

Muscle Topics

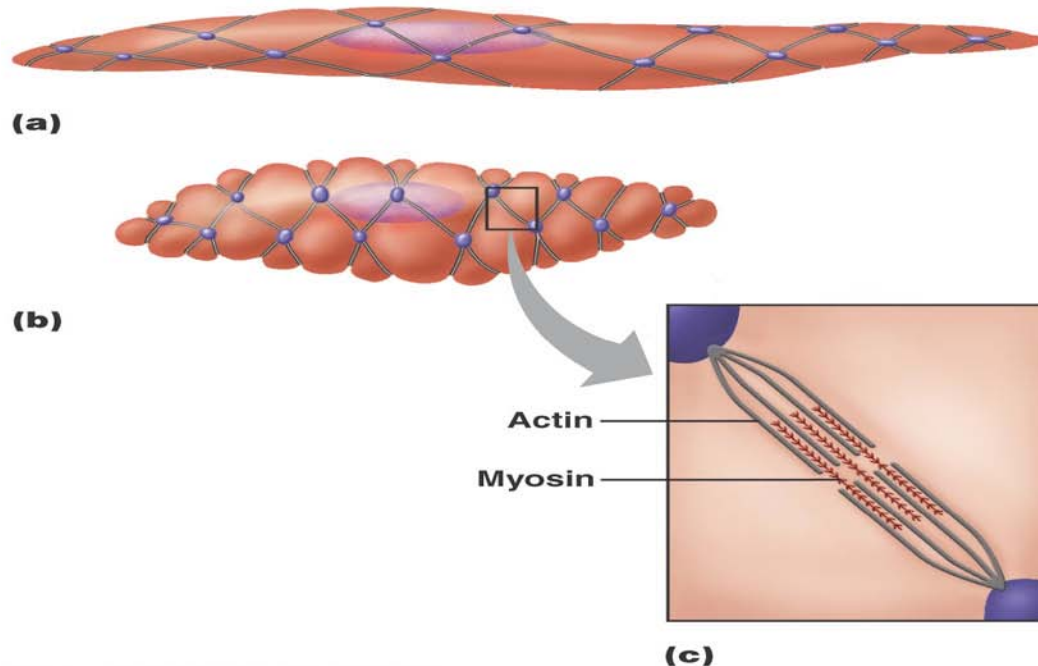
- 1. 3 Muscle Types**
- 2. How Muscles Work**
- 3. Skeletal Muscles**
- 4. Muscle Force**
- 7. Diseases**

3 Muscle Types (2)

Feature	Skeletal	Cardiac	Smooth
1) location	to bones	heart	hollow organs
2) function	body mvmts	pump blood	organs & BV mvmts
3) speed	fast 50 ms	mod. 150 ms	slow 1-3 sec
4) fatigue	varies	low	very low
5) control	vol.	invol.	invol.

Smooth Muscle Cells

- 1) contraction: myosin pulls actin towards center
cell shape: long, thin \dashrightarrow short, thick
- 2) relaxation: myosin relaxes, actin moves from center
cell shape: long, thin \longleftarrow short, thick

