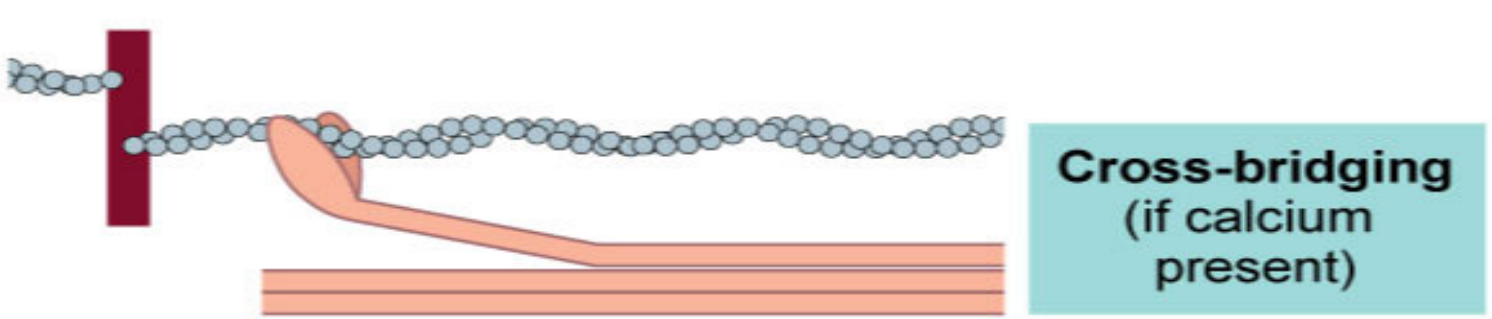
Excitation of the Sarcolemma





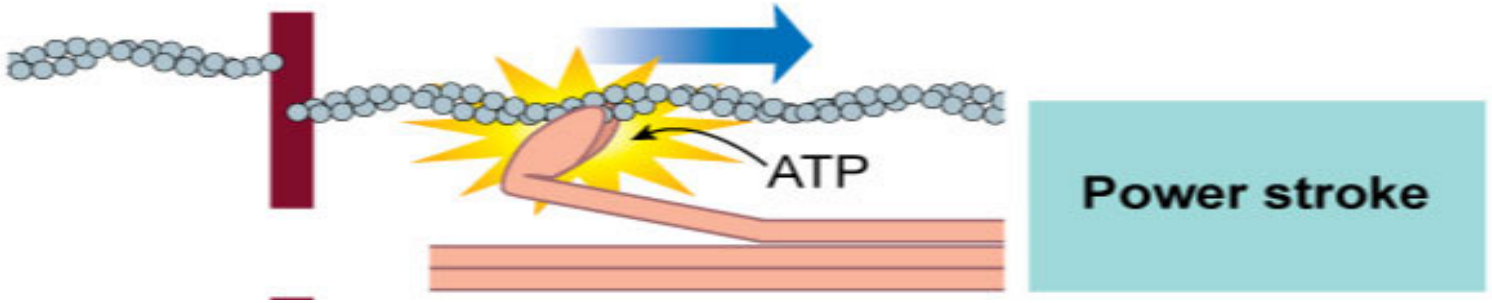
Mechanism of Contraction
"Sliding Filament Mechanism"

Cross-Bridging: "Now that calcium is present in the sarcomere, it binds to troponin causing tropomyosin to slide off and expose the site allowing myosin heads to bind to thin myofilaments."



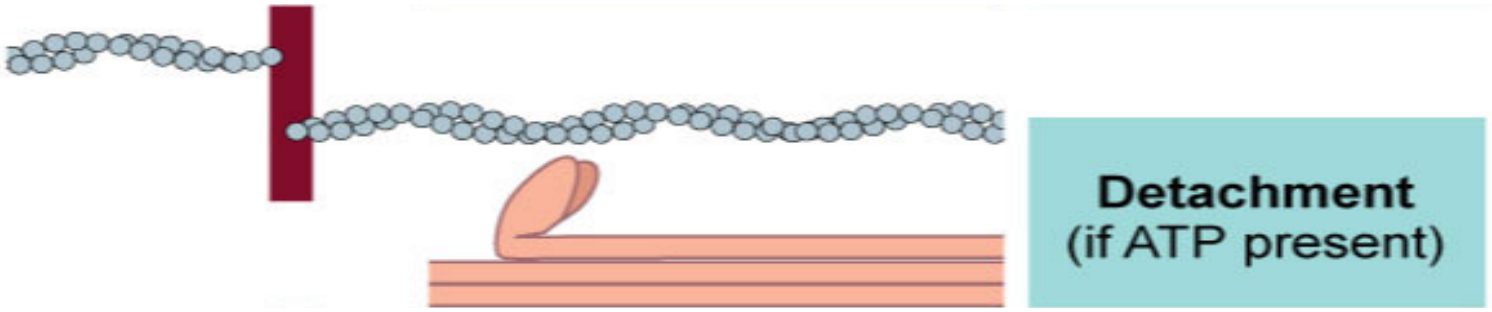
Mechanism of Contraction
"Sliding Filament Mechanism"

Power Stroke: "Myosin heads, which are hinged at their base, then toggle in a mechanism similar to a light switch. This action causes thin myofilaments to slide toward the center of the sarcomere which shortens the overall length of the muscle fiber. Yeah! We have contraction!"



Mechanism of Contraction
"Sliding Filament Mechanism"

Detachment: "If ATP (adenosine triphosphate) is present, myosin head the detach themselves, bind to the next exposed site, and pull again!"



Mechanism of Contraction
"Sliding Filament Mechanism"

All or None Response: "When a motor neuron delivers a stimulus of contraction, all the muscle fibers of the motor unit receive the same signal at the same time and contract to their fullest extent. There is no partial contraction. "

Mechanism of Contraction
"Sliding Filament Mechanism"

Recruitment: "Numerous motor units are linked to a single skeletal muscle. The nervous system regulates the amount of muscular contraction by activating only the motor units needed to perform a given action. If more strength is required, then additional motor units are recruited resulting in a stronger muscle contraction."

Mechanism of Contraction
"Sliding Filament Mechanism"

Relaxation: "Almost immediately after the sarcoplasmic reticulum releases calcium ions into the sarcomeres, it begins to actively pump them back into its sacs. Freed from its chemical bond with the calcium ions, the tropomyosin slides back to cover the myosin binding sites on thin myofilaments. This action releases the myosin heads and returns them to their pre-contraction resting state. The muscle is now at rest."

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