

Muscular System

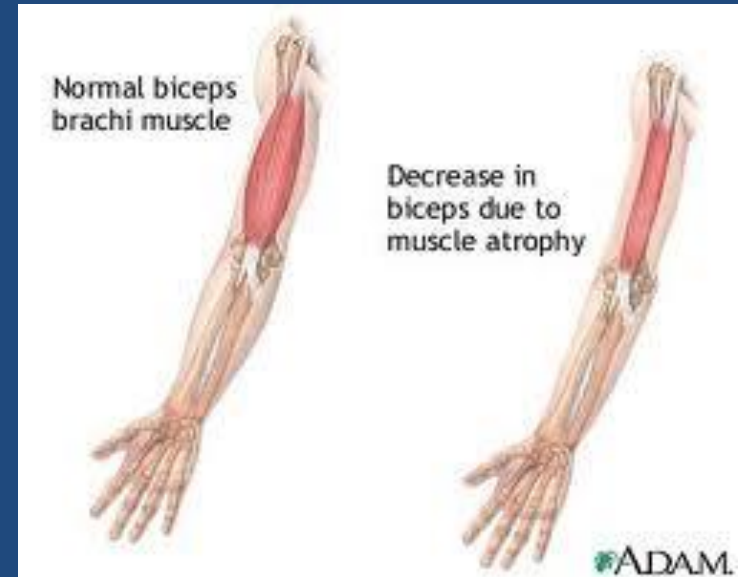
IB Sports, exercise and health science

1.2



Characteristics Common to Muscle Tissue 1.2.1

- **Contractility**-ability to shorten the muscles length
- **Extensibility**-ability to lengthen the muscles length
- **Elasticity**-muscle tissue has a tendency to return to its initial length after being stretched
- **Atrophy**-loss of muscle mass
- **Hypertrophy** - gaining muscle mass
- Muscles are controlled by nerve stimuli
- Muscles are fed by capillaries



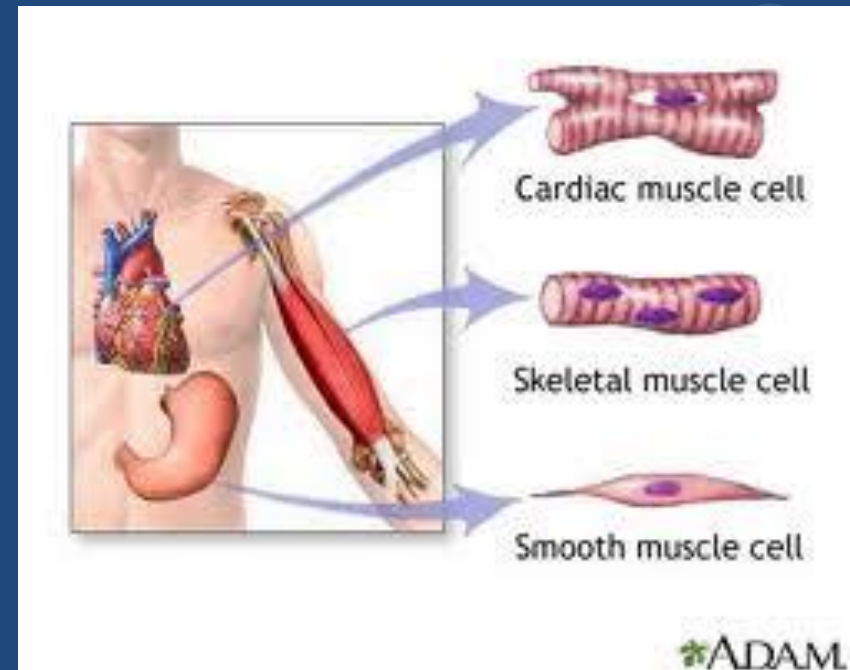
Types of Muscle Tissue 1.2.2

- Smooth muscle - an involuntary muscle found in the lining of visceral organs (stomach, bladder) and in the linings of blood vessels where it provides support. NON STRIATED!

- Cardiac muscle - involuntary muscle found only in the heart.

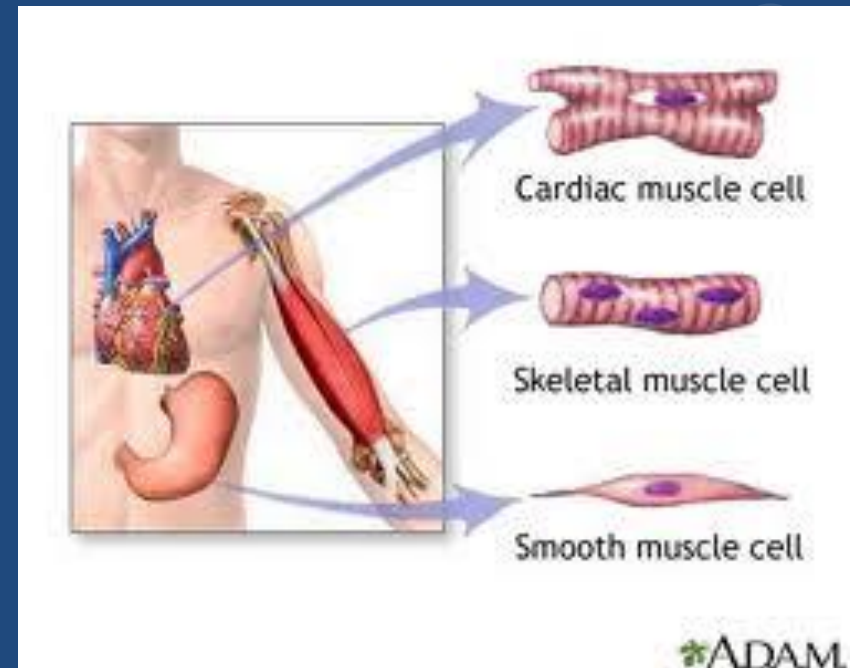
STRIATED!

- Skeletal muscle - voluntary muscle found in the majority of the body. STRIATED!



