

# Muscular System

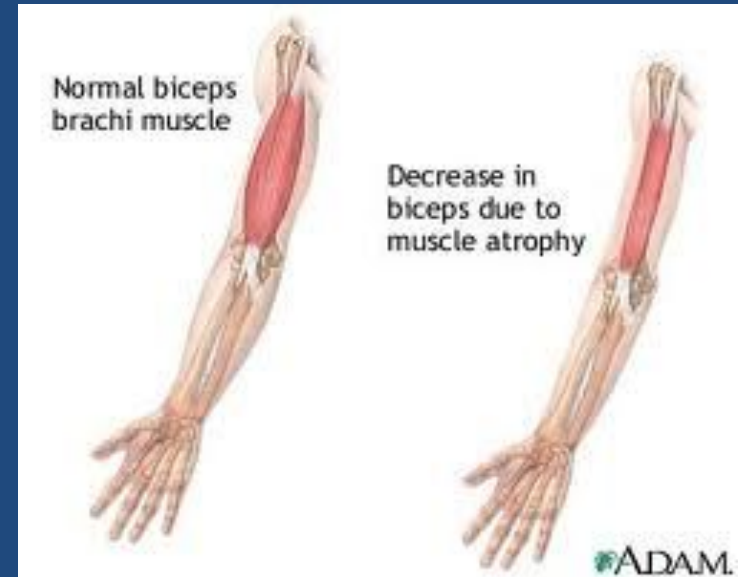
IB Sports, exercise and health science

1.2



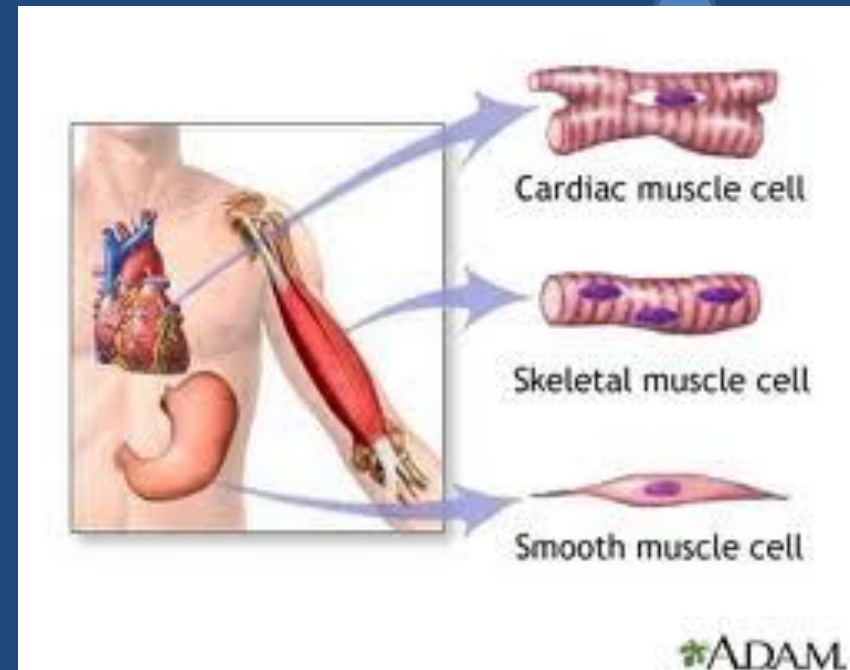
# Characteristics Common to Muscle Tissue 1.2.1

- **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



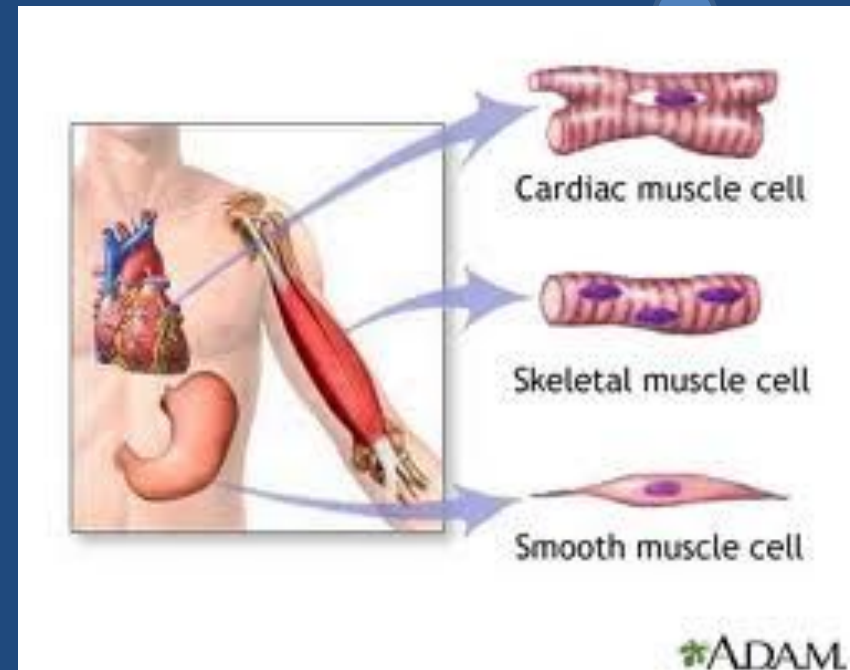
# Types of Muscle Tissue 1.2.2

- 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!



