

The Muscular System

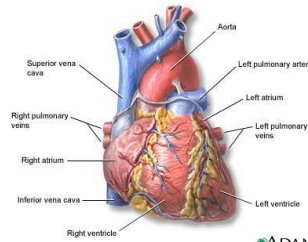
There are more than 600 muscles in the Human Body!!!

Muscles are...

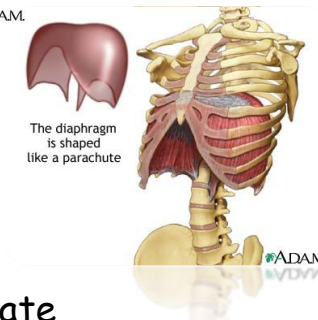
+ Needed for all types of movement.



+ Needed to pump blood



+ Needed to breathe (diaphragm muscle).



+ Needed to produce body heat and regulate body temperature.



+ Needed to Protect internal organs.



Answer the questions on your
lab answer sheet

3 Types of Muscle

View video clip:

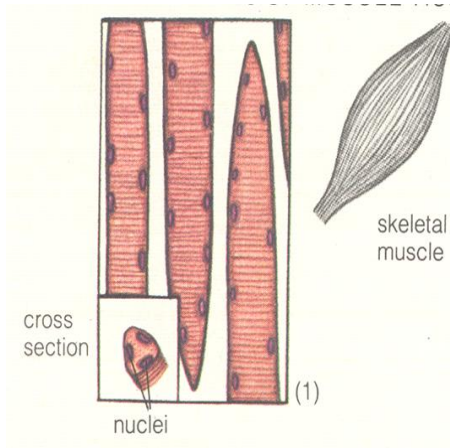
Muscle Types (A.D.A.M.)

<http://www.umm.edu/aniplayer/>

also found on **Human
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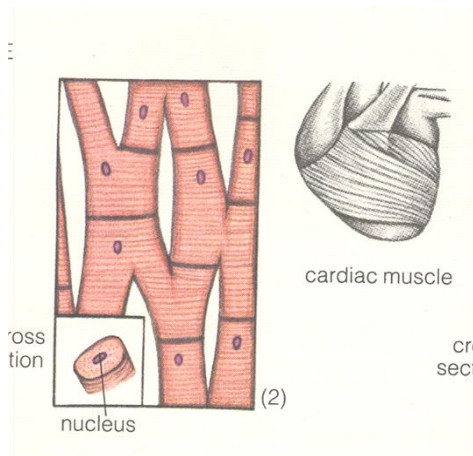
Skeletal Muscle:

- ✚ Voluntary (under your conscious control)
- ✚ Movement of your bones, face, eyes, etc.



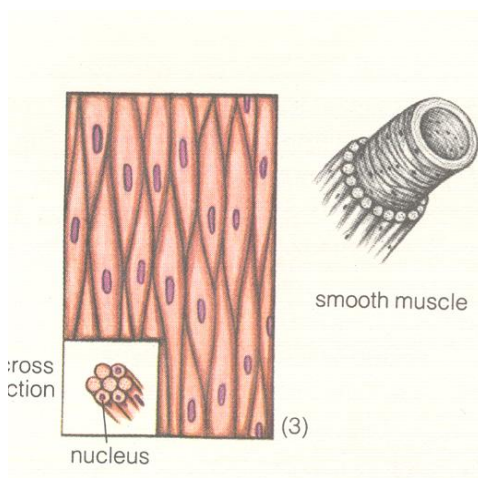
Cardiac Muscle:

- ✚ Involuntary (not under your conscious control)
- ✚ Movement of your heart and certain blood vessels.

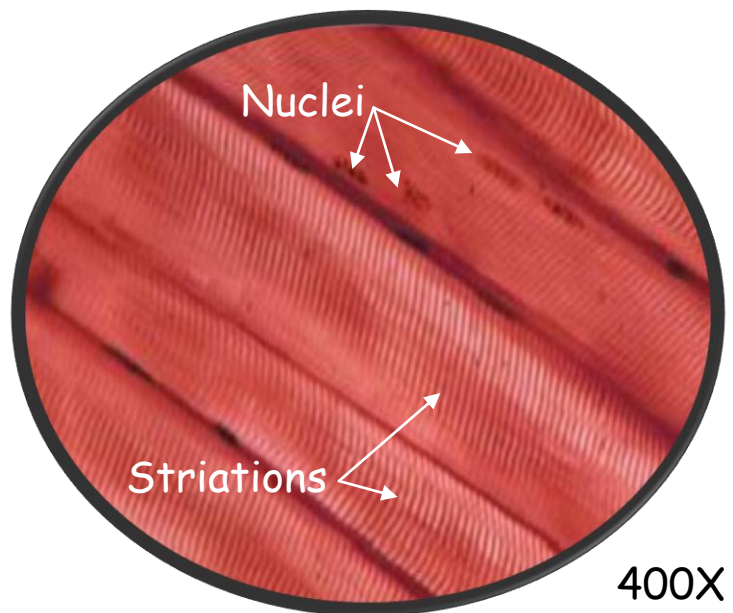


Smooth Muscle:

- ✚ Involuntary (not under your conscious control)
- ✚ Movement of your intestines, esophagus, and other internal organs.

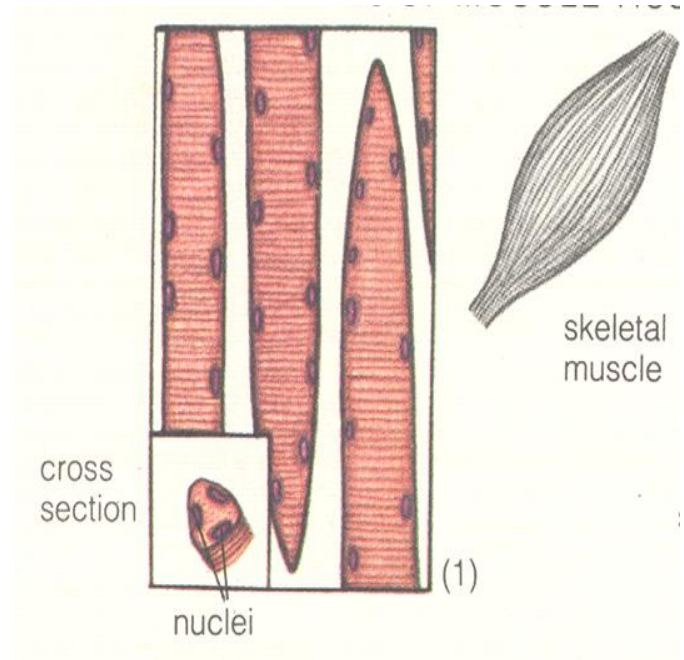


Skeletal Muscle



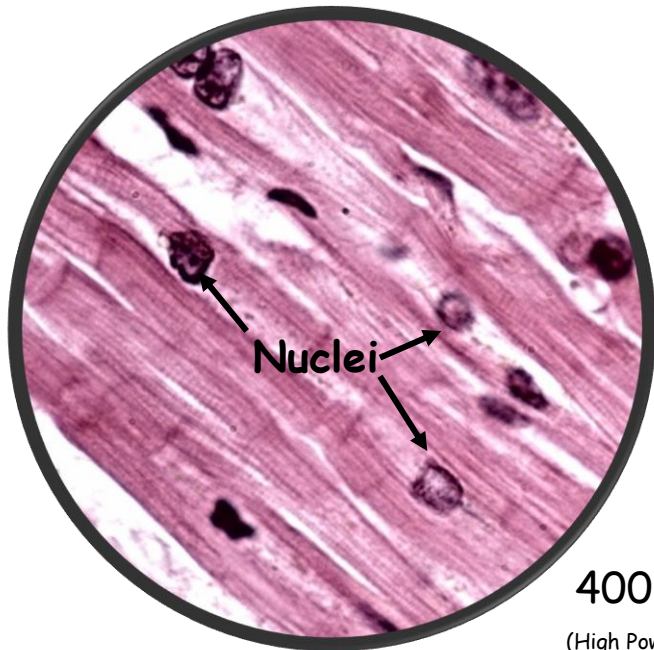
400X

(High Power)