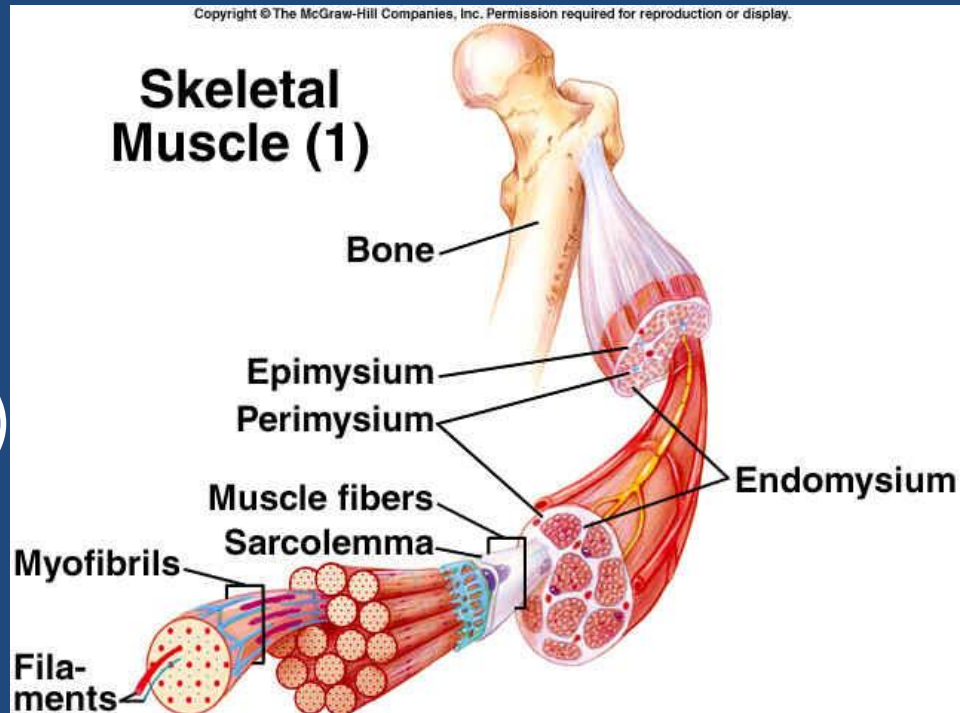
Types of Muscle Tissue 1.2.2

- Muscle cells are multinucleated.
 - More nuclei means faster cell signaling
 - Faster cell signaling = faster contractions
 - Multinucleated means multiple nuclei sharing cytoplasm within a cell



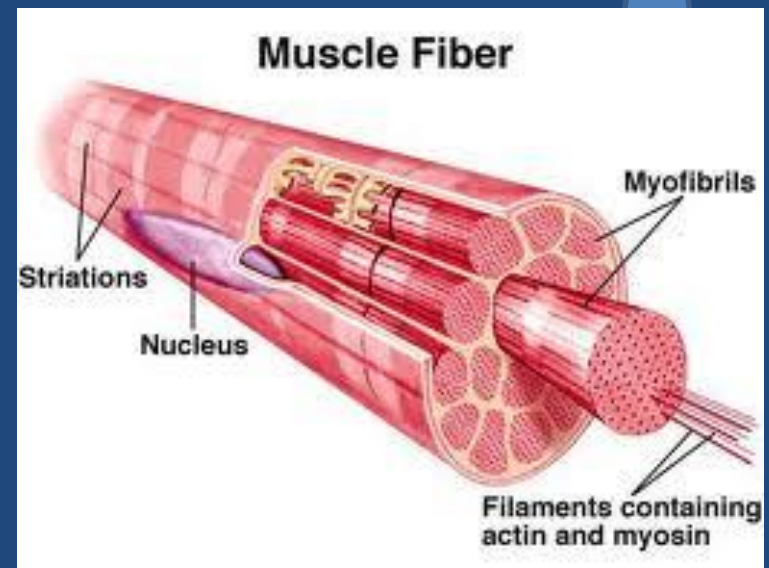
Structural Make-up of Skeletal Muscle 1.2.3

- Epimysium-outer most layer that surrounds the entire muscle
- Perimysium-surrounds up to 150 individual bundles of muscle fibers (called fascicle)
- Endomysium-surrounds each muscle fiber within a fasciculus
- Muscle fibers-muscle cells
- Fascicle – a bundle of muscle fibers

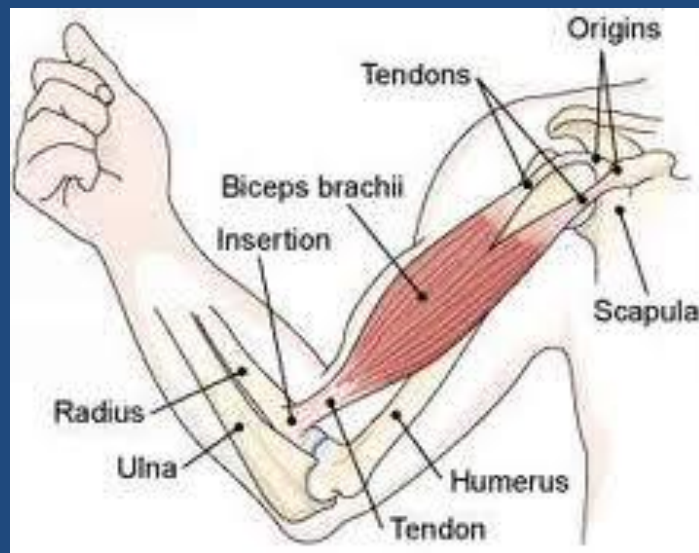


Breaking It Down

- **Myofibrils** - contractile fibers within muscle cells
- **Sarcomere**-the portion of a striated muscle fiber between the two adjacent Z lines that is considered the functional unit of a myofibril
- **Actin** - a protein in muscle fibers that together with myosin is responsible for contraction
- **Myosin** - a thick filament protein that together with actin causes muscle contraction
 - Type of Motor Protein
(They convert chemical energy into mechanical work by the hydrolysis of ATP)



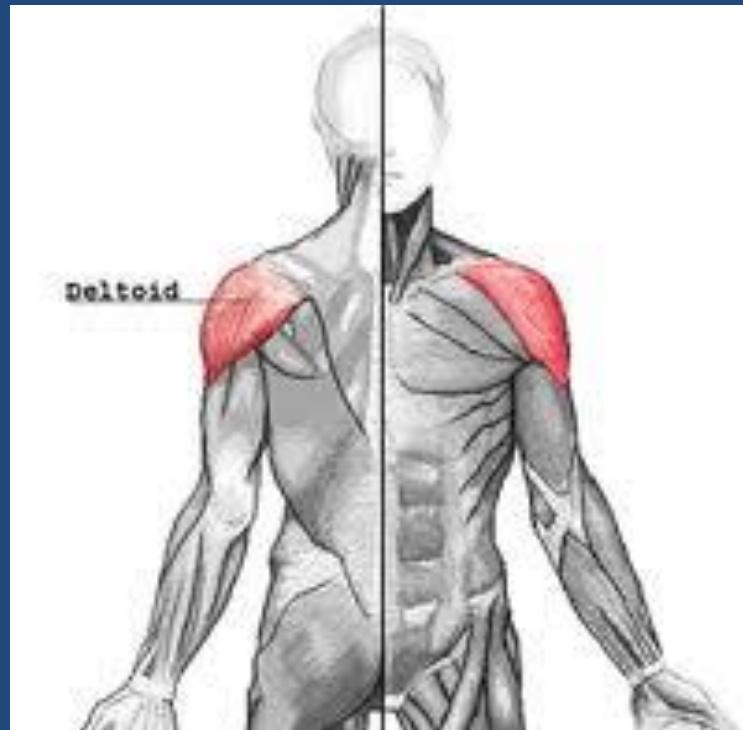
Origin and Insertion 1.2.4



- **Origin**-the attachment of a muscle tendon to a stationary bone, generally the proximal end of the joint or the one closest to the midline
- **Insertion**-the attachment of a muscle tendon to a moveable bone, generally the distal joint