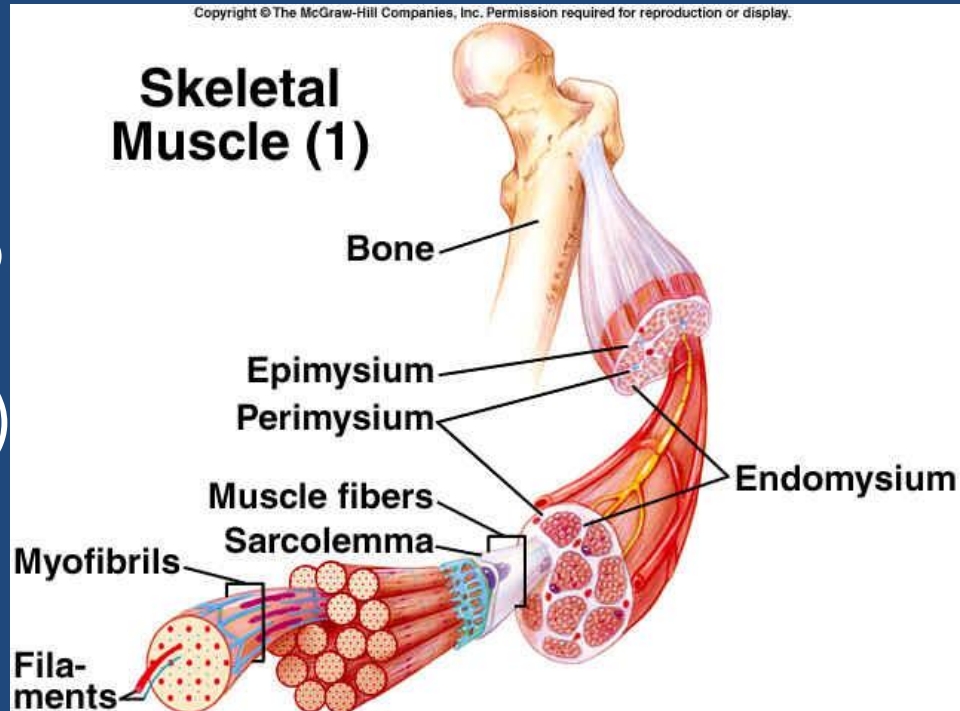
# Types of Muscle Tissue 1.2.2

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



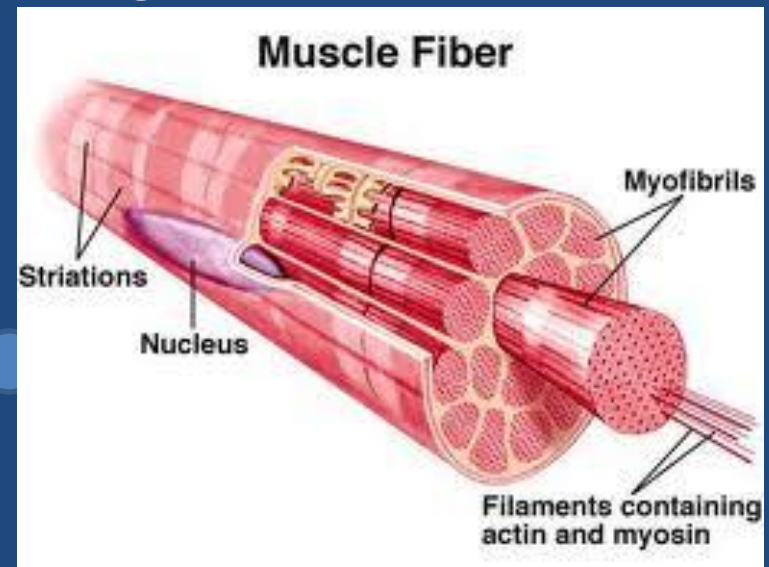
# Structural Make-up of Skeletal Muscle 1.2.3

- 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

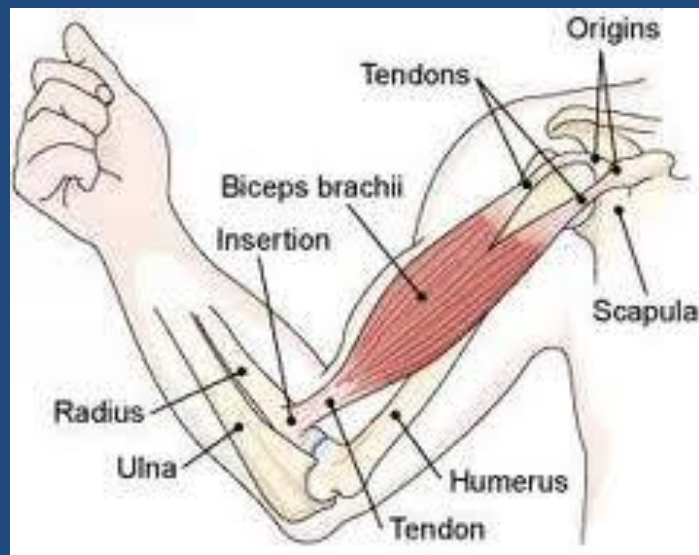


# Breaking It Down

- **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(They convert chemical energy into mechanical work by the hydrolysis of ATP)