- ✚ Move your bones (also your face, eyes etc)
- ✚ Voluntary (you can control them)
- ✚ Over 400 skeletal muscles in your body
- ✚ Long cells with several nuclei (along edges of cell)
- ✚ Stripes called striations in cell (visible in high power)

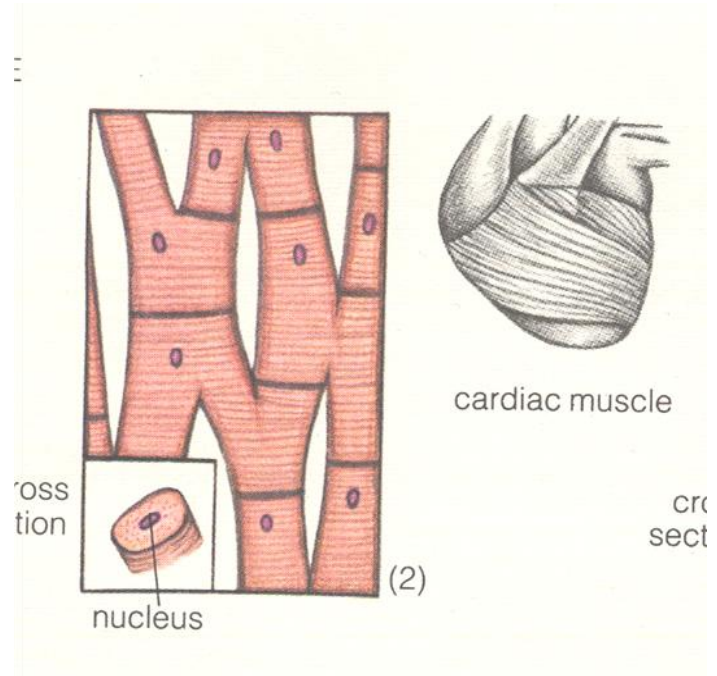
Cardiac Muscle



400X

(High Power)

Striations cannot be easily seen at this magnification



✚ The muscle of the Heart

✚ Involuntary (you cannot control them)

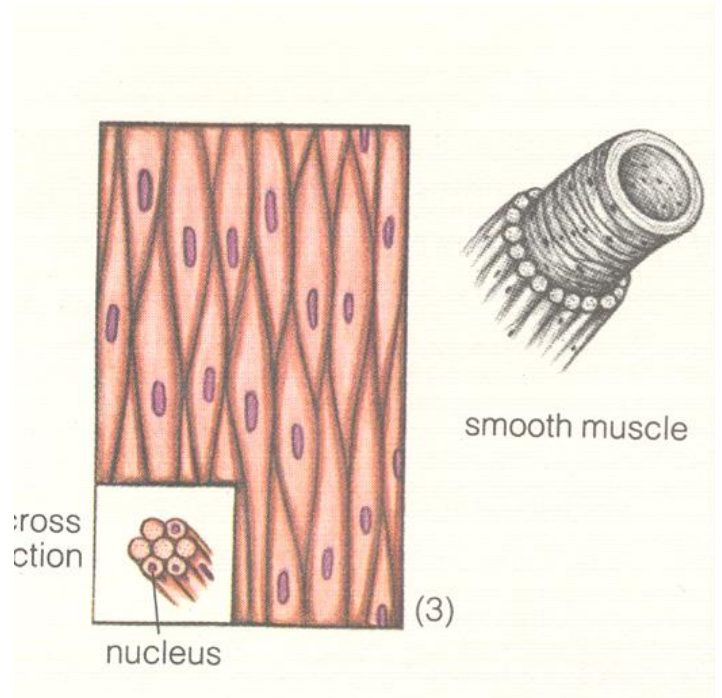
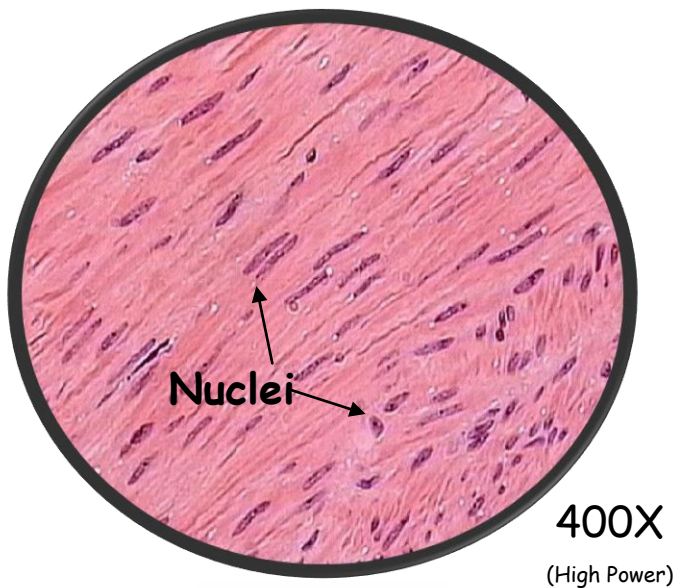
✚ Works 24 hours a day every day of your life!!!

✚ Strongest type of muscle

✚ Only one nucleus per cell (usually in center of cell)

✚ Some striping (striations) but not as much as skeletal muscle

Smooth Muscle



- ✚ The muscles of the esophagus, stomach, intestines and other internal organs
- ✚ Involuntary (you cannot control them)
- ✚ Contract slowly and smoothly
- ✚ Can remain contracted for long periods of time
- ✚ Usually one nucleus per cell (usually in center of cell)
- ✚ No striping (striations)

Anatomy of a Muscle

Body of
Muscle

Bone

Tendon

Answer the questions on your
lab answer sheet

View video clip:

Skeletal Muscle (A.D.A.M.)