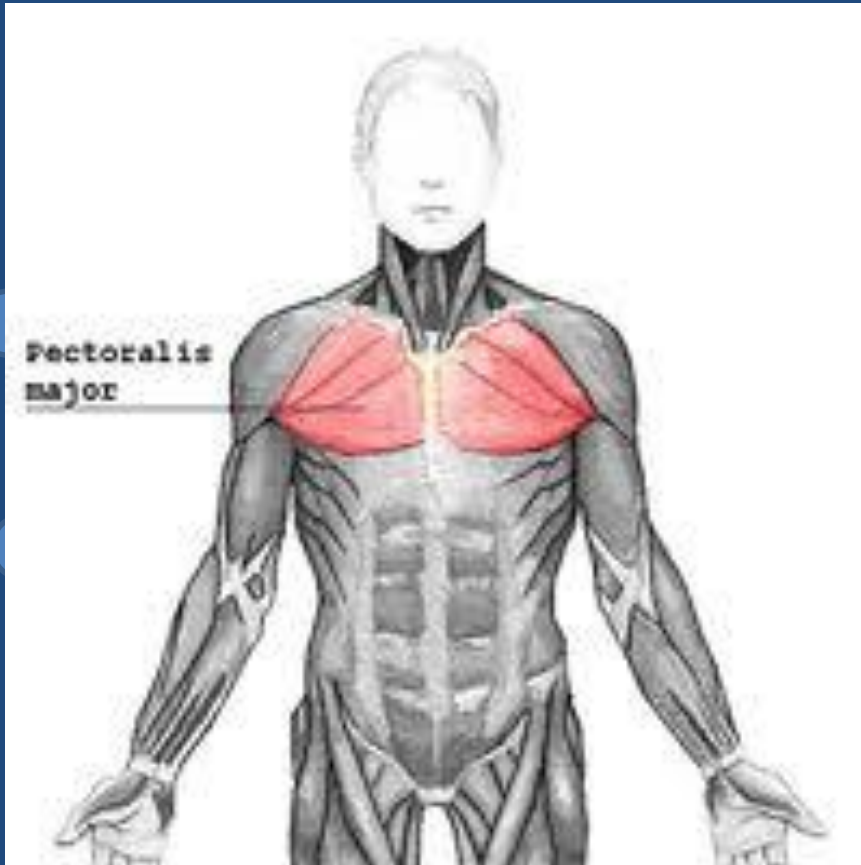
Locations of Skeletal Muscles 1.2.5

Deltoid



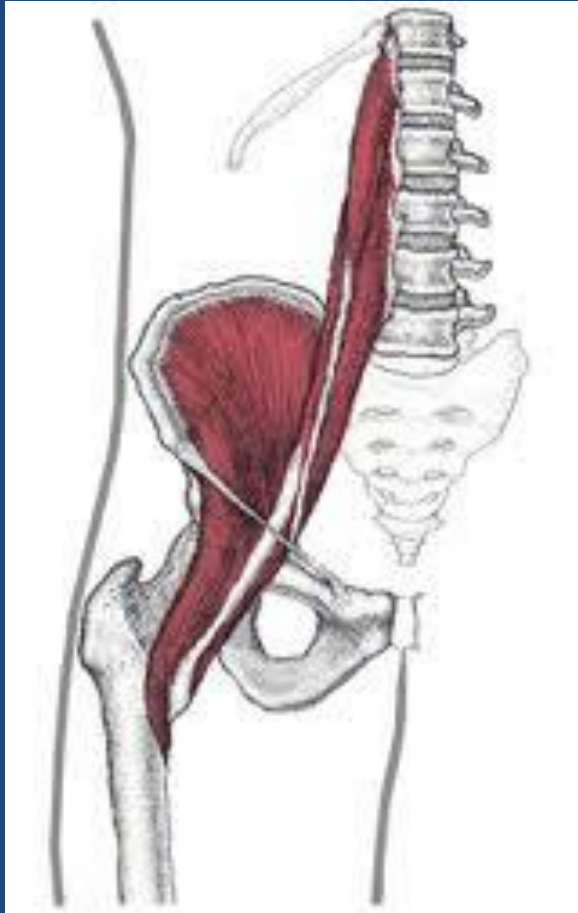
- Anterior Muscles
- Abducts, flexes, extends and medially and laterally rotates arm

Pectoralis Major



- Flexes, adducts and rotates arm medially

Iliopsoas



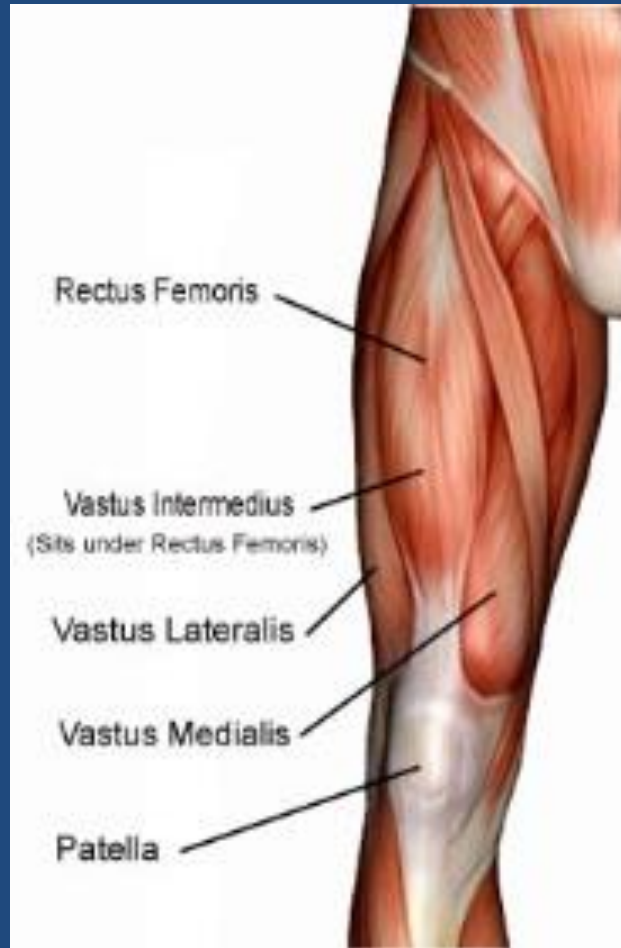
- Flexion and internal rotation of the hip