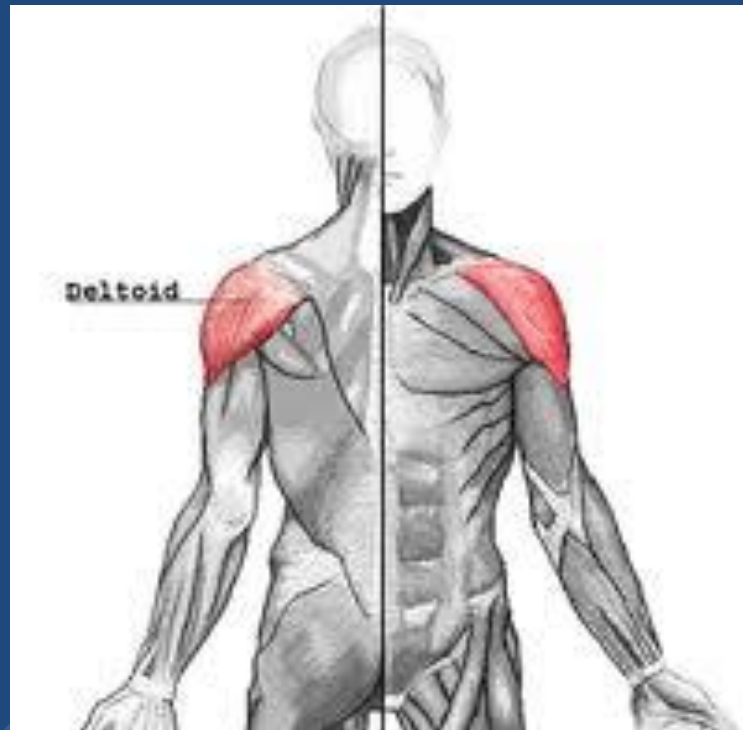
# Origin and Insertion 1.2.4



- **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

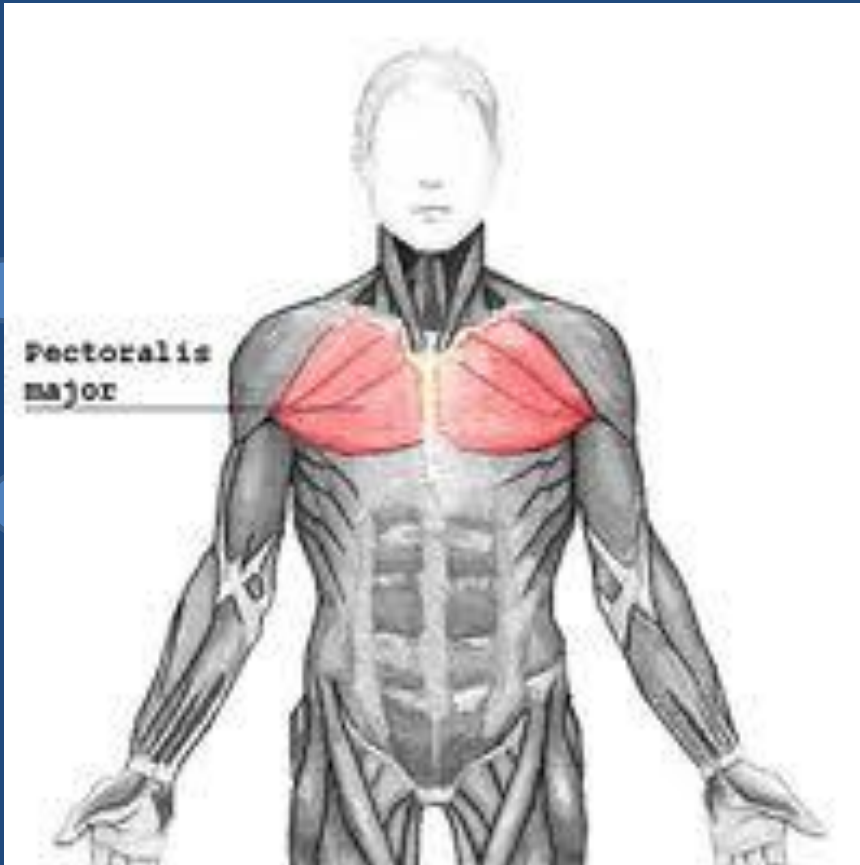
## Deltoid



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

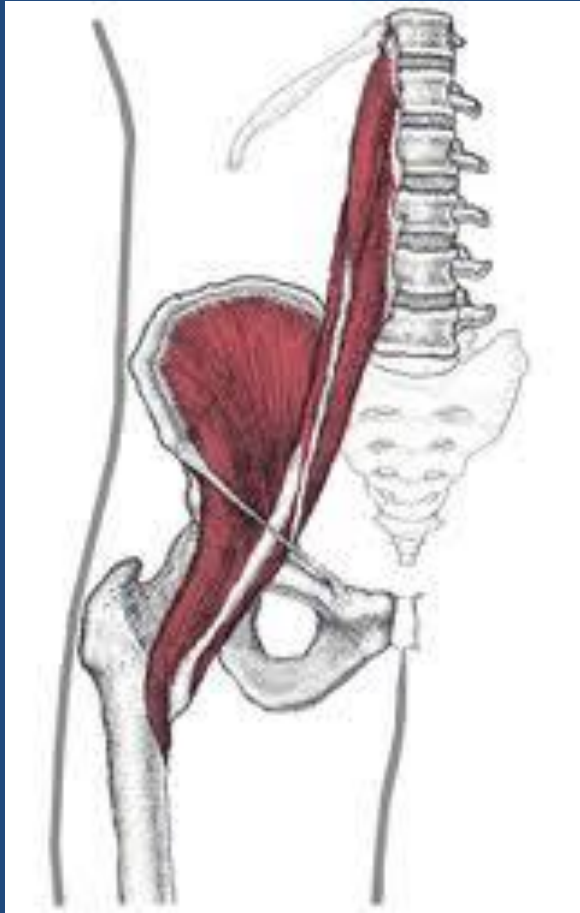


# Pectoralis Major



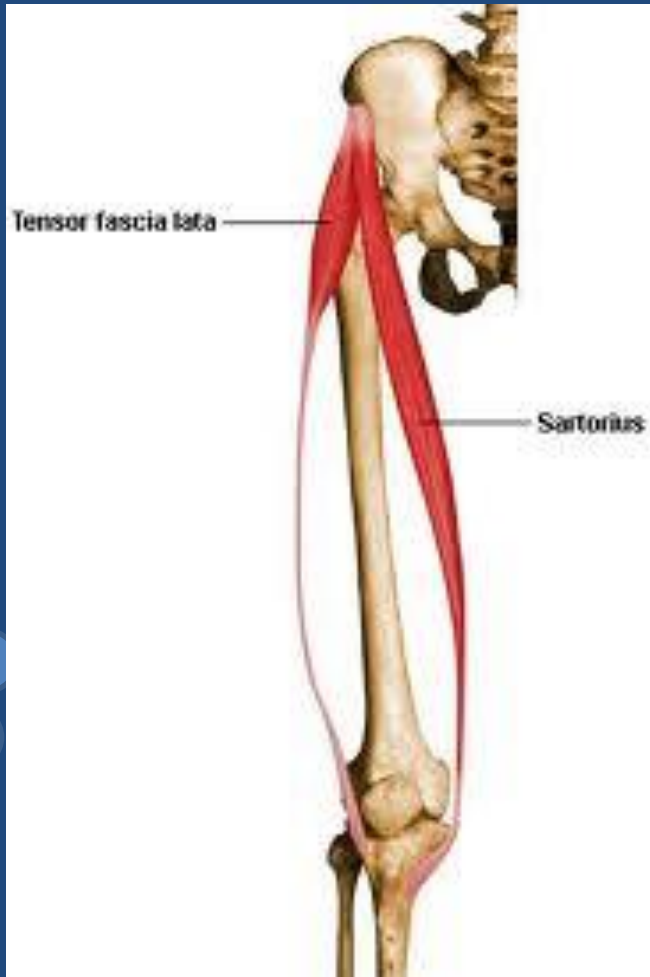
- Flexes, adducts and rotates arm medially

# Iliopsoas



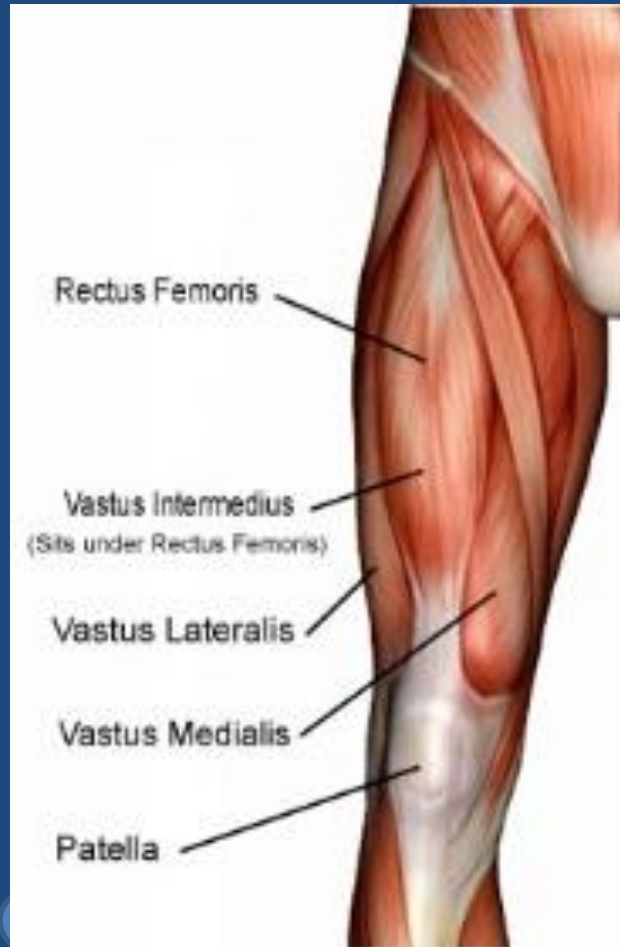
- Flexion and internal rotation of the hip