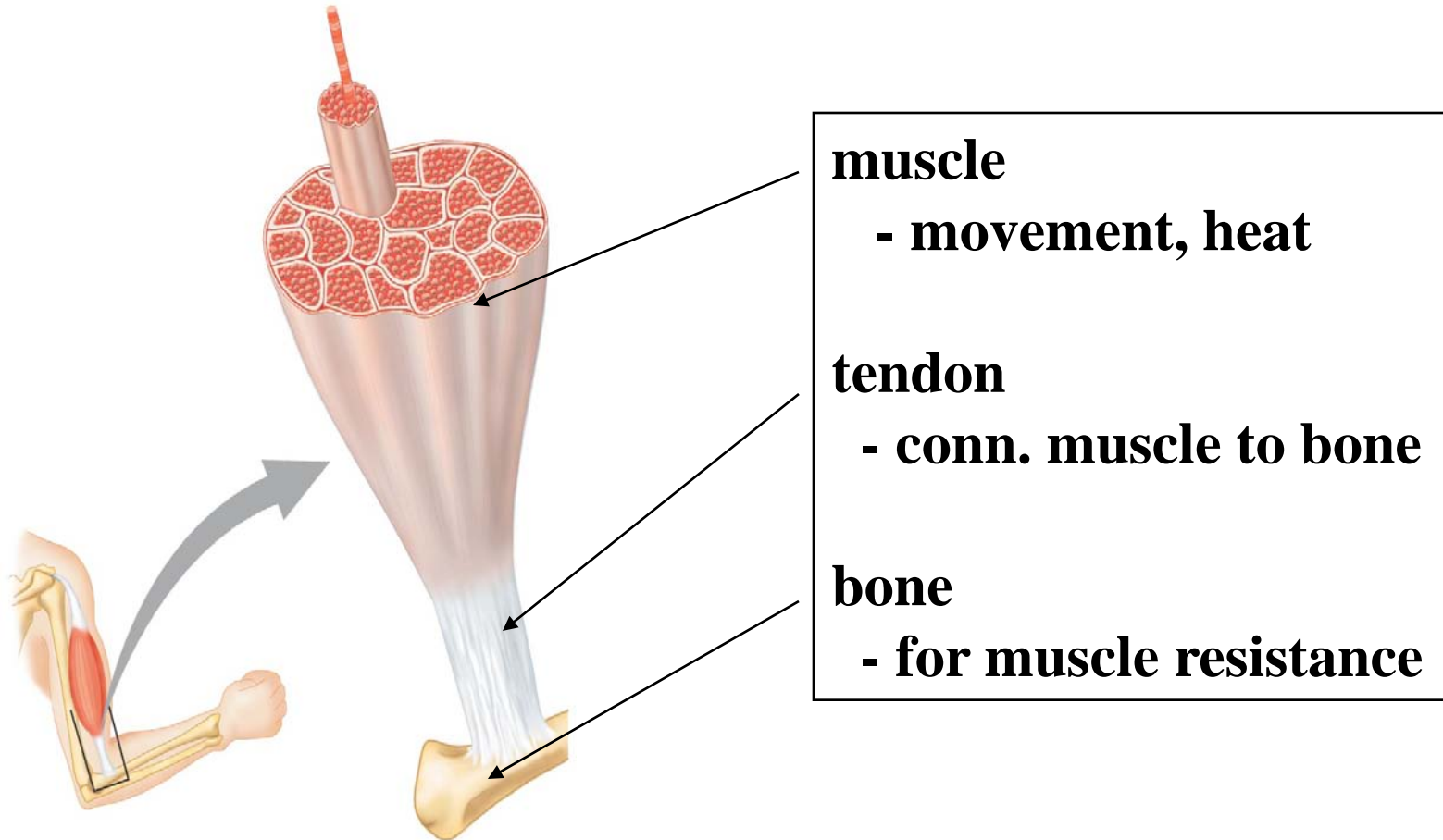


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Skeletal Muscle Functions

- 1. support - maintain upright posture**
- 2. move body & body parts**
- 3. even body temp. - 85% body heat**
- 4. move blood & lymph
- blood & lymph vessels**
- 5. protect internal organs**
- 6. stabilize joints**

Muscle Tissues (1)



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Muscle Tissues (2)

muscle (movement, heat)

- **muscle atrophy:**
 - **limited movements, crippling**
 - **cold, constant shivering, hunching**

tendon (connects muscle to bone)

- **tear: limited movements, pain, slow to heal**
(conn. tissue - poor blood supply)