Sartorius



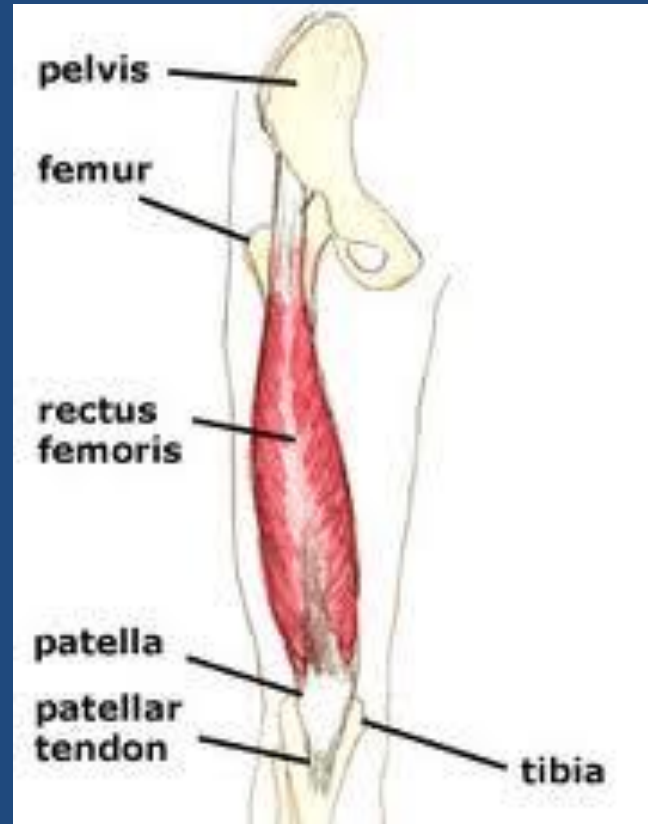
- Flexes knee. Flexes hip and rotates femur laterally

Quadriceps



- Rectus femoris - Extends knee and flexes hip
- Vastus lateralis - Extends knee
- Vastus medialis - Extends knee
- Vastus intermedius - Extends knee