# Sartorius



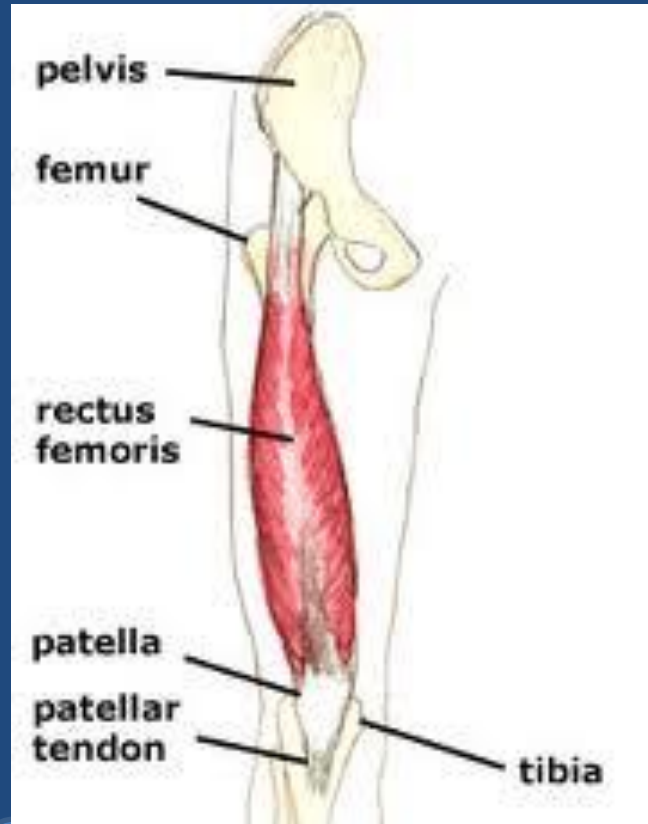
- Flexes knee. Flexes hip and rotates femur laterally

# Quadriceps

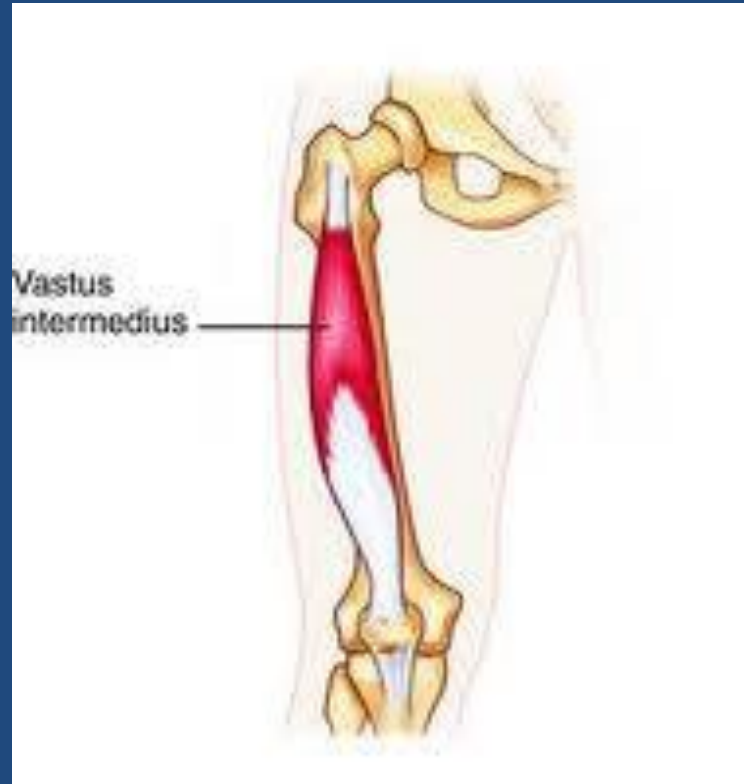


- Rectus femoris -  
Extends knee and flexes hip
- Vastus lateralis -  
Extends knee
- Vastus medialis -  
Extends knee
- Vastus intermedius -  
Extends knee

