

Muscles and Bones

Lesson goals:

- Learn the purpose of bones, muscles and tendons
- Understand how skeletal muscles work together
- Know the three types of muscles and how they differ

Part 1: Model Elbow:

When you move your arm, what's doing the moving? That is, which part of your body turns food energy into mechanical motion? Your muscles do! Every movement you make is the result of your muscles. Ask if any of your students know the names of any muscles (bicep, tricep, calf, heart, etc.)

Your muscles are attached to bones via tendons. You can see/feel some tendons in the back of your hand by spreading out your fingers and bending your hand back. Or you can see/feel your achilles tendon just above your heel.

In this part, we're going to build a model elbow to explore which muscles are doing work when you. (lesson plan modified from learnnc.org)

Materials:

Two cardboard strips, 2 inches by 6 inches
Two paper fasteners
Tape
A hole puncher
Two different colored balloons

Methods:

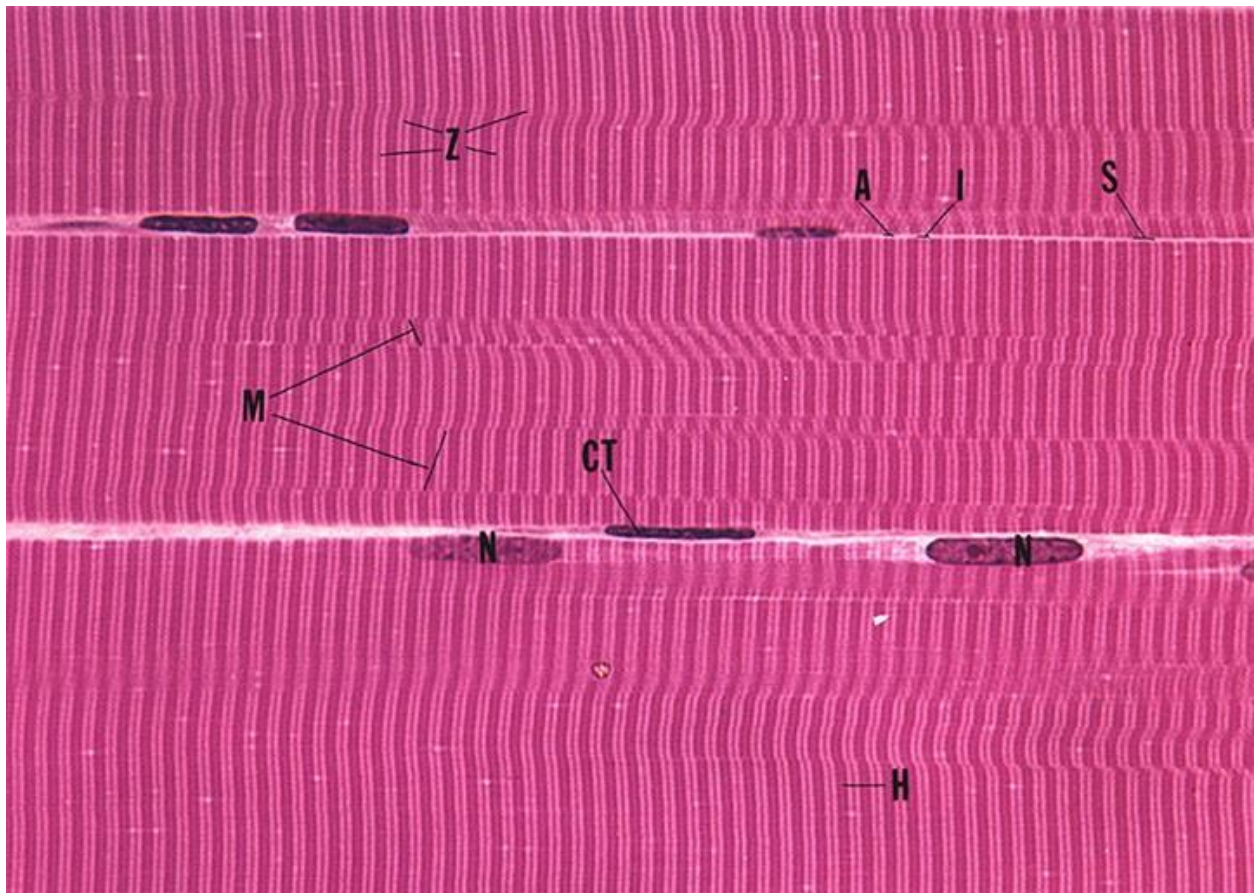
1. Punch a hole in each cardboard strip, about 1.5 inches from the end, and in both ends of each balloon.
2. Tape the two strips together end to end so that the holes are about 3 inches apart. The strips will bend like a joint on the taped side. (One strip represents the upper arm; the other represents the lower arm; the joint represents the elbow.)
3. With a paper fastener, attach the two balloons to opposite sides of the "upper arm." Attach the other end of each balloon to the "lower arm" in the same way.
4. Bend the "arm" at the "elbow," noticing what happens to the balloons.