Rectus Femoris



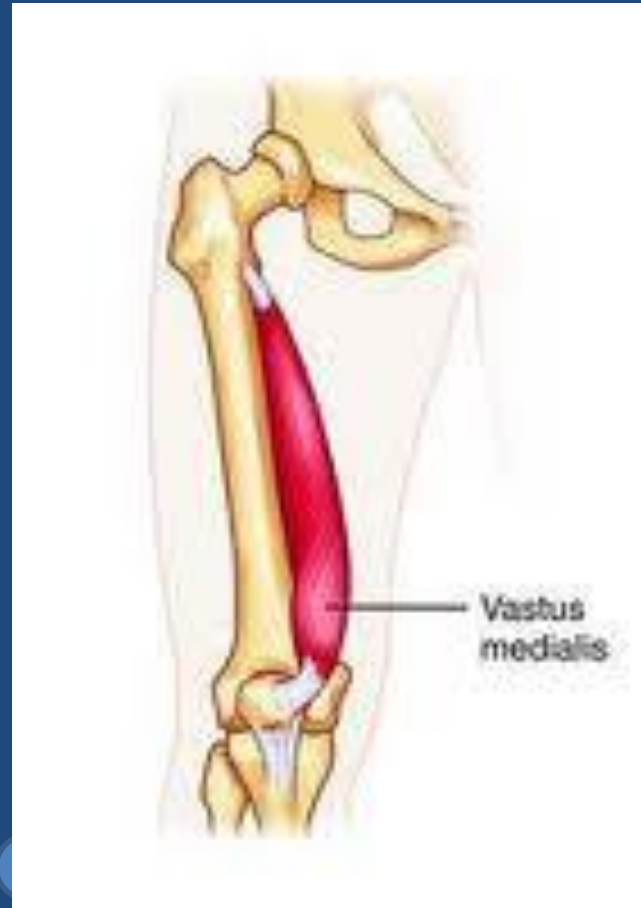
Vastus Intermedius



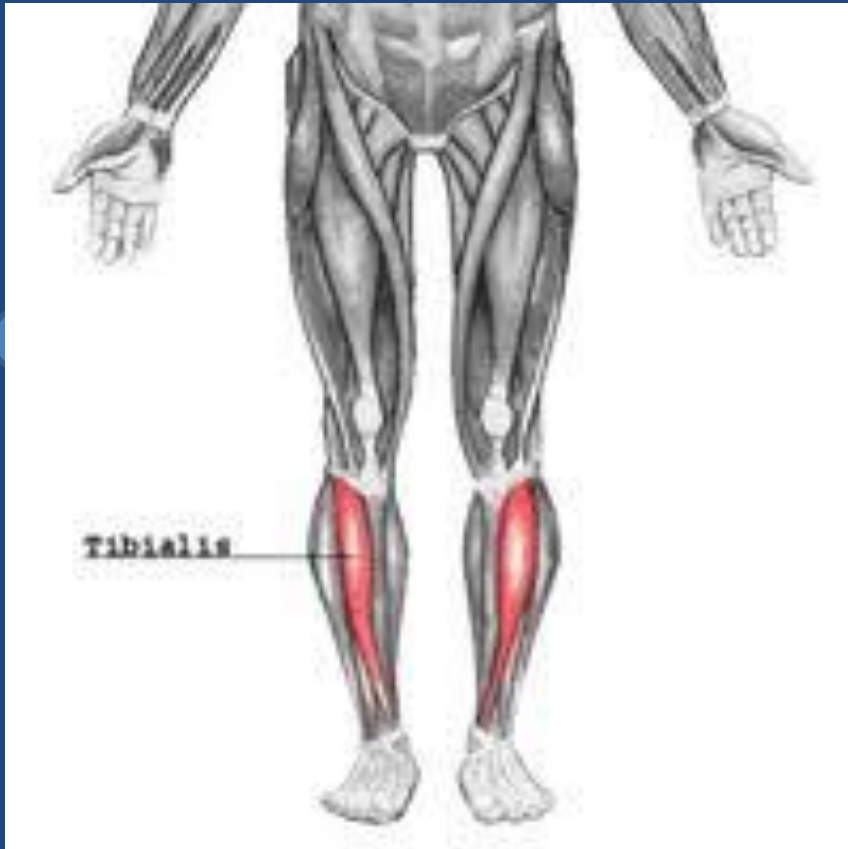
Vastus Lateralis



Vastus Medialis

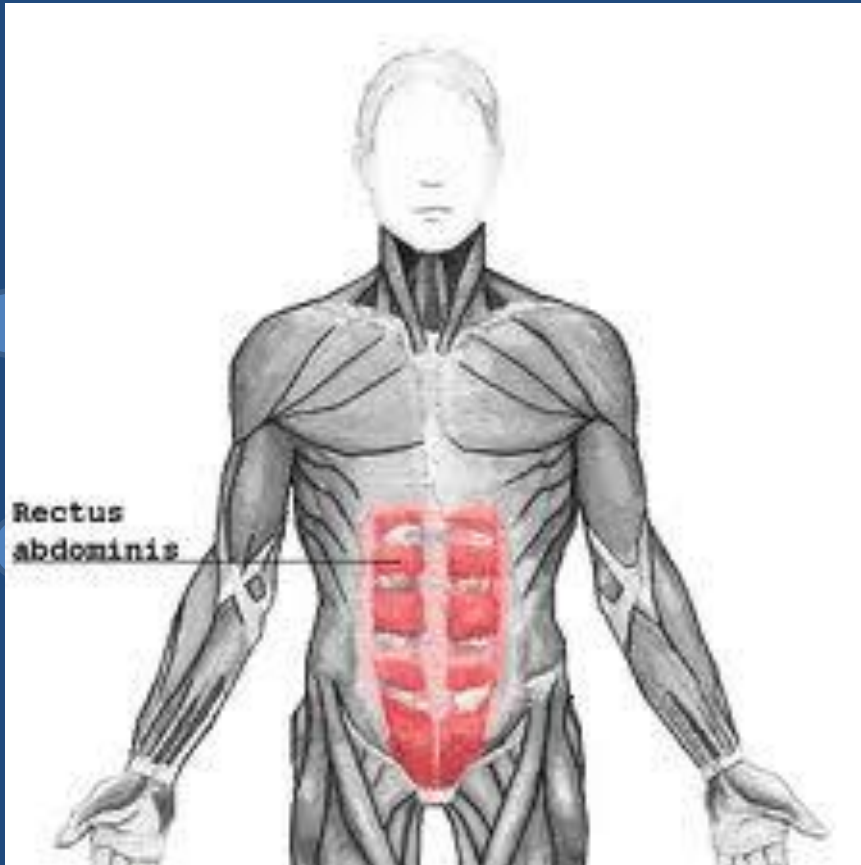


Tibialis Anterior



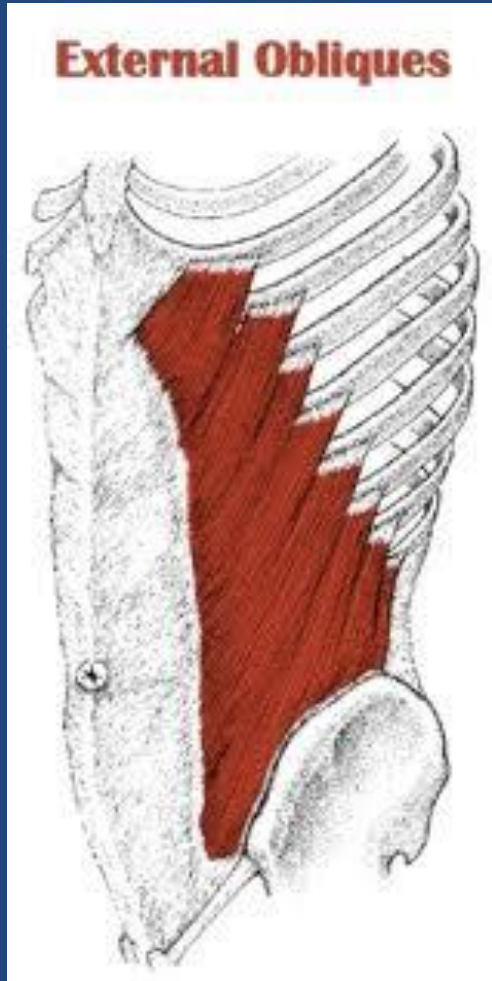
- Dorsiflexes and inverts foot

Rectus Abdominus



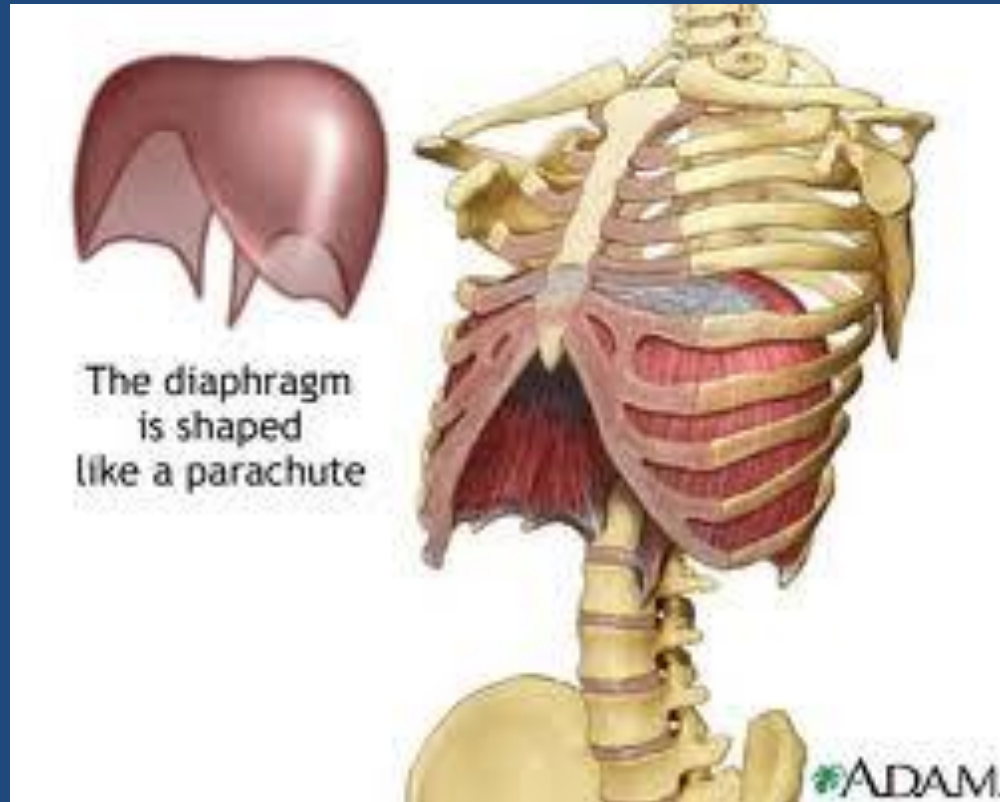
- Compresses abdomen and flexes vertebral column