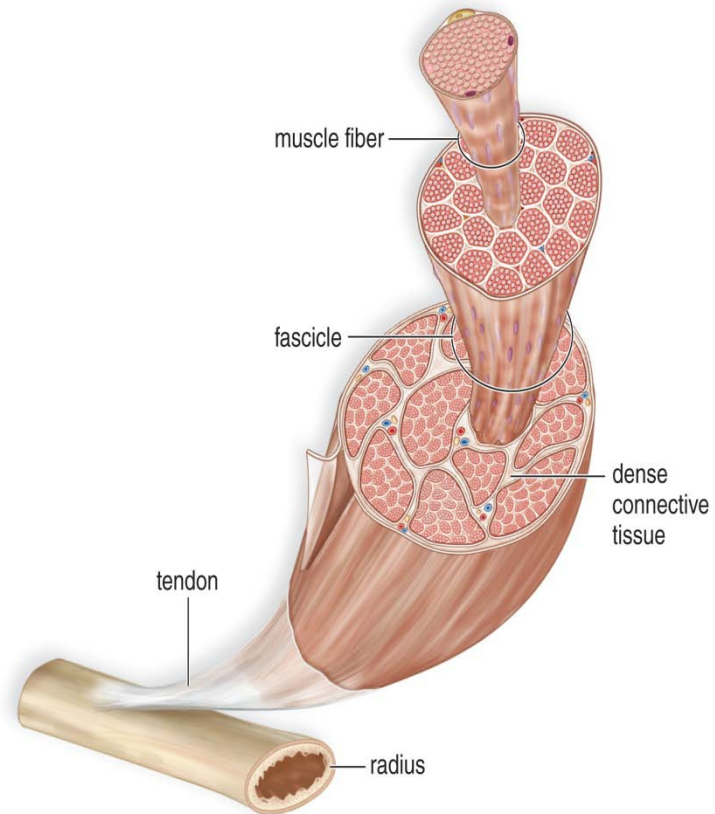
bone (muscle resistance)

- **fracture or osteoporosis:**
 - **joint problems, limited movements**

Muscle Organization

- 1) muscle
 - 2) fasicle
 - 3) muscle cell
(fiber)
 - 4) myofibril
 - 5) myo-filament
- *Golden Gate
Bridge cable (cs)**

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How Muscles Work

muscles work on paired bones

- levers moveable bone to stationary bone**
- moves insertion pt (moveable bone)
towards origin pt (stationary bone)**

1) flex forearm (pick up something)

bone pair: scapula & radius

muscle: biceps brachii

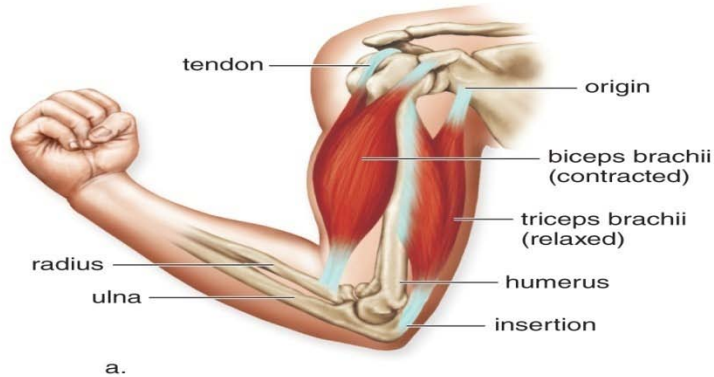
2) extend forearm (put down something)

Bone pair: scapula/humerus & ulna

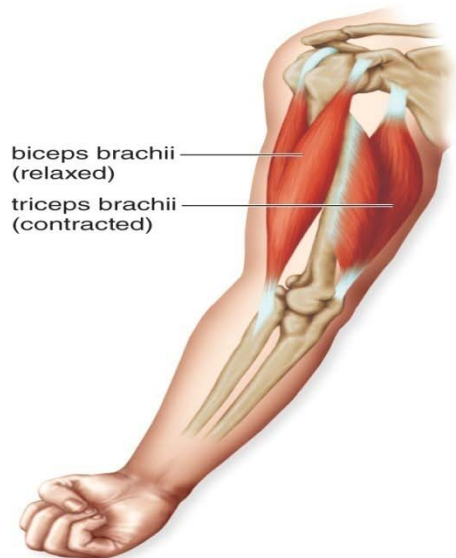
muscle: triceps brachii

Flex & Extend

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a.



b.

flex forearm (pick up)

biceps

- "brings radius to scapula"

extend forearm (put down)

triceps

- "brings ulna to scapula
& humerus"

Bone Pair

1) Bone Pair: scapula & radius

flex forearm (pick up something)

biceps brachii

- originate on scapula, insert on radius
- contraction: "top of forearm towards shoulder"