# Rectus Femoris



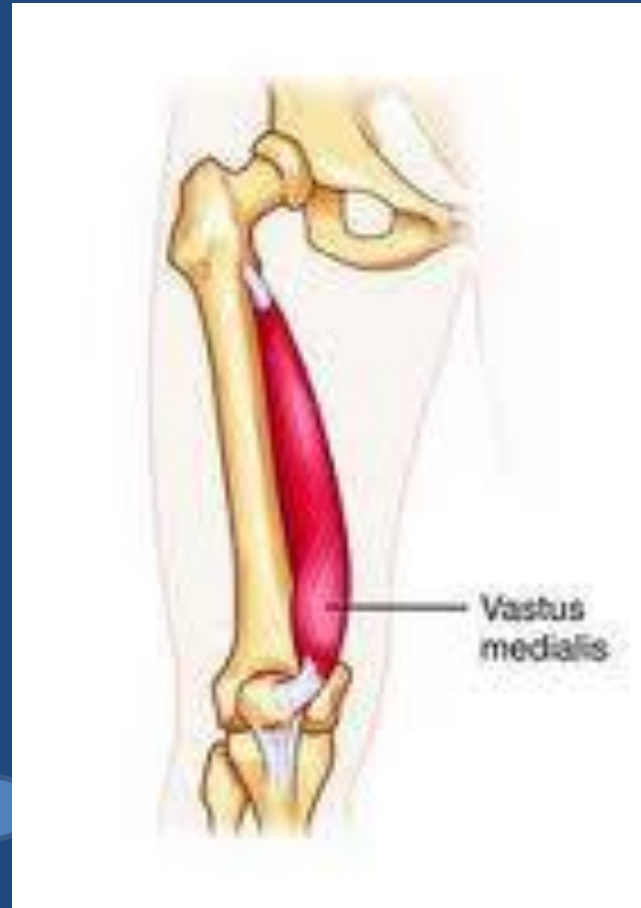
# Vastus Intermedius



# Vastus Lateralis



# Vastus Medialis



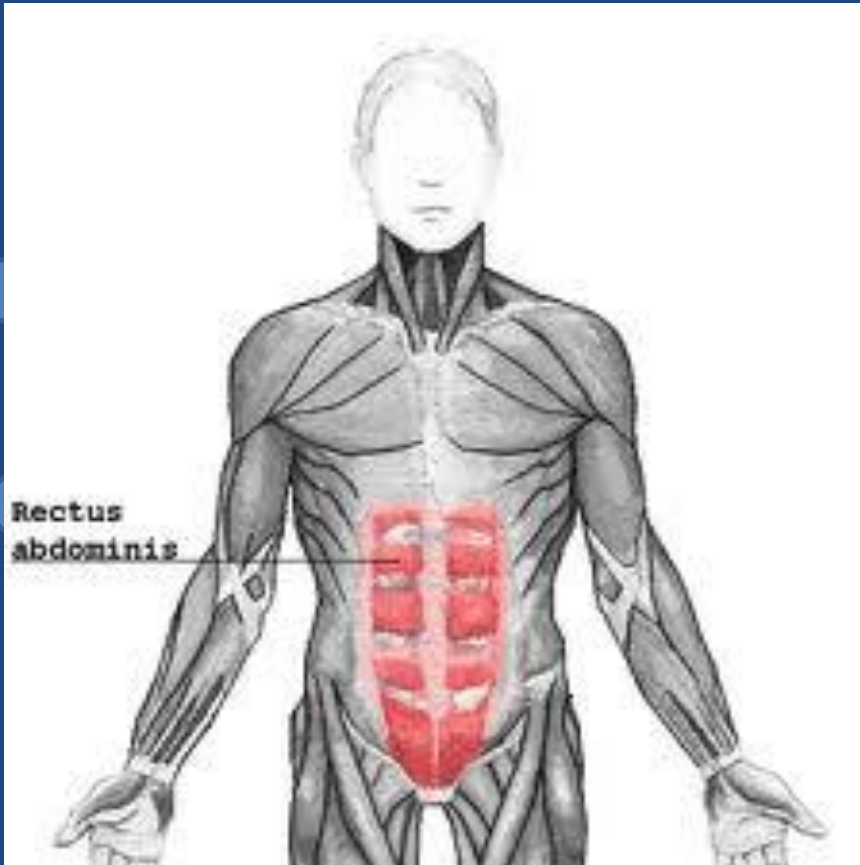


# Tibialis Anterior



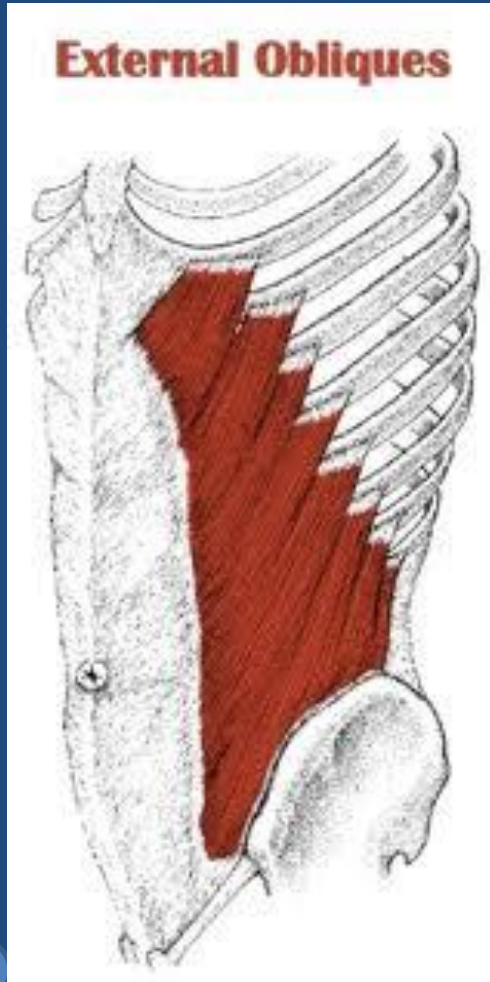
- Dorsiflexes and inverts foot

# Rectus Abdominus



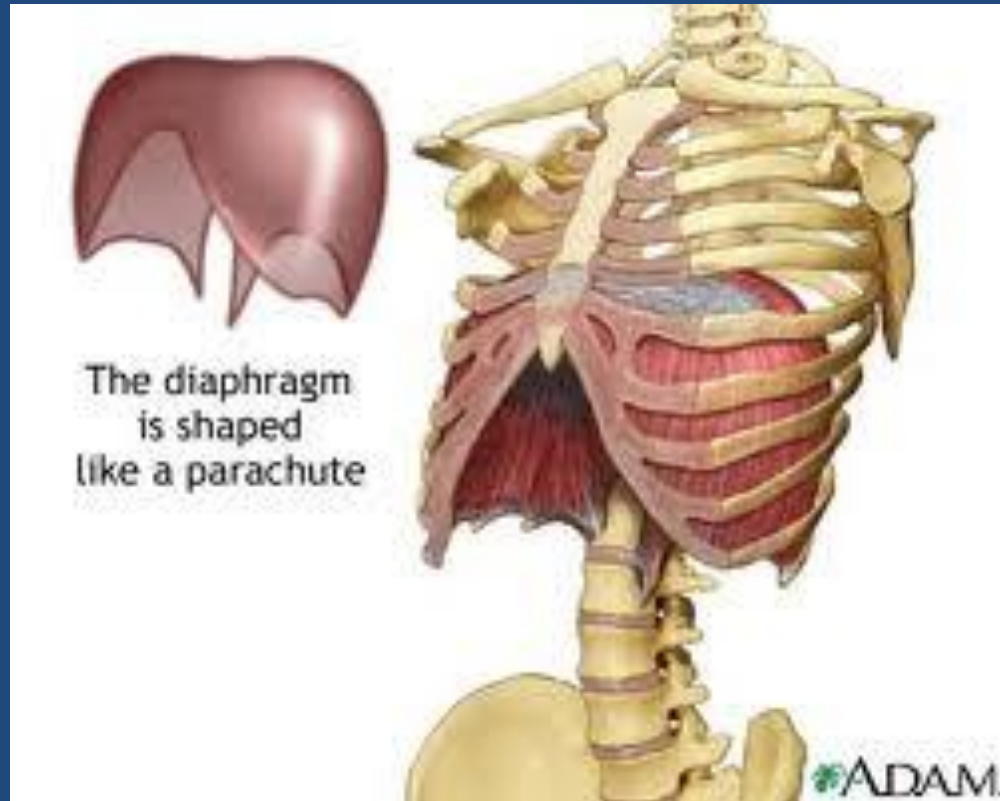
- Compresses abdomen and flexes vertebral column