5. Muscles do work when they contract. Which balloon contracts when you bend your elbow? Which one contracts when you straighten it?
6. Look at your own arm. Which muscle on your arm contracts when you bend it? Which one contracts when you straighten it? Why do you need both of those muscles?

Part 2: Different types of muscles

The muscles in part 1 are called **skeletal** muscles. Why do you think they are called that? (They create movement by pulling on your skeleton.) These muscles are **voluntary**, meaning that you control when they move. Does this mean you always control when they move? (Think about last week's lesson on reflexes!) Skeletal muscles also get stronger when you use them, a process known as **hypertrophy**.

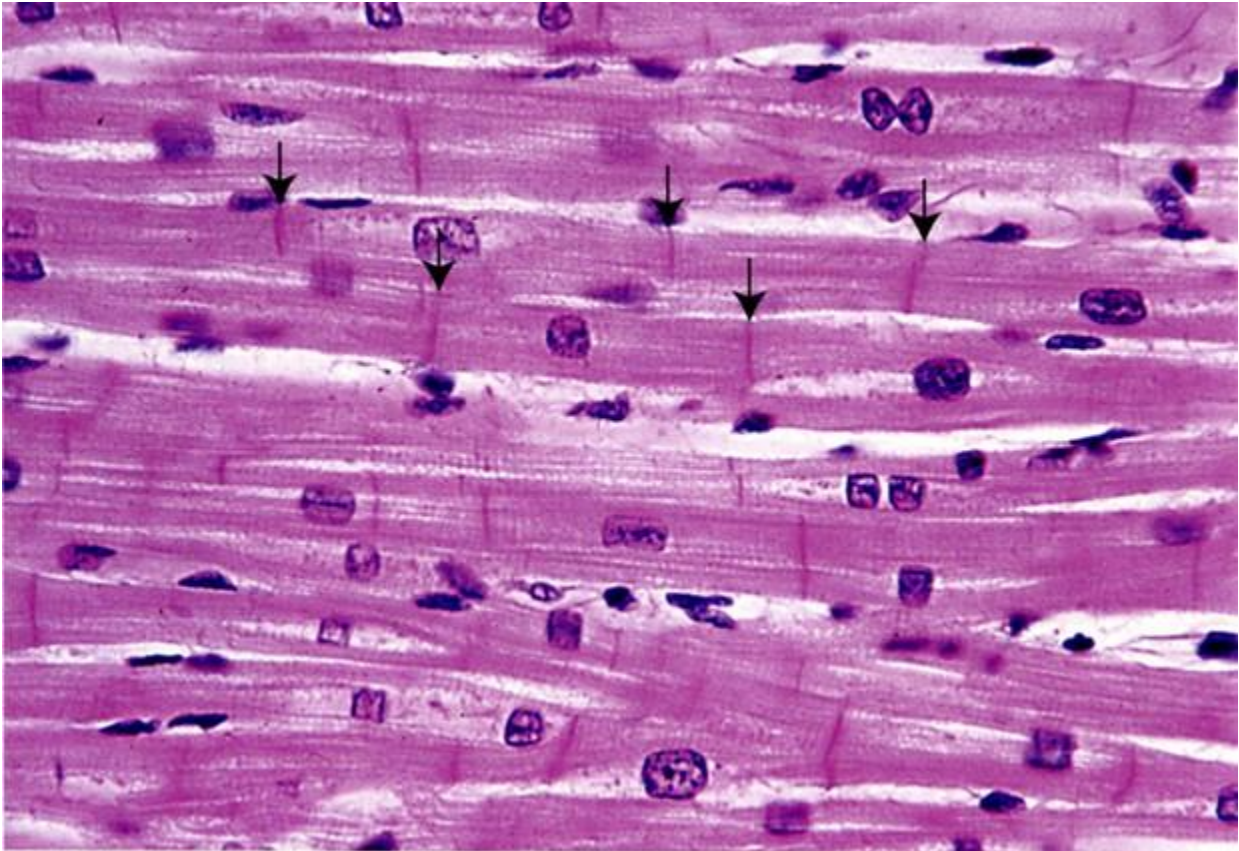
Skeletal muscles are **striated**. This means they have lines, bands or grooves. Look at the picture below or at the sample under the microscope, noticing the bands of muscle separated by other material.



