Human Systems - Respiration: Lesson 4 - Muscles

Types of Muscle

- Your body contains 3 different types of muscle
    - Smooth muscle
    - Cardiac muscle
    - Skeletal muscle

Smooth Muscle

- Is found in the walls of arteries and veins, in the walls of the digestive tract, and in other organs (uterus, bladder)

- Is under the control of the autonomic (**involuntary)** nervous system

Cardiac Muscle

- Is found **only** in the **heart**

- Is under the control of the autonomic (**involuntary)** nervous system

Skeletal Muscle

- Muscles that are attached to bones

- Attach to bones by **tendons**

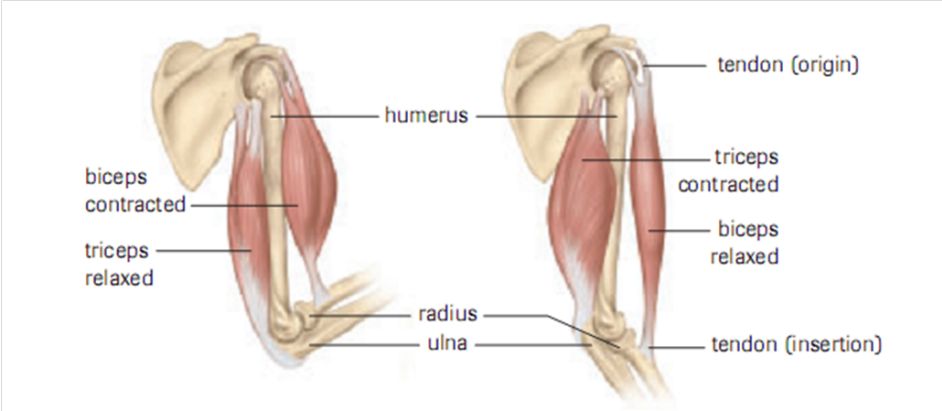
- Are under voluntary control

Types of Muscle Animation

http://www.nelson.com/ABbio20-30/teacher/protect/otr/Bio2030OTR/attachments/i_AnimationSimulation/muscle_tissues_v2.html

Skeletal Muscle

- Skeletal muscles that move joints often work in pairs called **antagonistic** muscles
    - When one of the pair is contracting the other is relaxing
    - The muscle that contracts to bend a joint is called a **flexor** muscle
    - The muscle that contracts to straighten a joint is called a **extensor** muscle
    - Eg. Bicep and tricep



Opposing Muscles Animation

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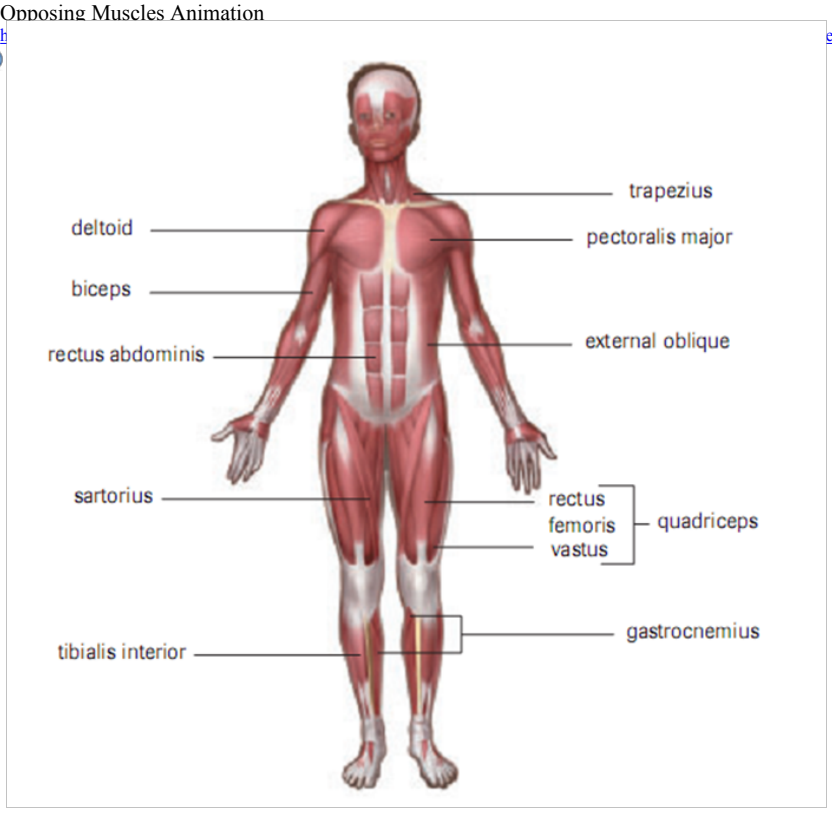