# External Obliques

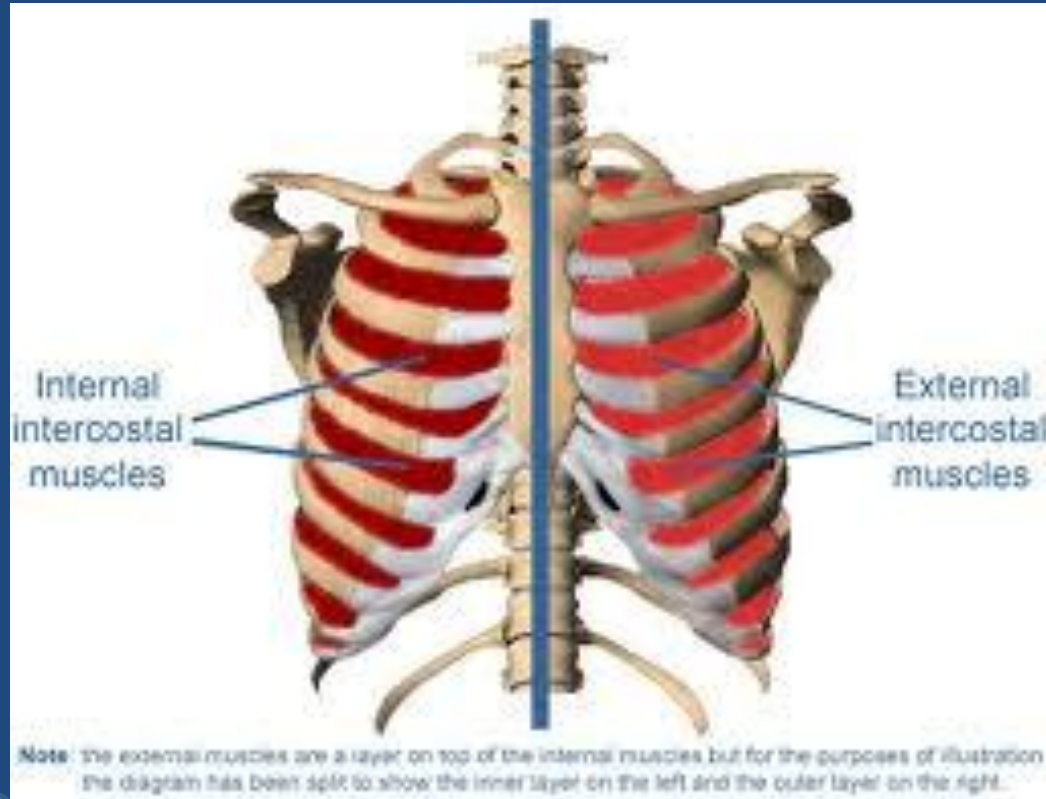


- Bends vertebral column laterally and rotates vertebral column

# Diaphragm

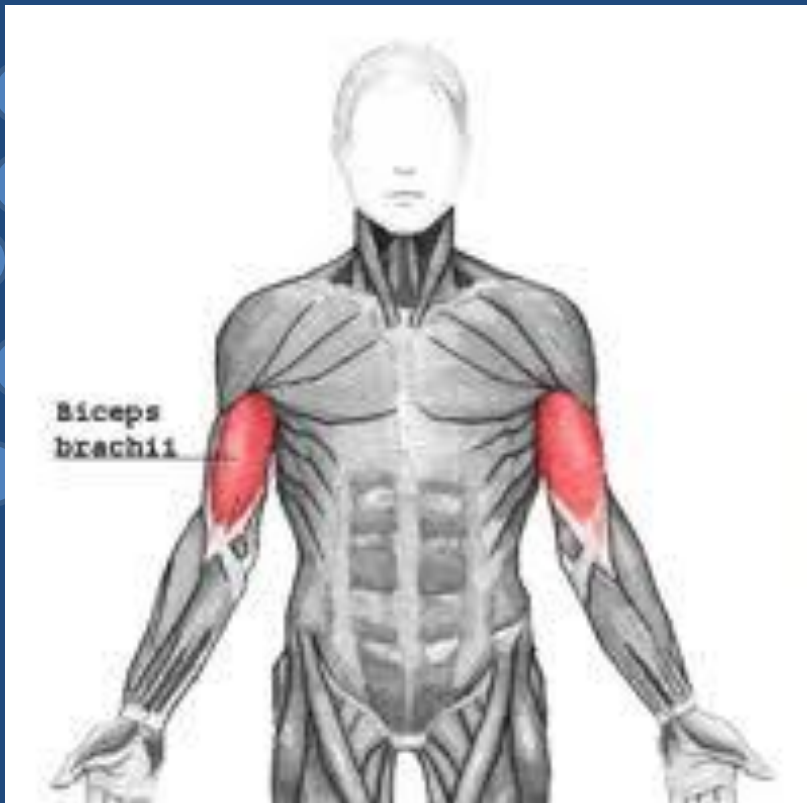


# Intercostals



# Biceps Brachii

- Flexes and supinates forearm. Flexes arm

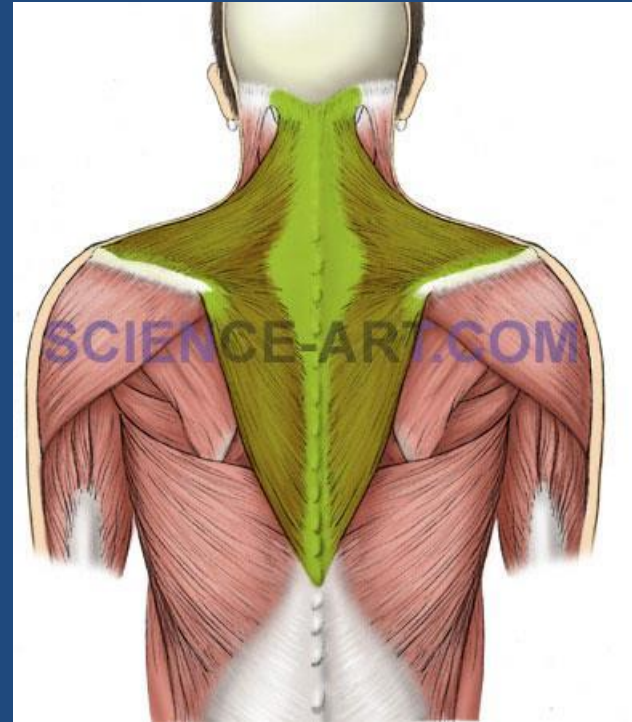


# Trapezius

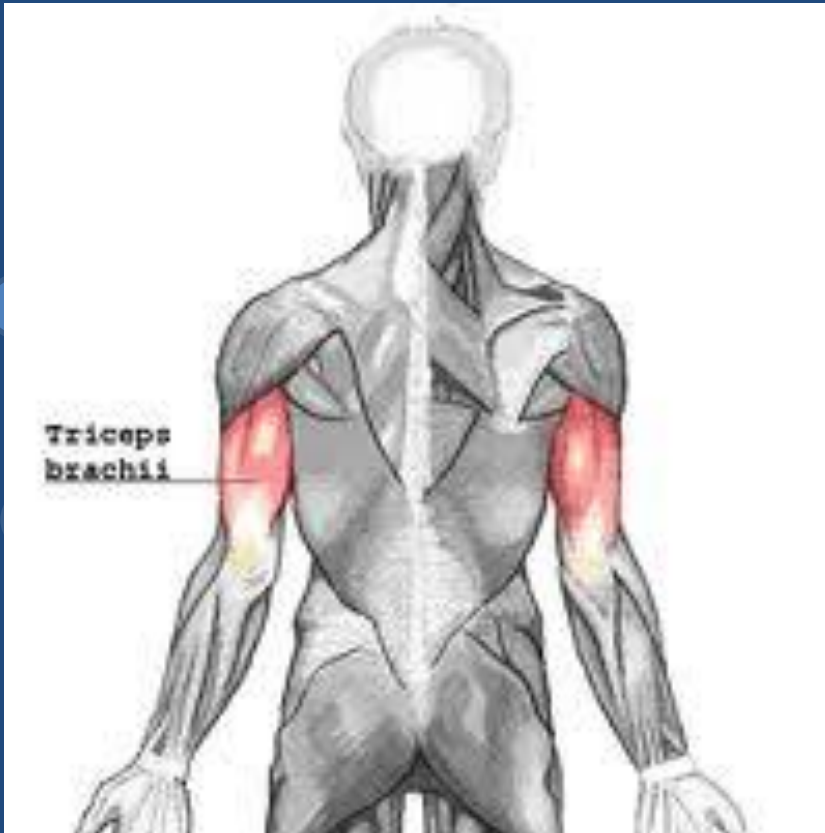