2) Bone pair: scapula/humerus & ulna

extend forearm (put down something)

triceps brachii

- originate on scapula & humerus; insert on ulna
- contraction: "bottom of forearm towards shoulder"

Muscle Pair

antagonistic muscles

= paired muscles for opposite actions

1) flex forearm

- when biceps contract, triceps relax

2) extend forearm

- when triceps contract, biceps relax

Muscle Assignment

Anterior Regions:

List the muscles & functions of the chest, abdomen, arm, and leg

Posterior Regions:

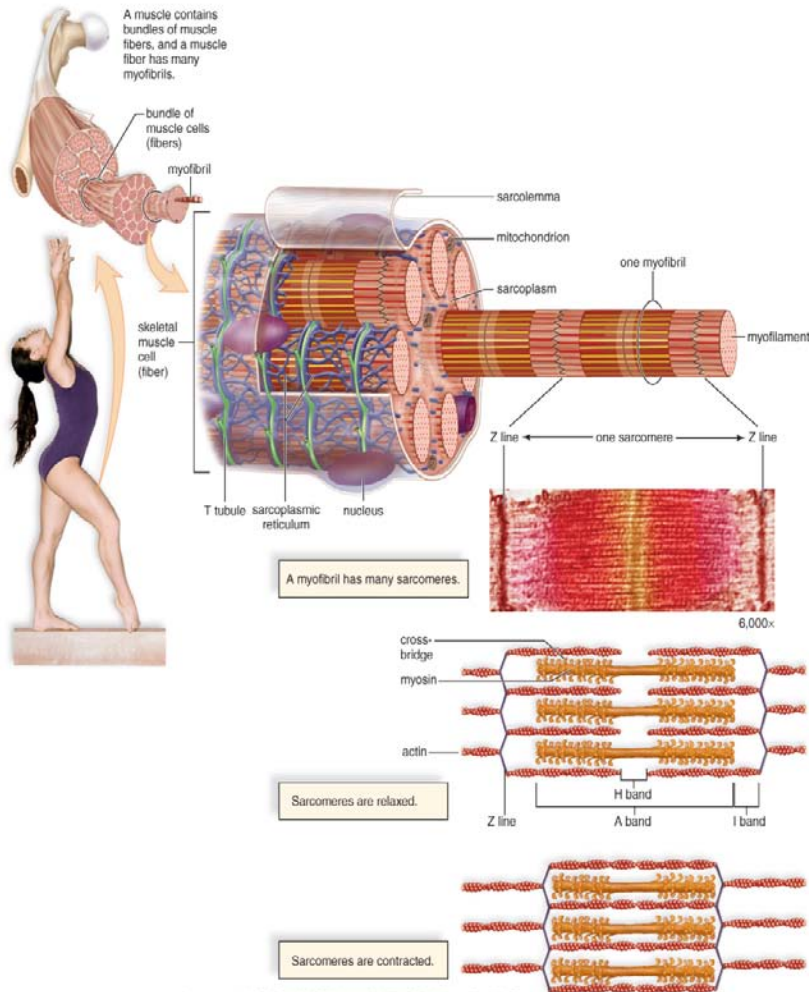
List the muscles & functions of the back, arm, leg

Example: posterior leg muscles

- 1) gluteus maximus - extends thigh back**
- 2) gastrocnemius - turns foot downward, bends leg**
- 3) biceps femoris - bends leg; extends thigh**

Molecular Muscle Work

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sarcomere

- myosin & actin (myo-filaments)
- stretchy "rubber bands"

1. relaxed sarcomeres
(longer, thinner)

2. contracted sarcomeres
(shorter, thicker)