Structure of Skeletal Muscle

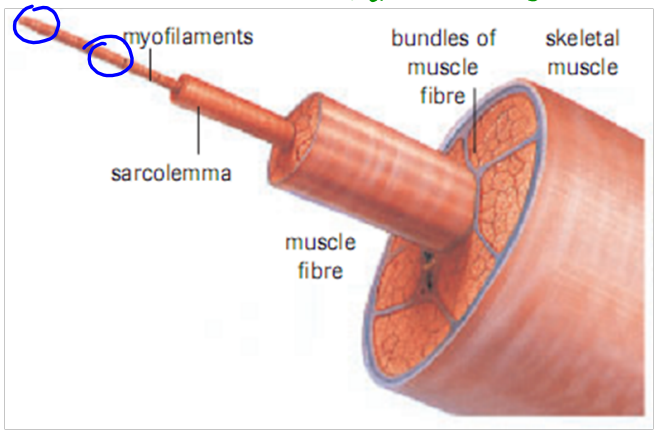
- Skeletal muscle is composed of several bundles of cells called **fibers**

- The fibers are enclosed within a membrane called the **sarcolemma**

- **Myofibrils** make up a muscle fiber (cell)

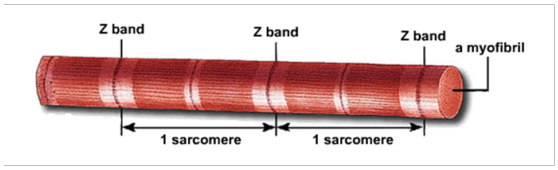
- Myofibrils are made up of **myofilaments**

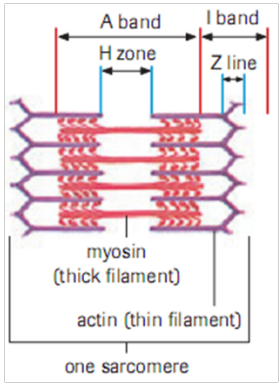
↳ actin + myosin



- There are two kinds of myofibrils, each made with a different protein

  - Actin - thin myofilament
  - Myosin - thick myofilament

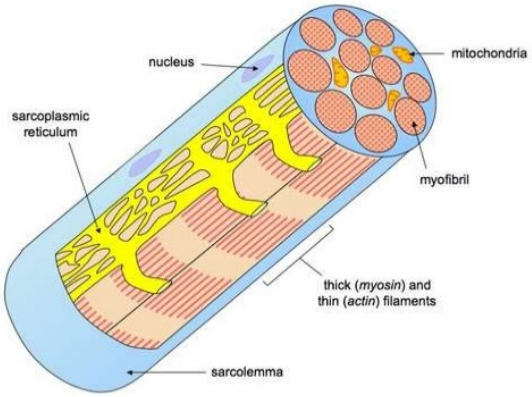




- The myofibril is divided into **sacromeres** that can contract and become smaller or relax and become longer

http://www.nelson.com/ABbio20-30/teacher/protect/otr/Bio2030OTR/attachments/i_AnimationSimulation/myofibril.html

Striated Muscle



Sliding Filament Theory

This we know for sure:

- Muscles cause movement by shortening.

- The actin filaments slide over the myosin filaments.

- Z lines move closer together when muscle fibres contract

What we don't know is how the filaments slide over each other. The Theory is:

- knoblike projections on the thick myosin filaments form cross-bridges on receptor sites of the thinner actin filaments

- A series of cross-bridges attach and detach as the actin filaments are drawn inward

- The energy required for cross bridges to detach comes from ATP, adenosine triphosphate

    - In the absence of ATP, the cross-bridges fail to detach and the muscle becomes rigid

http://www.nelson.com/ABbio20-30/teacher/protect/otr/Bio2030OTR/attachments/i_AnimationSimulation/sliding_filament_v2.html