External Obliques

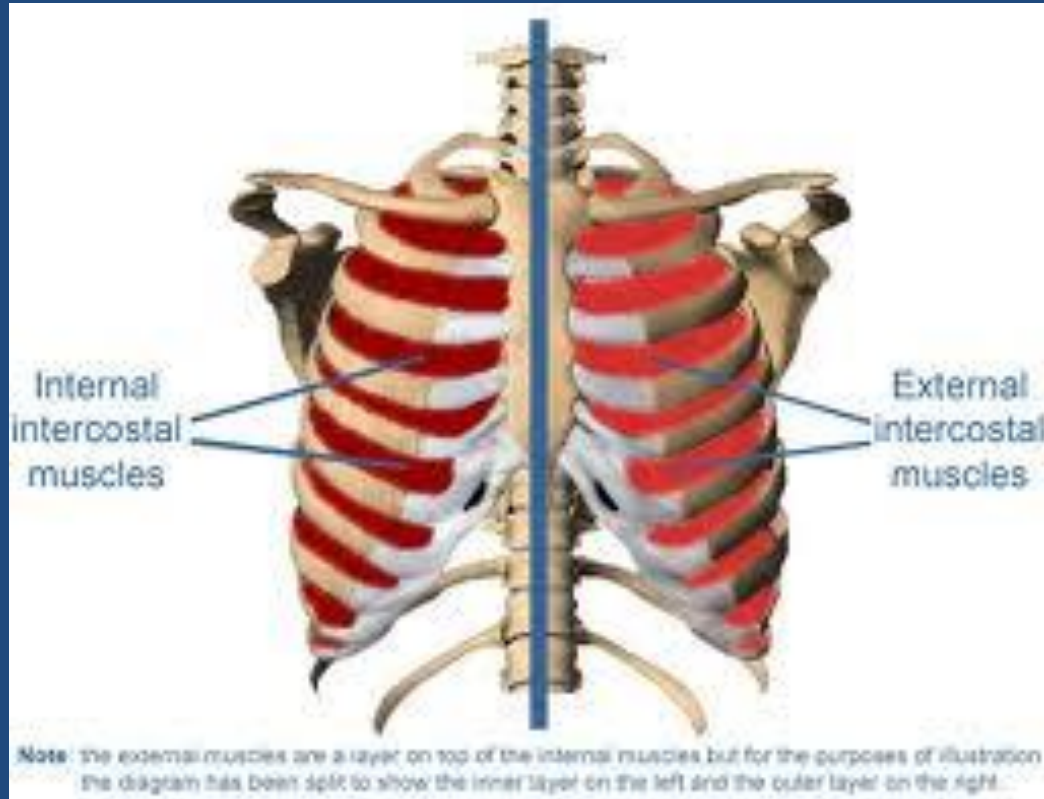


- Bends vertebral column laterally and rotates vertebral column

Diaphragm

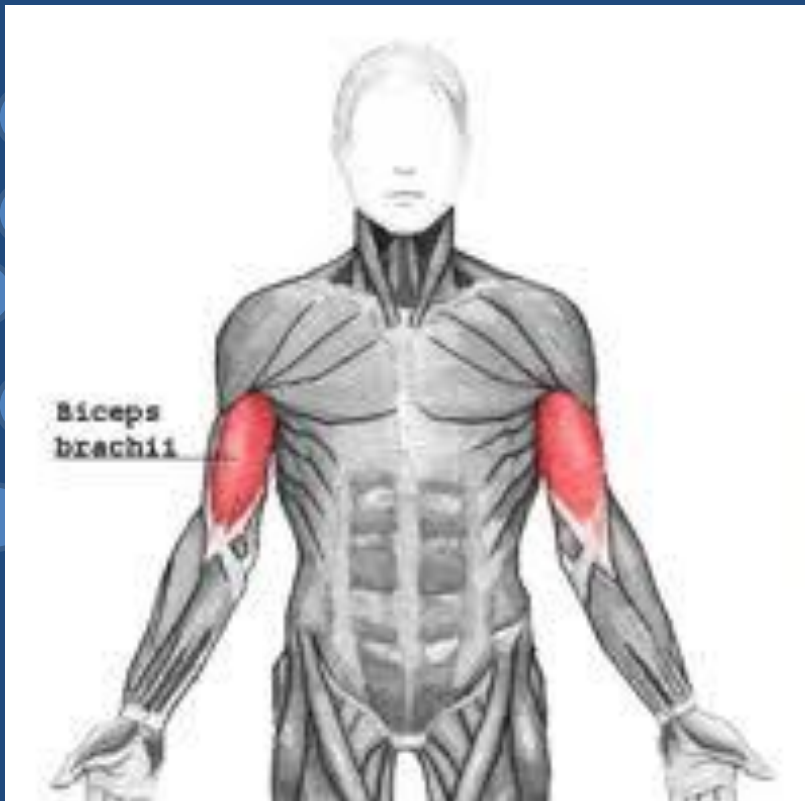


Intercostals



Biceps Brachii

- Flexes and supinates forearm. Flexes arm

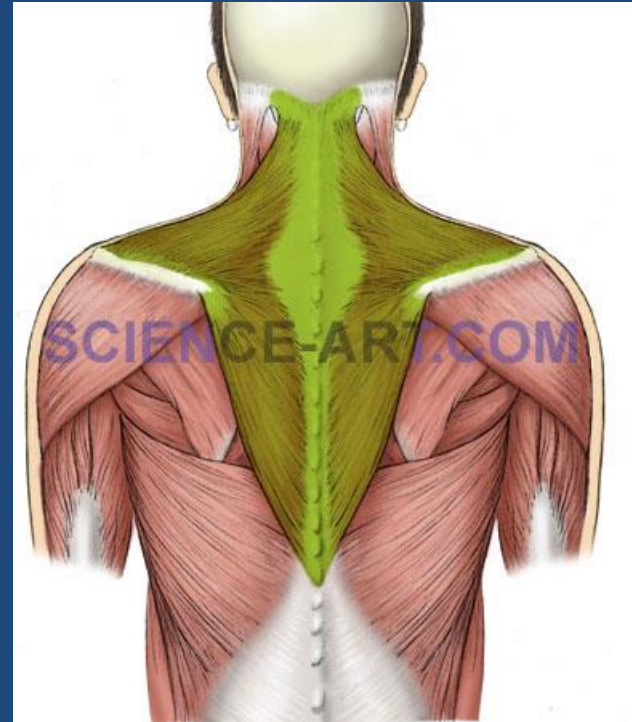


Trapezius

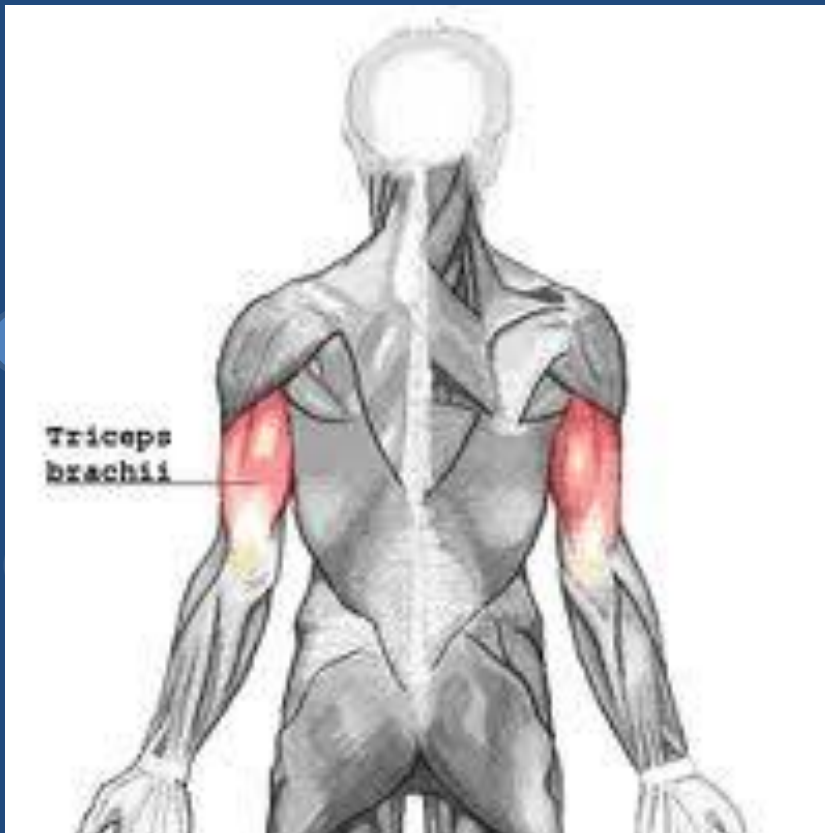
Posterior Muscles

Lifts clavicle.