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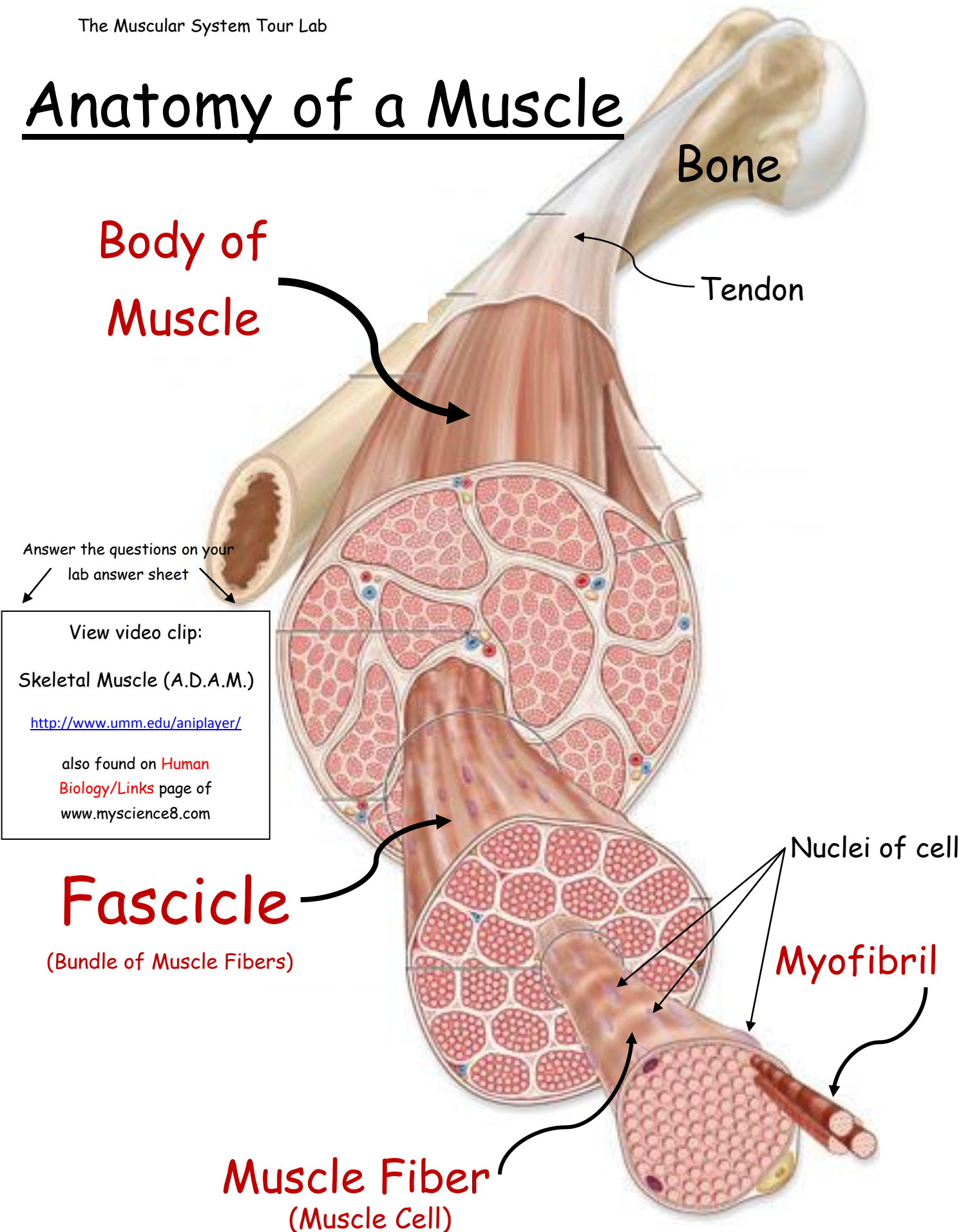
Fascicle

(Bundle of Muscle Fibers)

Nuclei of cell

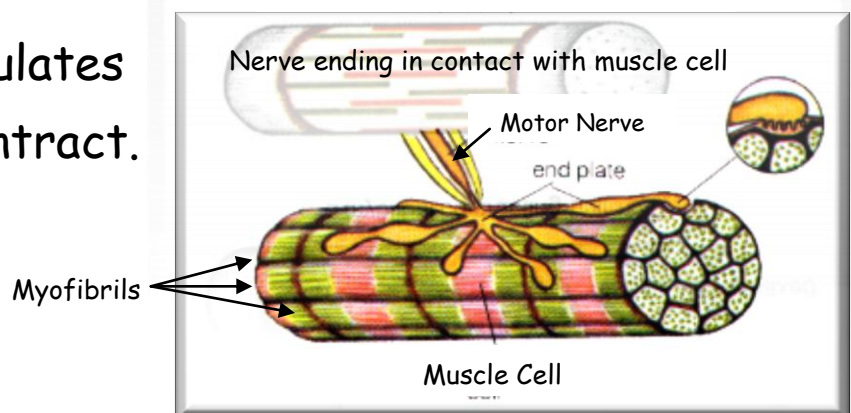
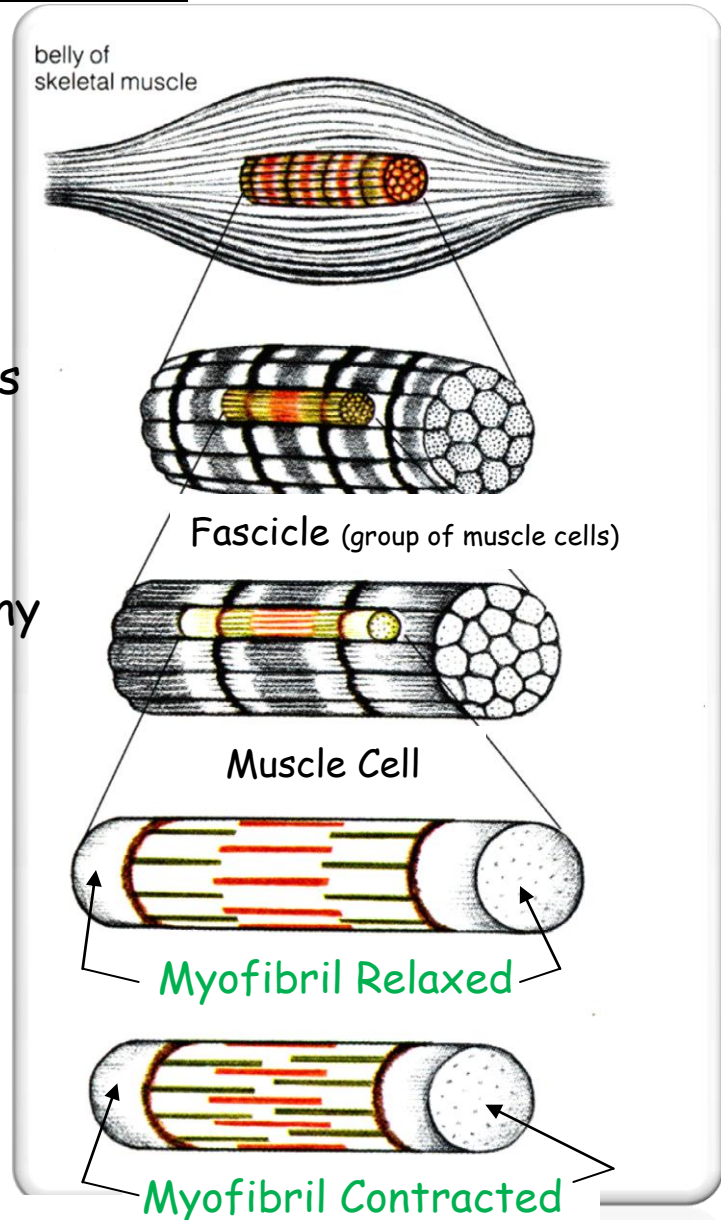
Myofibril

Muscle Fiber
(Muscle Cell)