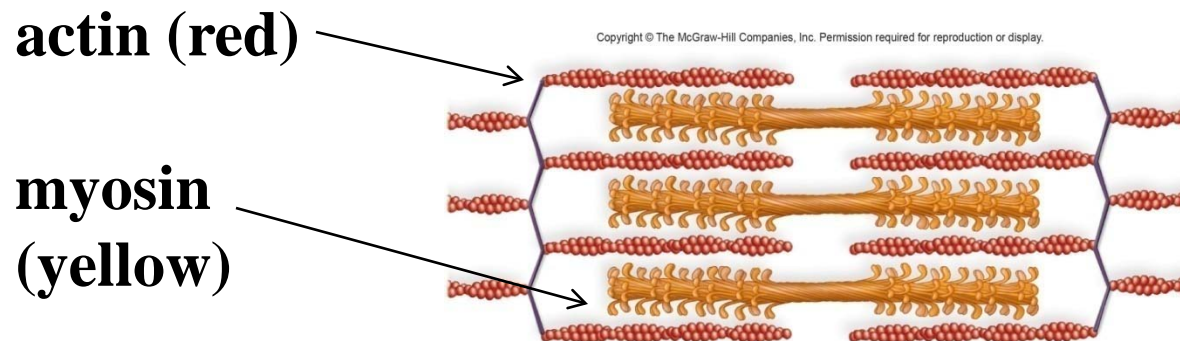
Sliding Filament Theory

muscle contracts (sarcomere shortens)

**- actin slides towards the center, over the myosin
eg flex arm -> "guns appear"**

muscle relaxes (sarcomere lengthens)

**- actin slides away from the center, over the myosin
eg relax arm -> "guns disappear"**



Muscle Force

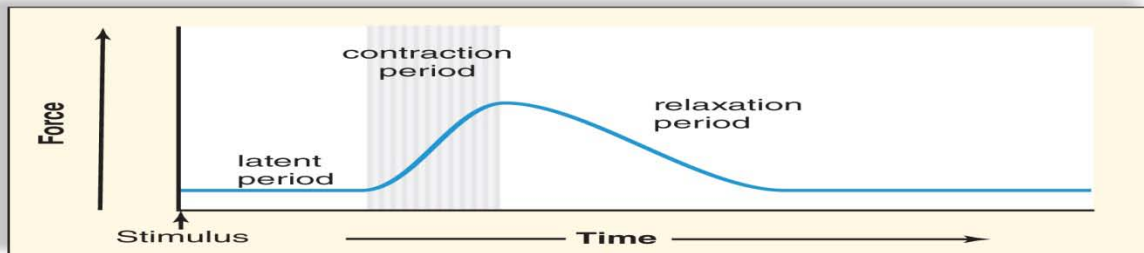
one stimulus: twitch (3 phases)

- useless, spasm

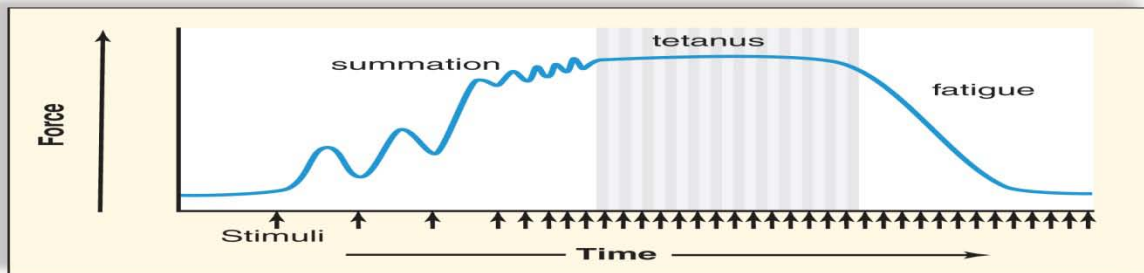
continued stimuli: summation & tetanus

- useful, do work, eg lift load

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a.

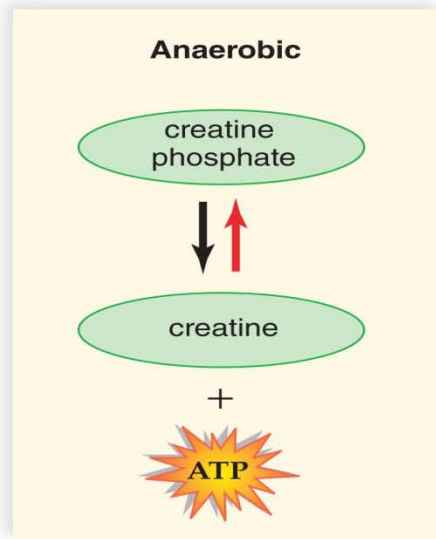


b.