Adducts, elevates
and rotates
scapular outwards



Triceps Brachii



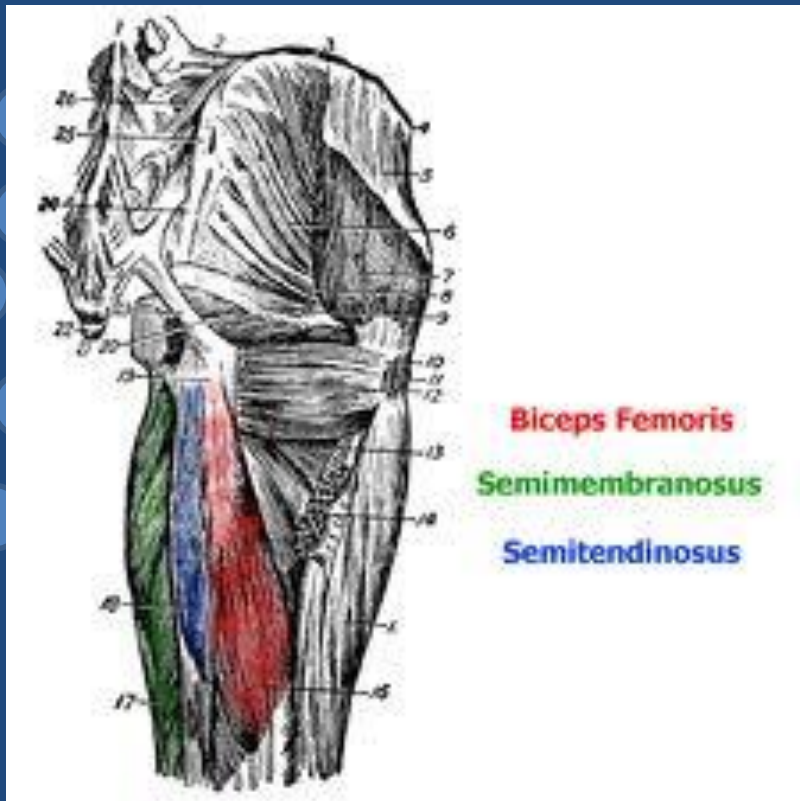
- Extends forearm.
Extends arm

Latissimus Dorsi



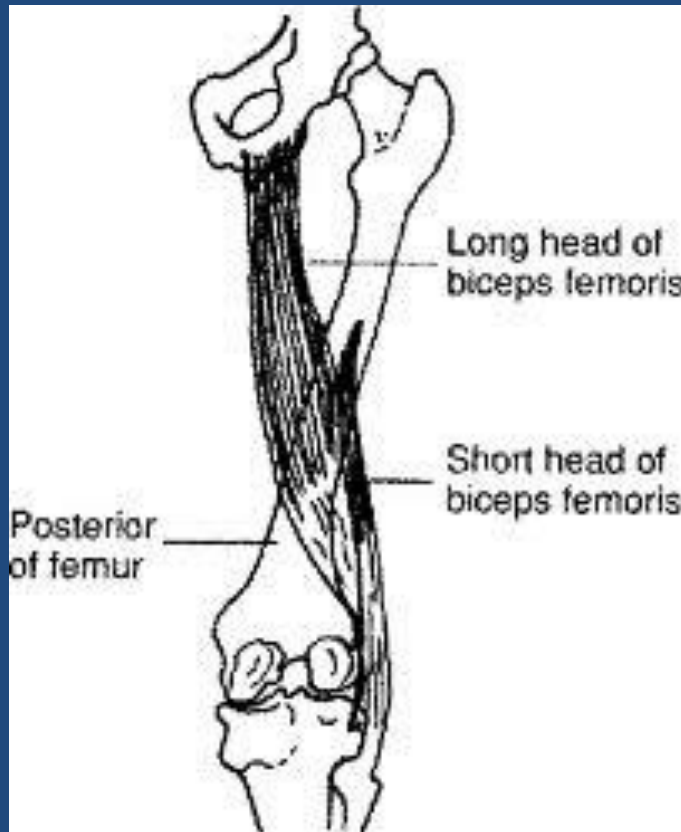
- Extends, adducts and rotates arm medially. Moves arm downward and backwards

Hamstrings



- Biceps femoris - Flexes leg and extends thigh
- Semitendinosus - Flexes leg and extends thigh
- Semimembranosus - Flexes leg and extends thigh

Biceps Femoris



Semimembranosus



Semitendinosus



Gastrocnemius & Soleus



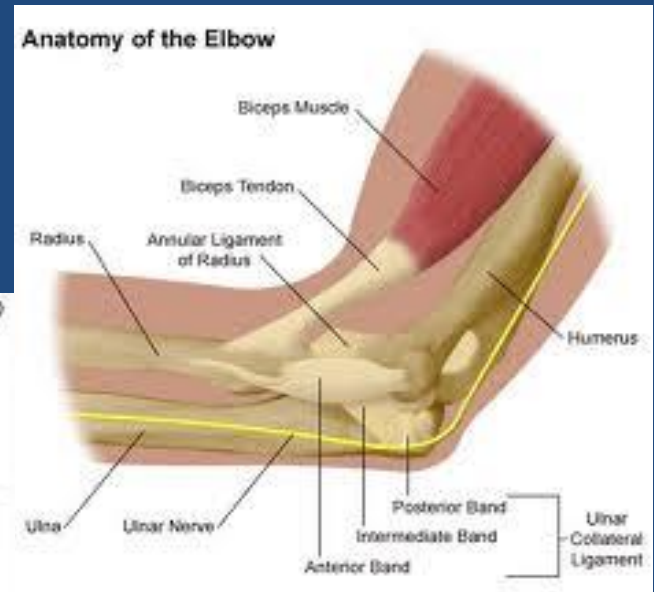
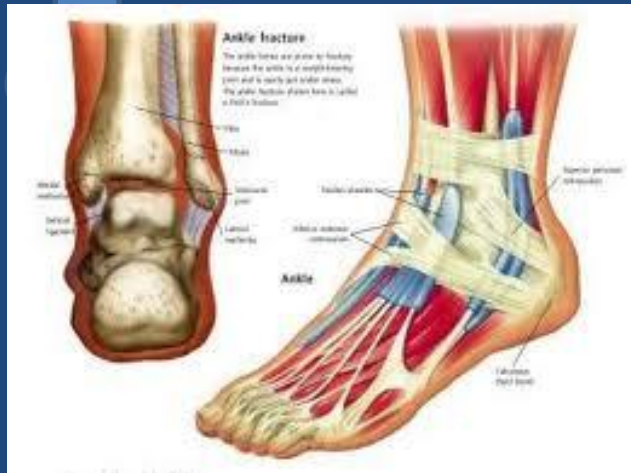
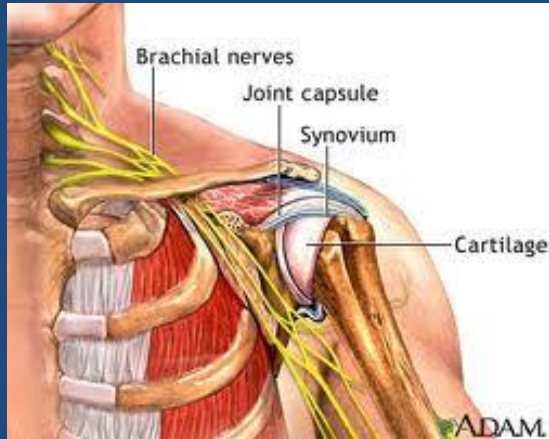
- Gastrocnemius - Plantar flexes foot and flexes knee
- Soleus - Plantar flexes foot

