

Muscular System Notes

Functions of Muscular System

- 1)
- 2)
- 3)
- 4)

Muscle Tissue Types

How are the types the same?

- All muscle cells are elongated – called _____ (thousands depending on muscle)
- Ability of muscle to shorten depends on two type of _____
- Terminology –
 - Myo or mys = muscle
 - Sarco = flesh

Skeletal Muscle

- Body Location =
- Appearance =
- Control =
- Speed of Contraction =

Cardiac Muscle

- Body Location =
- Appearance =
- Control =
- Speed of Contraction =

Smooth Muscle

- Body Location =
- Appearance =
- Control =
- Speed of Contraction =

Different parts of a muscular organ

- _____: bulging part of a muscle
- _____ (head): the less moveable attachment (there can be more than one origin)
- _____: the moveable attachment

Types of Body Movements

- _____ = decrease in joint angle and brings two bones closer together
- _____ = increase in joint angle and brings two bones farther apart
- _____ = moving from upward facing or anterior to downward facing or posterior
- _____ = moving from posterior position to anterior position
 - Like your holding a cup of soup
- _____ = moving a limb away from midline of body
- _____ = moving a limb toward the midline of body

- _____ = combination of flexion, extension, adduction, and abduction
- _____ = movement of ankle bringing the toes up toward the shin
 - Standing on your heels
- _____ = movement of ankle causing the toes to point down
 - Standing on your toes

Types of Muscles

- Muscles can't _____, they can only _____ as they contract
 - Movement is the result of _____ or teams of muscles working together
- 1) _____ – when several muscles are contracting at once, it the muscle that has the major responsibility for causing the movement
 - 2) _____ – muscles that oppose or reverse a movement
 - 3) _____ – help prime movers by making same movement or reduce other unnecessary movements

Muscle Names

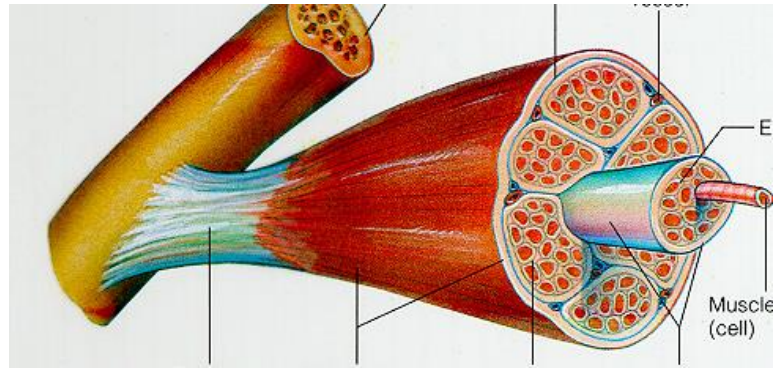
- Relative _____ of muscle – (*gluteus maximus*)
- _____ of muscle – named for the bone (*temporalis*)
- Number of _____ – (*biceps, triceps, quadrips*)
- Location of muscle's origin and insertion – (*sternocleidomastoid*)
- _____ of muscle – (*deltoid*)
- _____ of muscle – (*adductor longus, extensors of wrist*)

General Skeletal Muscle Structure

- Muscle tissue = Muscle fibers, as well as large amounts of connective tissue, blood vessels, and nerves
- _____ tissue covers and supports each muscle fiber and reinforces the muscle as a whole
- Health of muscle depends on a sufficient _____ and _____ supply. Each skeletal muscle has a nerve ending that controls its activity.
- Active muscles use a lot of energy and require a continuous supply of _____ and nutrients
 - supplied by arteries
 - muscles produce large amounts of metabolic waste that must be removed by veins

Organization of Skeletal Muscle

- _____ – fibrous connective tissue under the hypodermis that surrounds functional groups of the muscle
- Single muscles are surrounded by tough, dense connective _____ - which extends and merges with the _____ (epi = upon) (myo = muscle)
- Tendon attaches to _____ (covers bone)
- Epimysium surrounds many _____ (bundles)
- A single fascicle is surrounded by _____ (collagenic) (peri = around).
- A fascicle contains _____ (areolar tissue) and muscle fibers (muscle cells).
- Endomysium surrounds _____ (cells)
- Muscle fibers are long cylindrical cells containing _____
- Myofilaments are proteins which are part of the functional contractile unit of skeletal muscle, known as the _____



Parts of Muscle Fiber

- Many Nuclei
- Cell membrane = _____
- _____
- Cytoplasm
- Mitochondria
- Sarcoplasmic reticulum
- Transverse tubules – T tubes
- Myofibrils contain light and dark bands depending on where the actin and myosin are located
- _____ = chains of tiny contractile units called **sarcomeres**

2 Types of Protein Filaments

- THICK FILAMENTS are made up of a PROTEIN called _____
- THIN FILAMENTS are made of a PROTEIN called _____
- Myosin and Actin Filaments are arranged to form _____ patterns
- These are responsible for the Light and Dark Bands that can be seen in Skeletal Muscle (_____ Appearance)