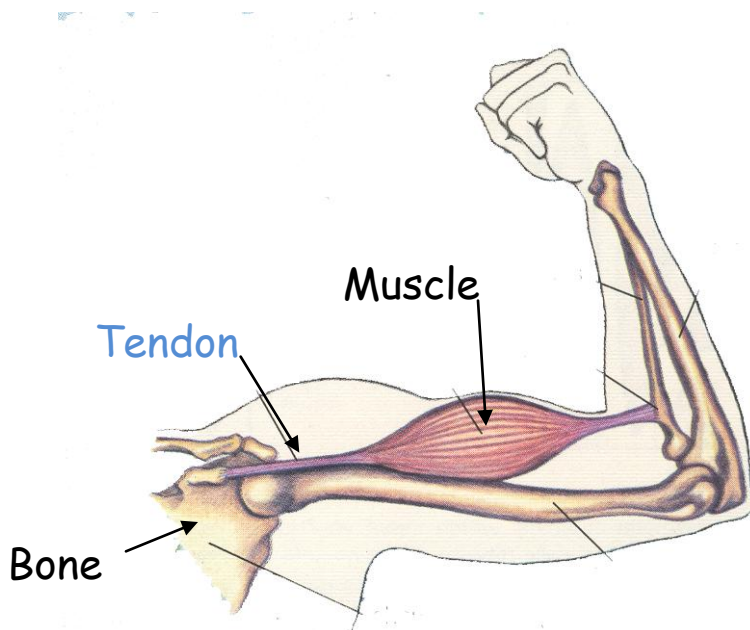


How a Muscle Works

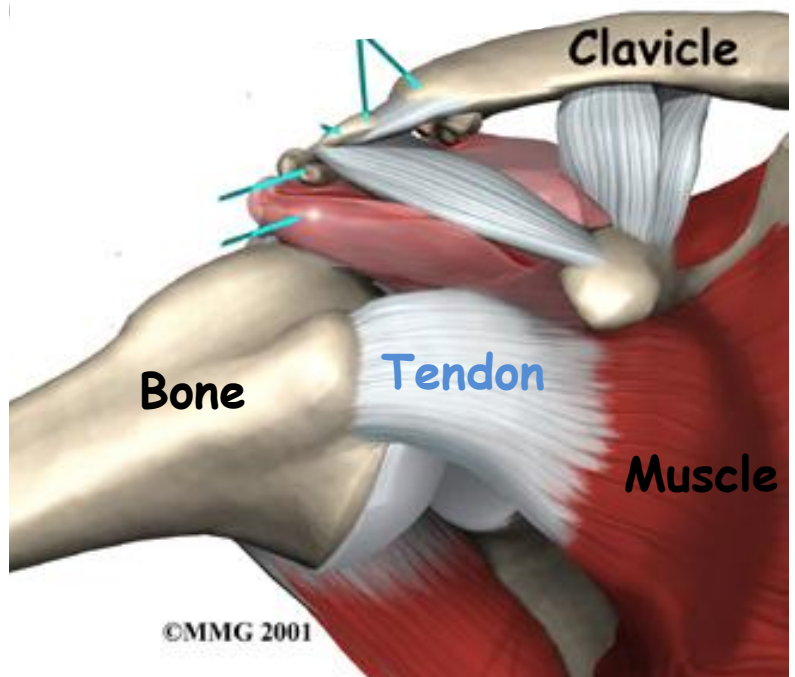
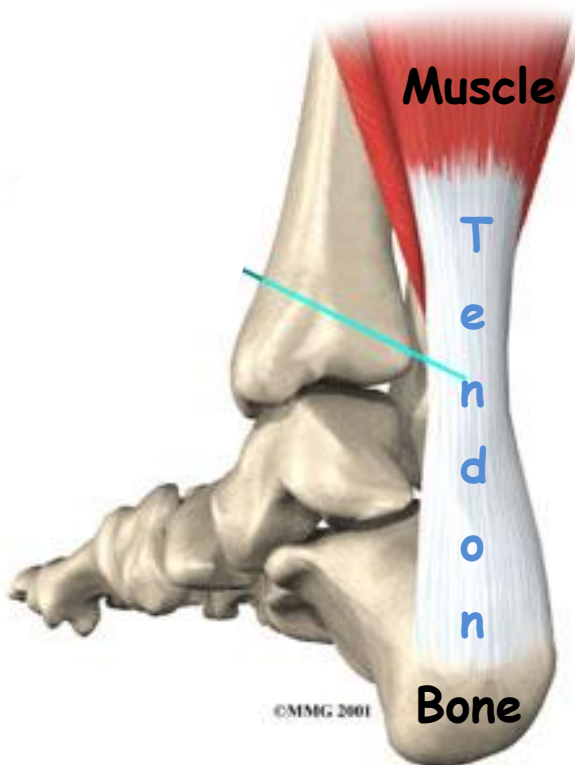
- ✚ A skeletal muscle works by **CONTRACTING** (getting shorter).
- ✚ The muscle can shorten as much as $\frac{1}{3}$ its resting length.
- ✚ Each muscle cell is made up of many smaller **MYOFIBRILS**
- ✚ The **MYOFIBRILS** are in contact with a nerve ending.
- ✚ The nerve releases a chemical called a **NEUROTRANSMITTER**.
- ✚ The Neurotransmitter stimulates the entire muscle cell to contract.