Erector Spinae

- Extends vertebral column

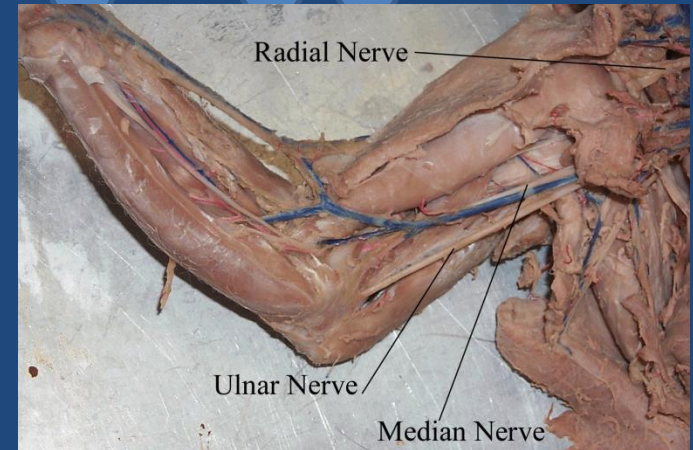


How Muscles and Bones Interact



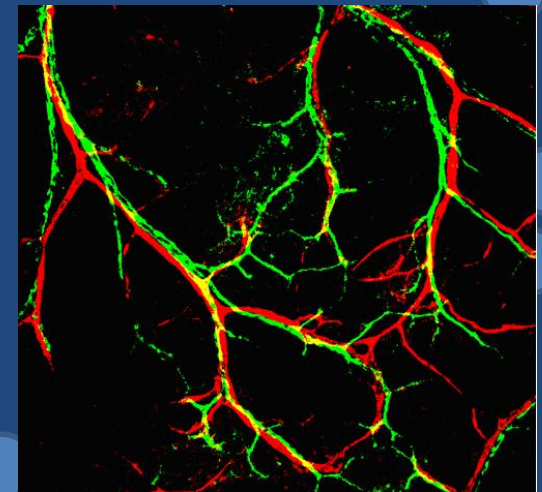
Nerves

- Nerves transmit information from the brain, telling muscles when to contract, extend, or relax.
- Nerves are sent from our brain and also allow our brain to respond to senses which we may touch, taste, smell, hear, or see.



Nerves of the Upper Arm

http://bio.bd.psu.edu/cat/nervous_system/Nerves_of_upper_arm.jpg



<http://dir.nhlbi.nih.gov/labs/lldb/sc/images/nerves-full.jpg>

Tendons

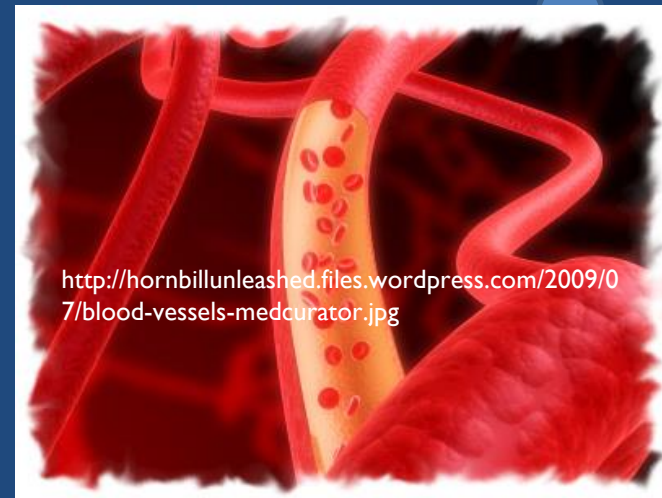
- Tendons are a form of tough connective tissue which joins skeletal muscle to bone.
- They are attached in a precise way, which allows them to pull on bones like levers.
- The muscles provide the force to move the bone, but the tendon does the pulling!



<http://runnerslife.ca/blogs/bare20my20sole/files/2009/12/anatomy-peroneal-tendons.jpg>

Blood Vessels

- Blood vessels keep muscles oxygenated and remove waste.
- As blood circulates through the body, oxygen that we breathe in is carried to muscles and organs throughout the body.
- As the blood returns, it carries with it waste such as lactic acid.

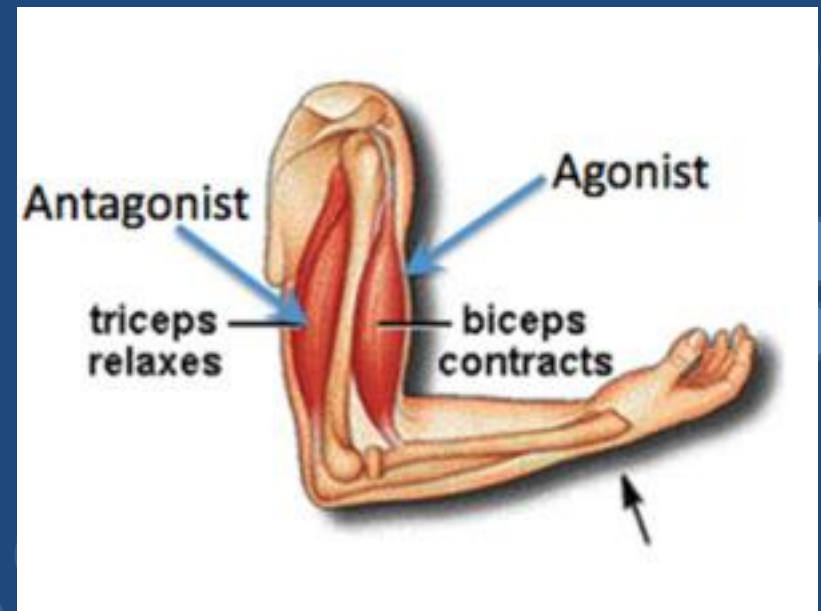


Opposing Muscles

- Opposing muscles work like a choreographed partnership to move your limbs back and forth. As one muscle contracts (tightens), the opposing muscle releases (stretches).

Muscles are arranged in **antagonistic pairs**.

As one muscle contracts (shortens) its partner relaxes (lengthens). They swap actions to reverse the movement.



The End