Posterior Muscles

Lifts clavicle.

Adducts, elevates  
and rotates  
scapular outwards



# Triceps Brachii



- Extends forearm.  
Extends arm

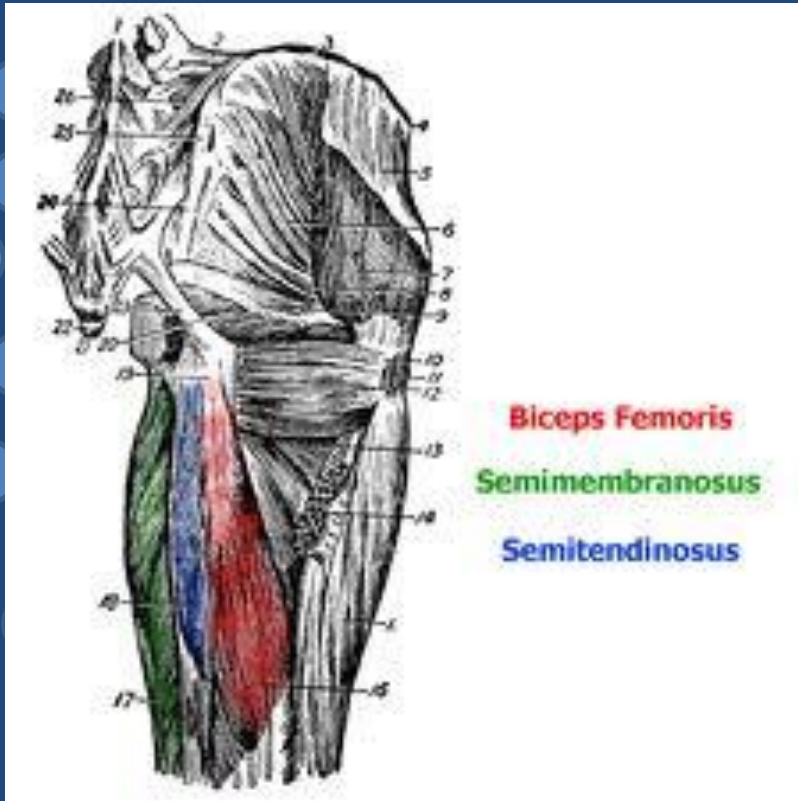


# Latissimus Dorsi



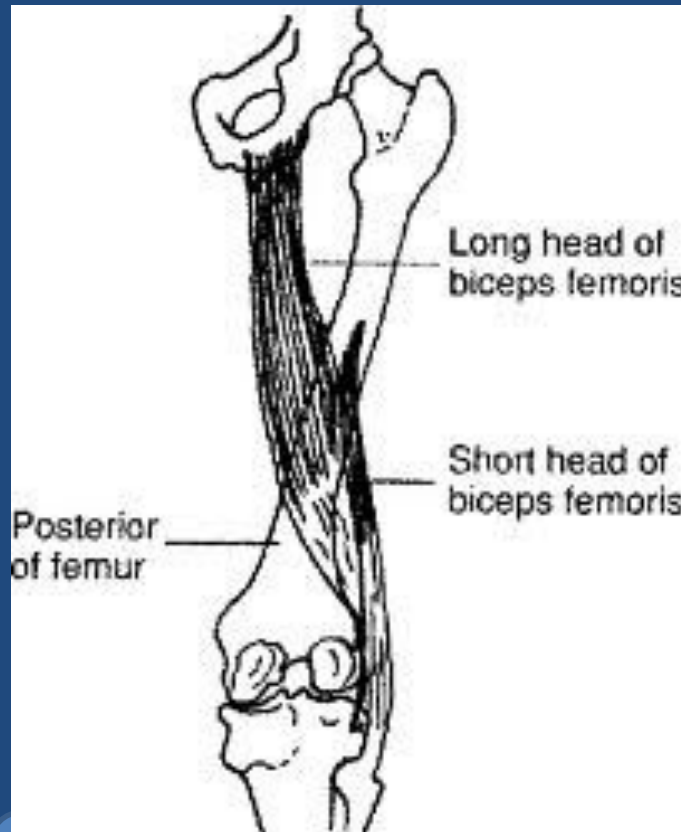
- Extends, adducts and rotates arm medially. Moves arm downward and backwards