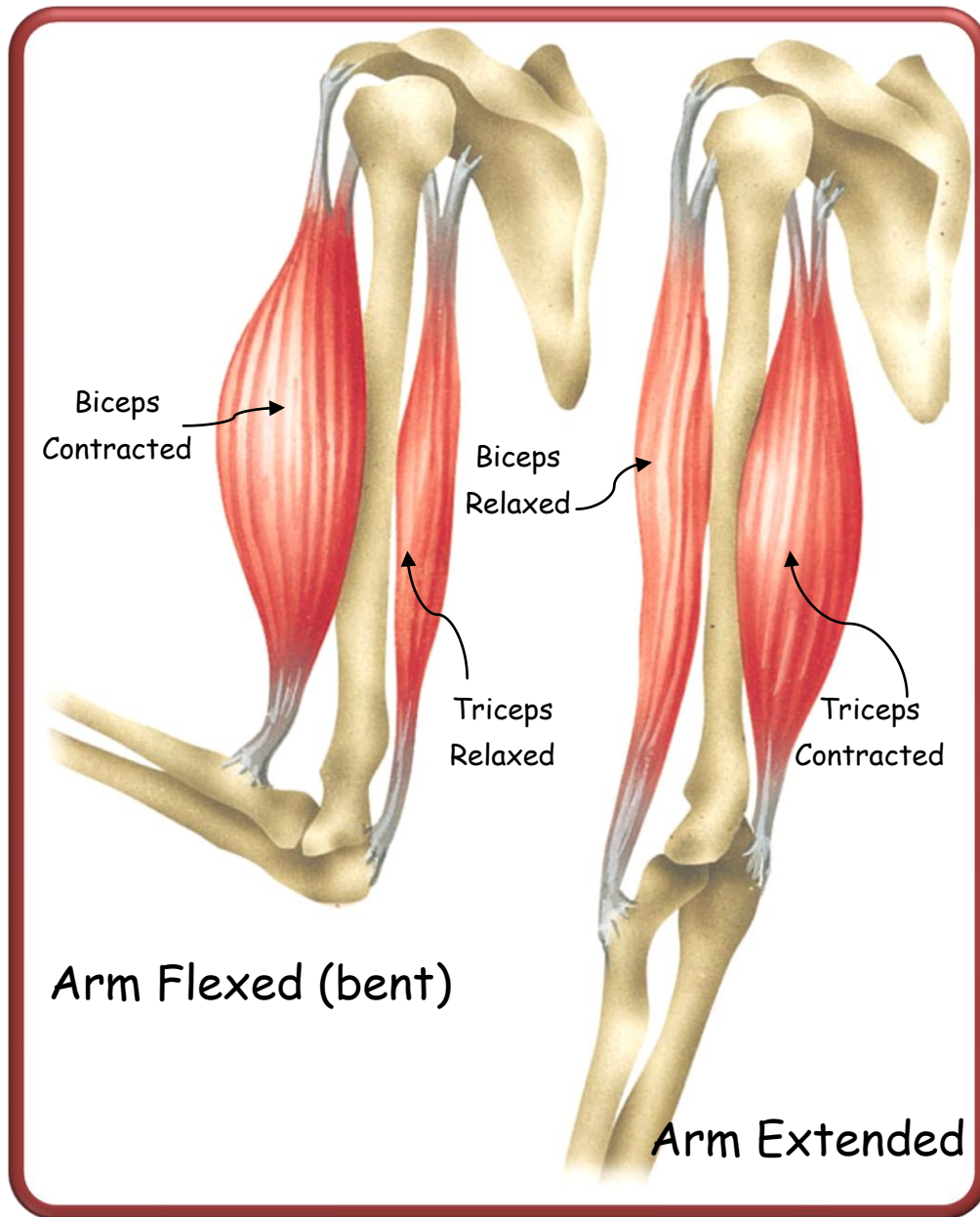
Muscle to Tendon to Bone



TENDONS
Attach
Muscle to Bone

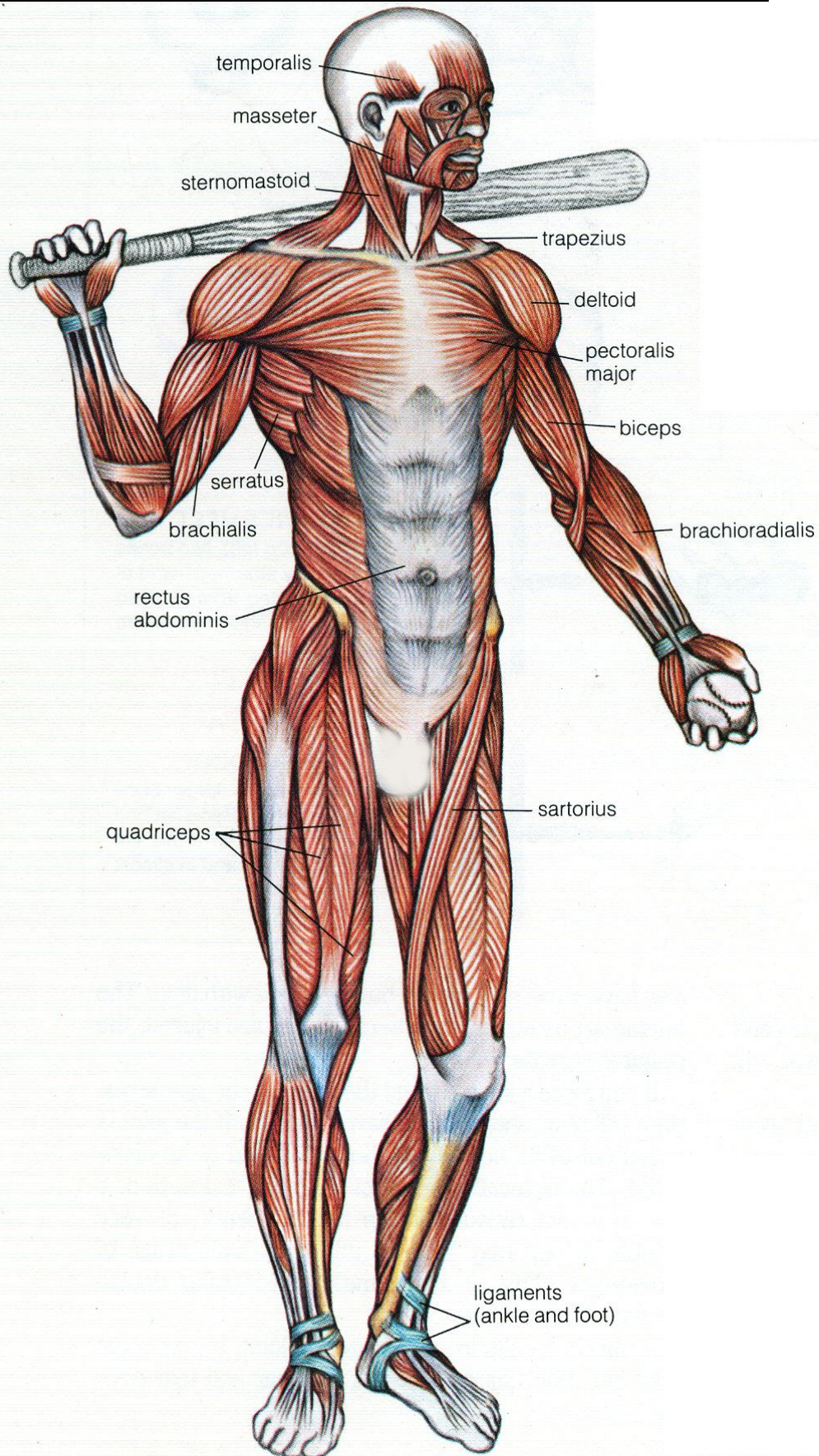


Opposites Contract ... and Relax

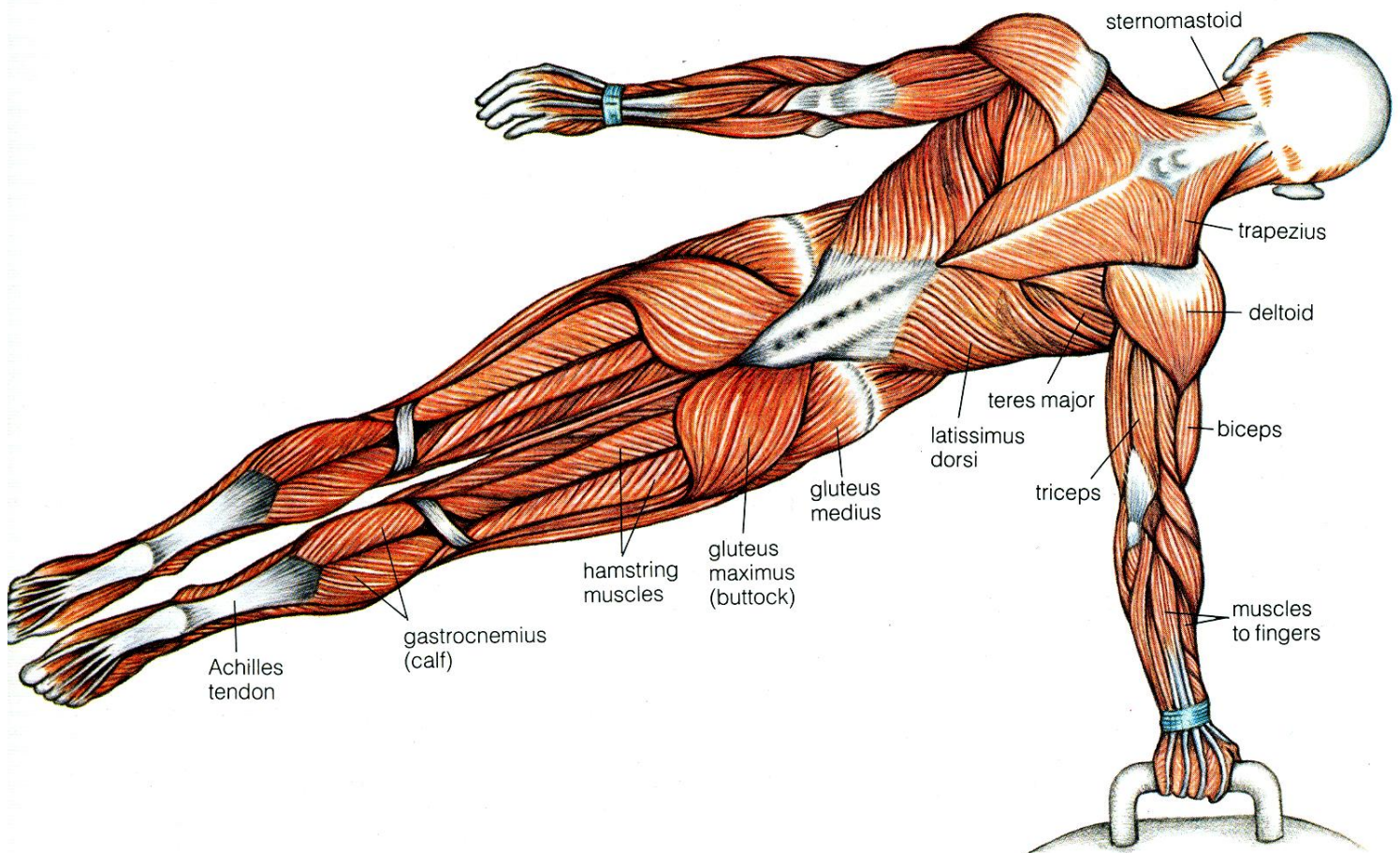


- ✚ Muscles work in pairs. The biceps muscle will bend the arm at the elbow and the triceps muscle will straighten the arm.
- ✚ While one muscle in the pair contracts the other must relax.

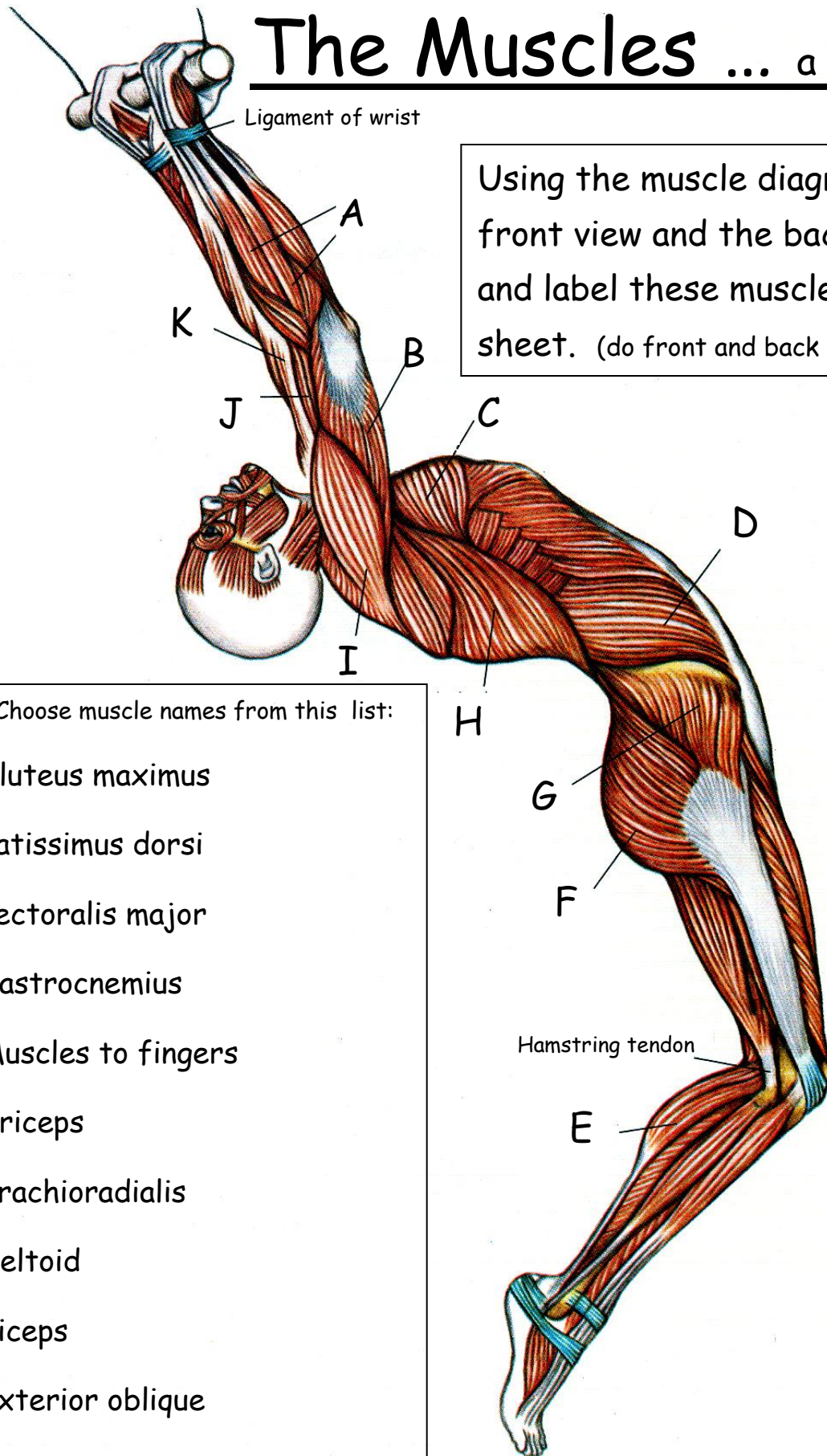
The Muscles ... a front view



The Muscles ... a back view



The Muscles ... a side view



Using the muscle diagrams for the front view and the back view, identify and label these muscles on your lab sheet. (do front and back view stations first)

Choose muscle names from this list:

Gluteus maximus
Latissimus dorsi
Pectoralis major
Gastrocnemius
Muscles to fingers
Triceps
Brachioradialis
Deltoid
Biceps
Exterior oblique
Gluteus medius



Muscle Fatigue ... Weight Lifting

Your muscles need *Glycogen* (muscle sugar) in order to function. When the glycogen is broken down into energy for the muscles a waste product called lactic acid is produced. A buildup of lactic acid decreases the muscles' ability to contract and Muscle Fatigue sets in.

Do this:

Hold a book in each hand.
Raise one arm straight out parallel to the ground and the other arm down at your side.



Compare the feeling in each arm.

Answer questions on your lab sheet.

Answer the questions on your
lab answer sheet →

View video clip:

Excercise (A.D.A.M.)