Sarcomere – tiny contractile units

- The structural and functional unit of skeletal muscle
- Actin is surrounded by the _____ (troponin and tropomyosin)
- Myosin has extensions called _____, which can attach at actin binding sites reference points of a sarcomere

Zones of Sarcomere

- _____: the terminating end of a sarcomere (middle of one I-band)
- _____ (light): contains actin only
- _____ (dark): contains actin and myosin
- _____: contains myosin only

Muscle Responses

1. Graded Response

- “ _____ ” Law – muscle cell will contract to its _____ when adequately stimulated
 - Never _____ contracts
- Graded Response – degrees of shortening
 - 1) Changing _____ of muscle contraction
 - 2) Changing _____ being stimulated

2. Muscle Response to Increasingly Rapid Stimulation

- _____ – get very rapid stimuli, so rapid the muscle cells don't have time to relax between stimuli
 - Stronger and smoother contractions
- _____ – single, brief, jerky contraction

3. Muscle Response to Stronger Stimuli

- When a _____ muscle cells are stimulated = contraction is _____
- When _____ muscle cells are stimulated = contraction is _____
“The same hand that soothes can deliver a stinging slap”

Energy for Muscle Contractions

- Need _____ to cause contractions – body only stores 4 to 6 seconds worth
- So, our body has to _____
- Our body does this by three pathways:

Three pathways:

1) _____ of ADP by creatine phosphate

- $CP + ADP \rightarrow Creatine + ATP$
- Creatine Monohydrate- natural supplement that helps your body make more ATP which delays the development of lactic acid as you workout

2) _____ Respiration – needs O₂

- _____
- $Glucose \rightarrow Pyruvic\ acid \rightarrow Krebs\ Cycle \rightarrow Electron\ Transport\ Chain \rightarrow$
Makes 38 ATP

- first pathway the body uses, but it is slow

3) _____ glycolysis and lactic acid formation –
_____ need O₂

- Glucose → Pyruvic acid → No O₂ → Lactic Acid → Makes 2 ATP
 - working muscles requiring more nutrients than the body has to offer
 - produces _____ per glucose, but can last for 20 to 30 sec of strenuous activity
 - drawbacks: use up glucose and accumulates lactic acid (muscle fatigue and soreness)

Muscles and Exercise

Muscle Tone – _____ of some fibers even when the muscle is relaxed

- muscle remains firm, healthy, and _____
- If nerve supply to a muscle is destroyed, muscle can no longer be stimulated
- Muscle loses its tone – _____
- Then, muscle becomes flaccid, and begins to _____ (decrease in size)

Muscle Fatigue – muscle is unable to contract even though it is still being

- _____
- 1) lack of _____
 - 2) depletion of _____ and _____ – Oxygen Debt
 - breathe heavily after exercise because body is trying to replenish ATP and Creatine reserves
 - 3) high levels of _____ – creates soreness

Increased acidity and lack of ATP causes the muscle to contract less and less effectively

Type of Muscle Contraction

- 1) _____ – same tone or tension as the muscle moves through a range of motion
 - Concentric – contracting and shortening
 - Eccentric – contracting and lengthening
- 2) _____ – same length and muscle does not shorten

Effect of Exercise on Muscle

- Use it or Lose it – muscles that are inactive will get weaker and smaller
- Regular exercise increases

1) Aerobic or endurance exercise – jogging, biking, walking

- Results: stronger, more flexible muscles with greater resistance to fatigue
- Blood supply increases, _____ number increases, stores more oxygen
- Helps body _____, improves digestion and coordination, heart hypertrophies, and lungs work better

2) _____ exercise – weight lifting

- Isometrics require very little time or money (push against a wall)
- Muscle tone and endurance = low weight and high repetitions
- Muscle strength and hypertrophy = high weight and low repetitions

Muscle Disorders

1. Paralysis – when _____ to a muscle is destroyed and muscle is no longer stimulated
2. _____ – (wryneck) when sternocleidomastoid or platysma gets injured during birth
3. _____ – inherited
_____ diseases where fat gets deposited and muscle fibers degenerate and atrophy
4. _____ – characterized by droopy eyelids, difficulty in swallowing and talking, and generalized muscle weakness
 - a. There is a shortage of _____ and death usually involves respiratory failure

Muscle Development

- In embryo = muscles laid down in _____ and then nerves attach
- Development of the muscular system occurs early in pregnancy
- _____ week = mother can feel the baby's movements
- After birth = movements are _____ because _____ system is not mature yet
- _____ to _____ motor control
 - A. Babies learn how to raise their head before they can sit up which is before they can walk
 - B. Babies learn how to wave bye-bye before grasping a pen
- Mid-adolescence = reached _____
- Old Age = muscle tissue _____ which can cause a drop in weight and decrease in strength