# Hamstrings

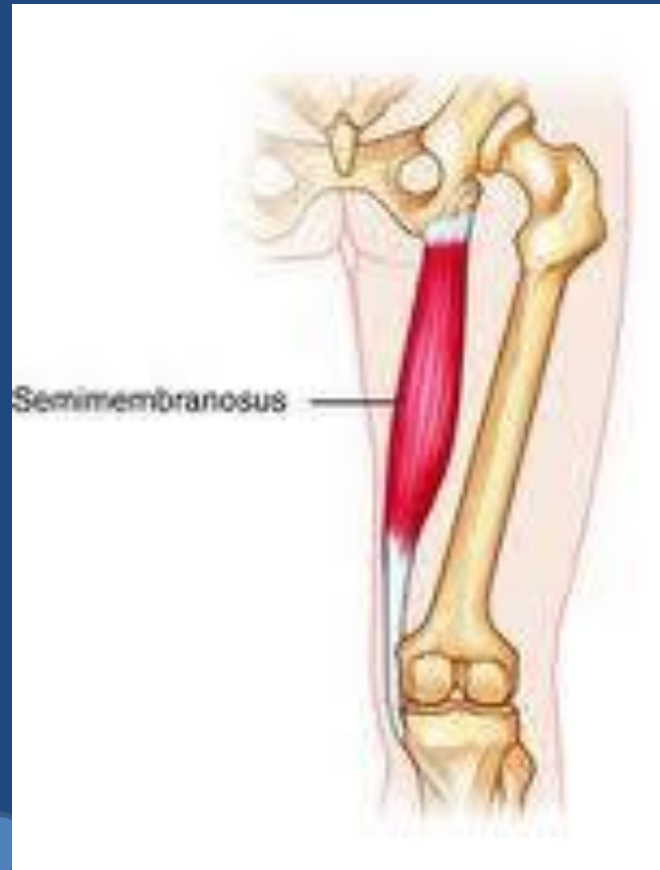


- Biceps femoris - Flexes leg and extends thigh
- Semitendinosus - Flexes leg and extends thigh
- Semimembranosus - Flexes leg and extends thigh

# Biceps Femoris



# Semimembranosus



# Semitendinosus



# Gastrocnemius & Soleus



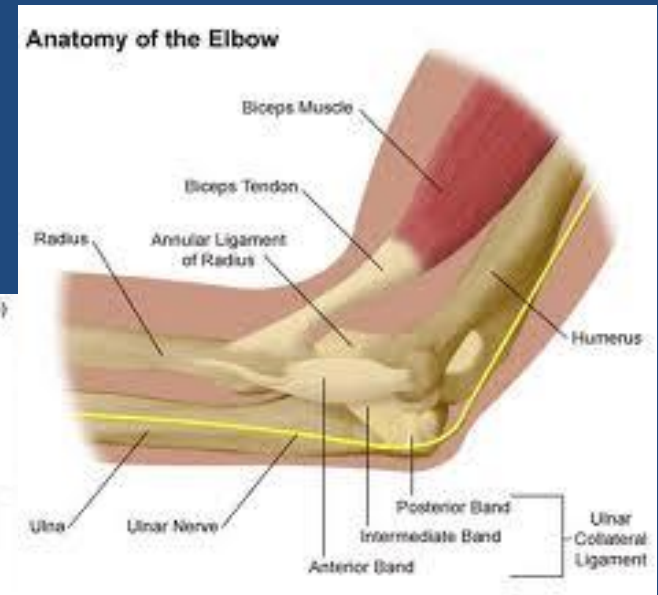
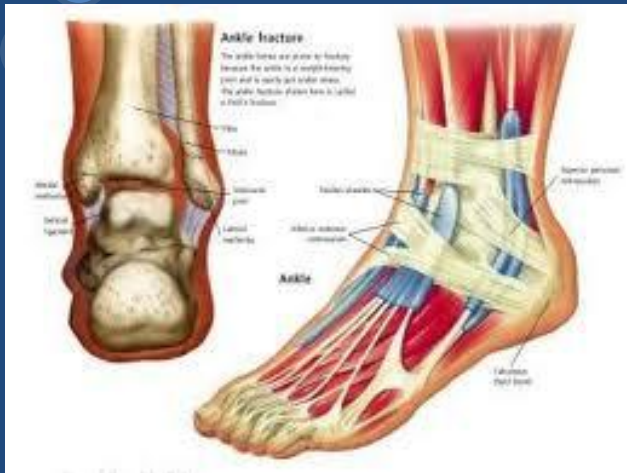
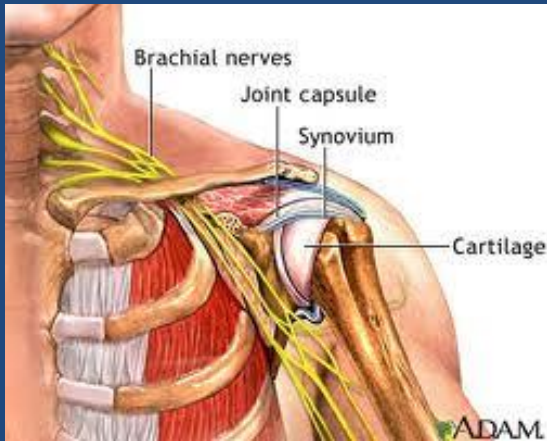
- Gastrocnemius - Plantar flexes foot and flexes knee
- Soleus - Plantar flexes foot

# Erector Spinae

- Extends vertebral column



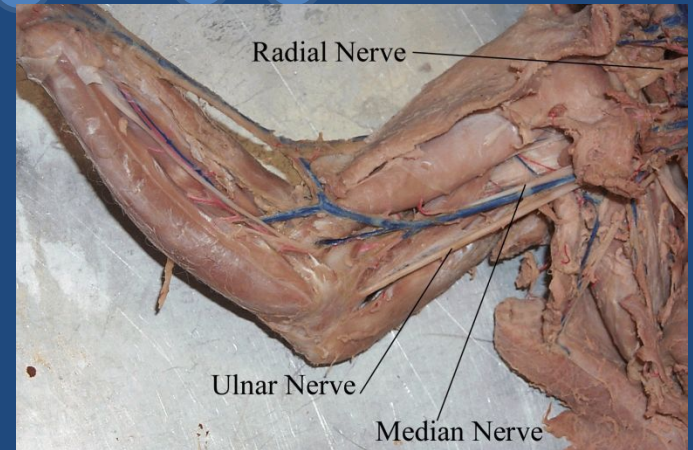
# How Muscles and Bones Interact





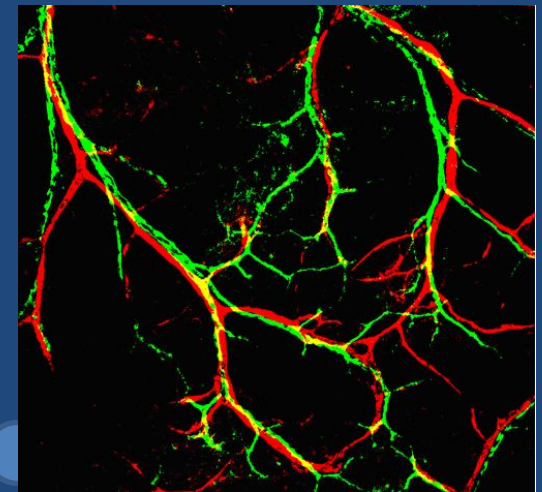
# Nerves

- 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://bio.bd.psu.edu/cat/nervous_system/Nerves_of_upper_arm.jpg)



<http://dir.nhlbi.nih.gov/labs/ldb/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.