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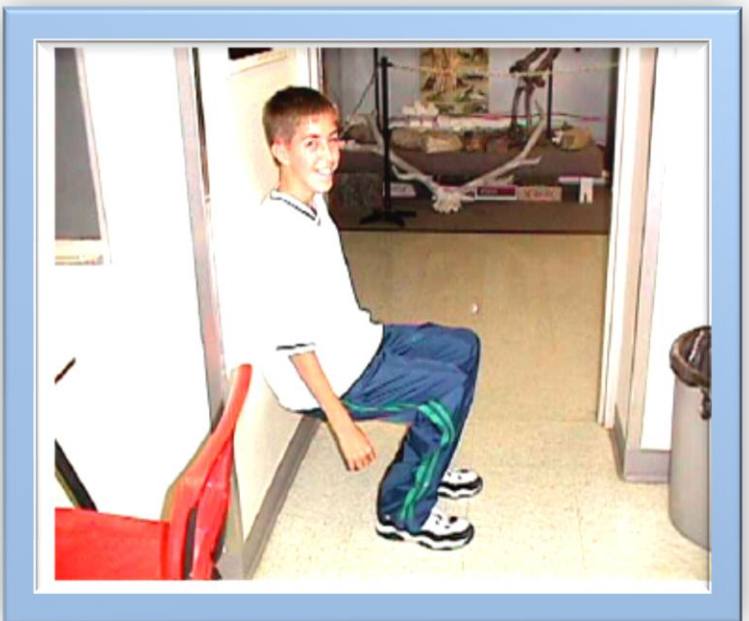
Muscle Fatigue ... Too Tired to Sit

Your muscles need *Glycogen* (muscle sugar) in order to function. When the glycogen is broken down into energy for the muscles a waste product called lactic acid is produced. A buildup of lactic acid decreases the muscles' ability to contract and Muscle Fatigue sets in.

Do this:

Sit against the wall with your knees bent at a 90° angle. Hold this position for as long as it takes to feel muscle fatigue.

(If it's been more than 3 minutes you ain't doin' it right).



View video clip:

Excercise (A.D.A.M.)

<http://www.umm.edu/aniplayer/>

also found on **Human Biology/Links** page of
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Answer all questions on your lab answer sheet



Muscle Fatigue ... To Beat or Not to Beat

Your heart is made up of a very special type of muscle called **Cardiac Muscle**. It keeps working hard from before the day you are born until the moment of your death. It never gets needs to stop and rest like your skeletal muscles do. Cardiac muscle does not experience muscle fatigue but skeletal muscles do. Here we will compare cardiac and skeletal muscles with the help of your strong arm and a "tennis ball heart".

Do this:

Extend your arm out in front of you and using your hand, squeeze the tennis ball hard one time each second. This is how hard your heart works... and it doesn't complain!

Answer the questions on your lab answer sheet.



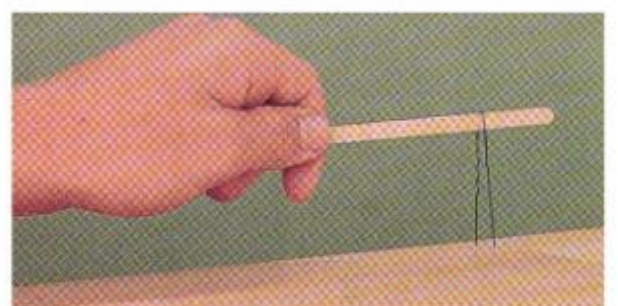
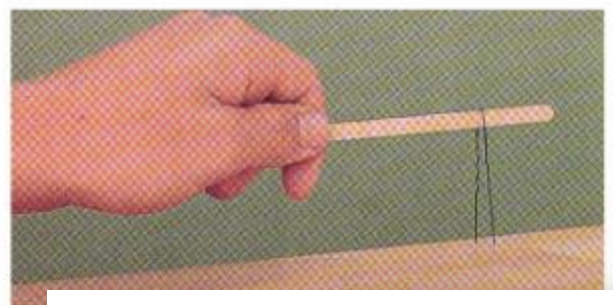
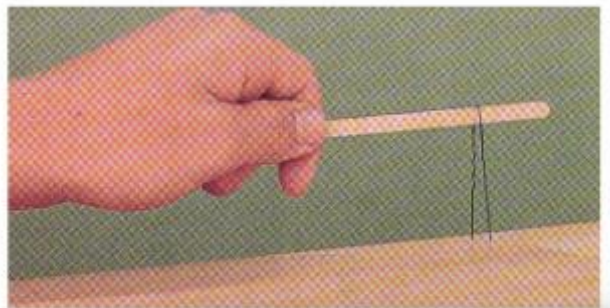
You would not live long if your heart were made of skeletal muscle.

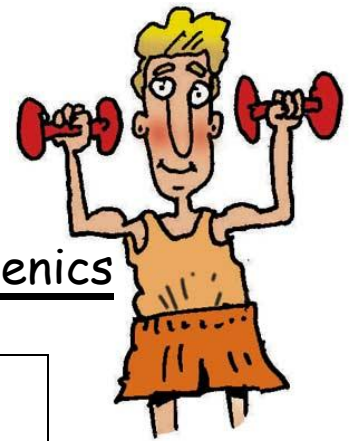
Muscle Fatigue ... Get a Grip

After just 7 seconds of use the muscle begins producing lactic acid as glycogen is broken down to provide energy. To help delay muscle fatigue, the muscle fibers are constantly switching on and off to allow individual fibers a moment to rest. This activity will demonstrate the effects of action of muscle fibers.

Do this:

1. Hold a popsicle stick in front of you , parallel to the table top.
2. Place a bent paper clip on the stick.
3. Raise the stick until the legs of the paper clip just touch the table.
4. The top of the paper clip should rest on the stick.
5. Hold the stick as steady as you can for about 30 seconds and observe.
6. Grip the stick tighter and repeat step 5.
7. Answer the questions on your answer sheet.





Muscle Fatigue ... Clothespin Calisthenics

Your muscles need Glycogen (muscle sugar) in order to function. When the glycogen is broken down into energy for the muscles a waste product called lactic acid is produced. A buildup of lactic acid decreases the muscles' ability to contract and Muscle Fatigue sets in.

Do this:

1. Hold a clothespin between your thumb and index finger and see how many times you can squeeze it in one minute. Record
2. Now, without resting, squeeze it as fast as you can for a second minute. Record



Answer the questions on your lab sheet

View video clip:

Excercise (A.D.A.M.)

<http://www.umm.edu/aniplayer/>

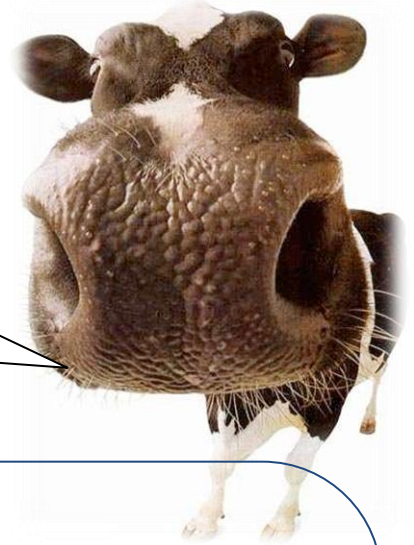
also found on **Human
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Making a Temporary Muscle Slide



(from Dead Meat)

You better see
the striations or
your dead meat!!