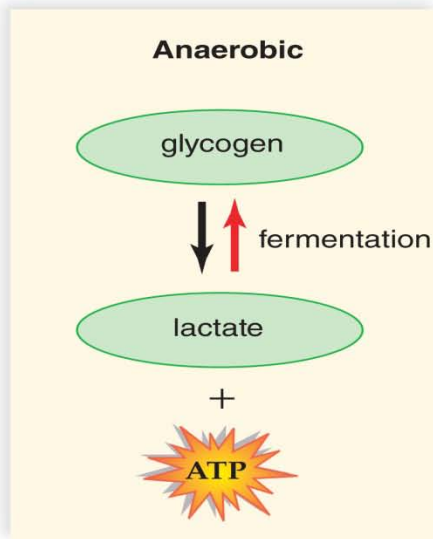
ATP Production (2)

- 1) creatine phosphate, no O_2 : fast, limited supply
- 2) glycogen, no O_2 : fast, lactic acid (soreness), limited supply
- 3) glycogen or fatty acid, O_2 : slow, long term supply

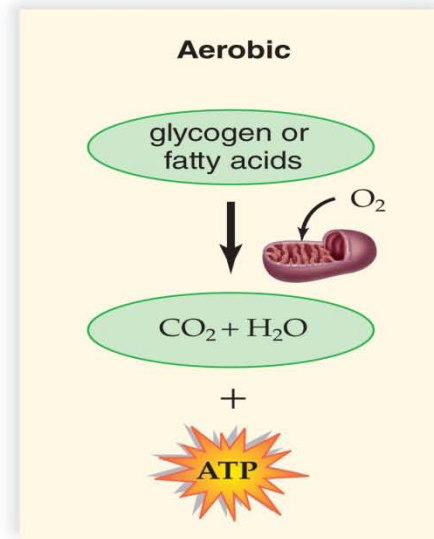
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a.



b.



c.

Muscle Fibers

fast twitch

- anaerobic, creatine phosphate & fermentation
 - quick movement, then hold position
 - explosive strength, large muscles
- eg sprint, lift weights, swing golf club

slow twitch

- aerobic, cellular respiration
 - continued movement
 - consistent strength, endurance, wiry muscles
- eg long distance running, bike, jog, swim

Sore Muscles

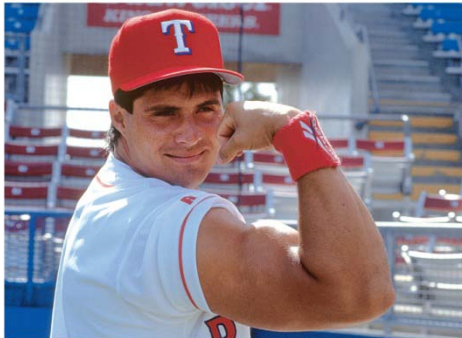
**new activities → new micro-tears in muscles
tissue injury → muscle repair → inflammation
redness, swelling, pain, heat (sore muscle)**

clue for exercises:

- 1) warm up first**
- 2) be aware with new activities**
- 3) be aware of muscle lengthening activities**

**note: tears usually occur when muscle lengthens
ex. walk downstairs, run downhill, lowering
weights, downward motion of squats and pushups**

Steroids



- = anabolic steroids, 100+ types**
- related to testosterone**
- med. use: muscle waste & slow growth**
- sport use: increase muscle mass
& male char. (aggression)**

**risks: changes in sex. char.
(men - larger breasts,
women - smaller)
aggressive & irritable
heart & liver prob., stroke
early death**

Muscular Diseases

Describe the cause & effects of:

- 1) muscular dystrophy**
- 2) tetanus**
- 3) cramps**
- 4) pulled muscles (strain)**
- 5) pulled joint (sprain)**
- 6) fasciitis**
- 7) myasthenia gravis**
- 8) muscle cancer (sarcoma)**