Do this:

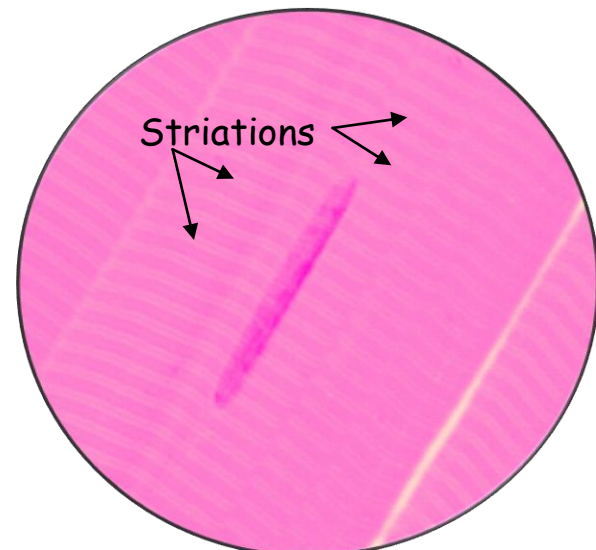
1. Place a very small piece of dead meat (shaved beef steak) on a clean glass slide.
2. Tease the meat apart with two dissecting needles.
3. Place one drop of stain on the meat and cover with a cover slip.
4. Observe under the microscope in all 3 powers.

Note:

You will only see striations (stripes) under high power with the light (diaphragm) turned down low.

Show your teacher when you have found them!!

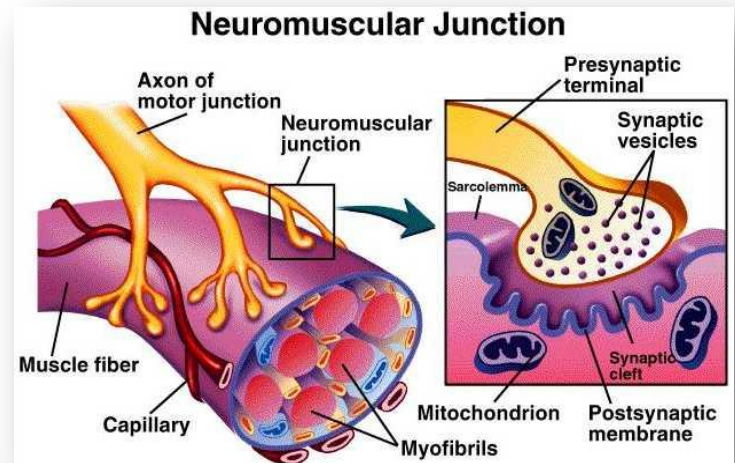
Answer questions on lab answer sheet



Muscle Stimulation

Your muscles contract when a mild electric current comes in contact with the myofibrils in the muscle cells. The chemicals in your body produce the electricity to cause a muscle to contract.

If muscles are stimulated from an artificial electrical signal, they will contract but without your conscious control. This is what a **MUSCLE STIMULATOR** does.



Do this:

Go see your teacher for a shocking demonstration.

(for the next 30 seconds we are in control of your muscles)



Muscle Tutorial



Complete the
Muscle Tutorial

found online at:

[http://www.gwc.maricopa.edu/class/
bio201/muscle/mustut.htm](http://www.gwc.maricopa.edu/class/bio201/muscle/mustut.htm)

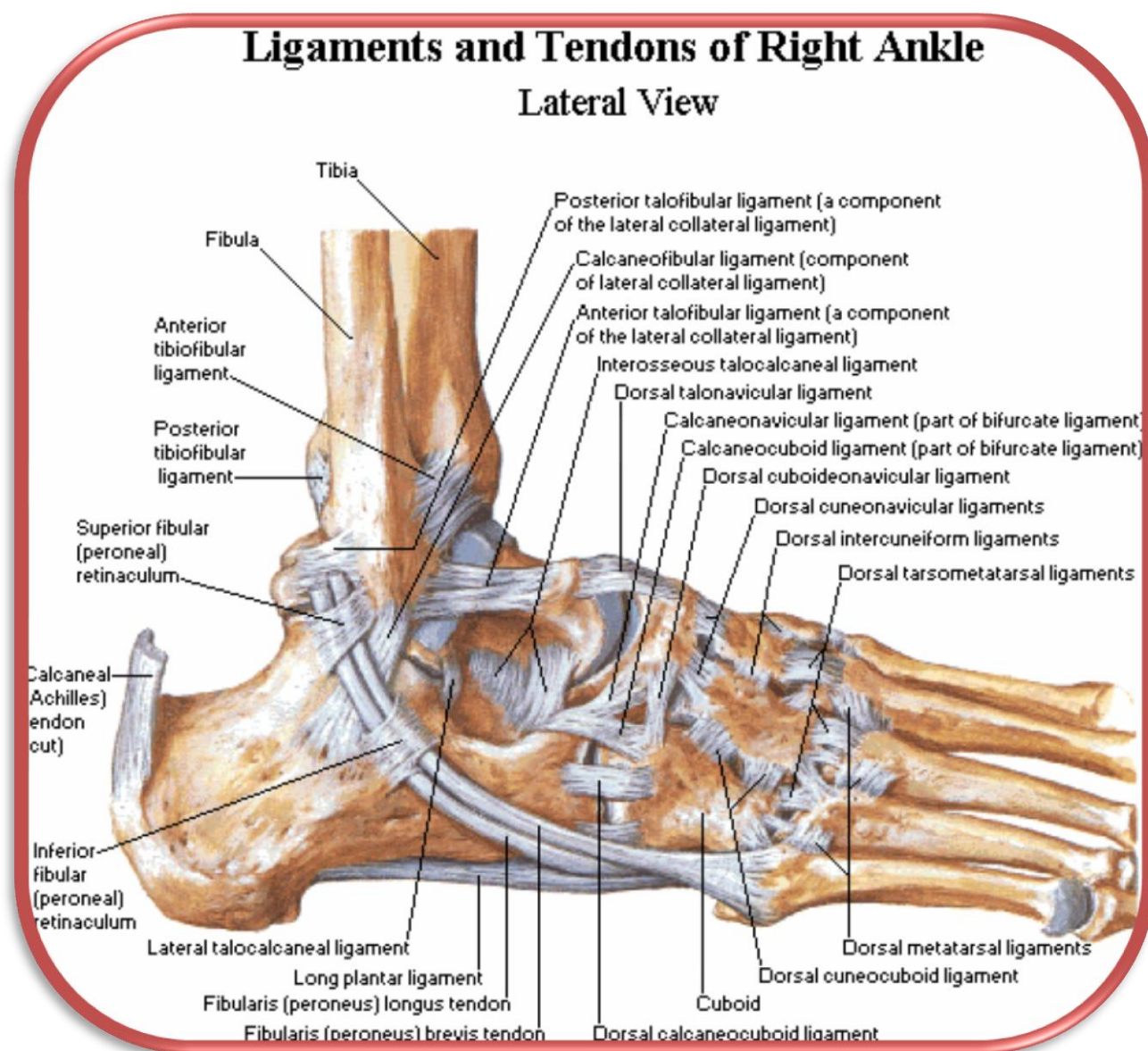
Or just go to the

Human Biology/Links

page of our science website
(www.myscience8.com) and click on
the *Muscle Tutorial* link.

Put all answers on your answer sheet

Ligaments hold bones together



Answer all questions on the lab answer sheet