Your blood also moves around your body. Does that mean your blood is a muscle? It isn't, but your heart is! Your heart is made up of **cardiac** muscle. Do you think cardiac muscle is

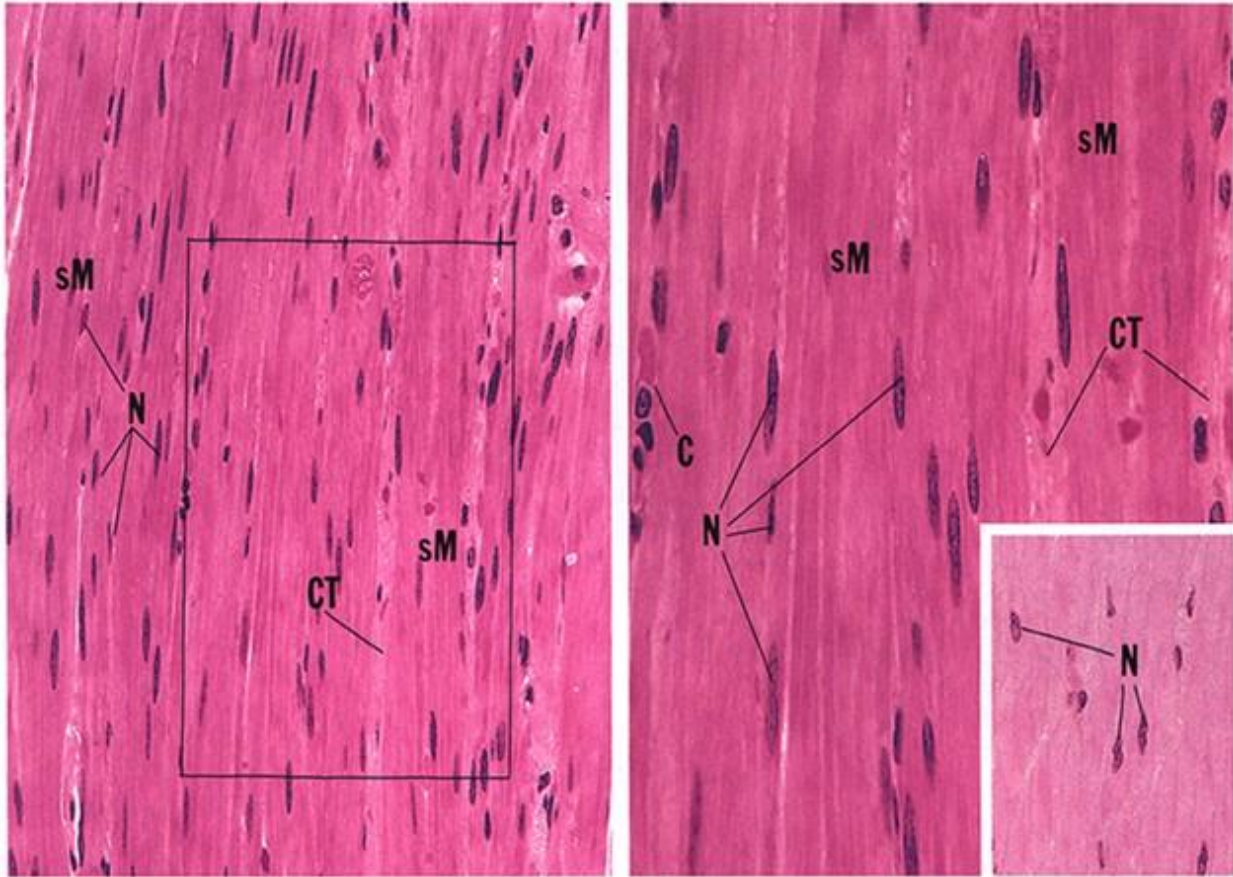
voluntary or **involuntary**? Do you think your heart muscle gets stronger when you use it? Think about athletes who move around a lot (which makes your heart work hard). Do their hearts get stronger?

Look at the picture below or at the heart muscle through the microscope. Do you think heart muscle is **striated** or not? What looks different about it than the skeletal muscle?



What else moves in your body without you thinking about it? What happens when you eat something? The food moves down your esophagus into your stomach. How does it do that? There are muscles around your esophagus known as **smooth** muscles. Smooth muscles are **involuntary** and don't get stronger the more you use them.

Look at the smooth muscle under the microscope or in this picture. Is it striated? What looks different about it in relation to the cardiac and skeletal muscles?



Other examples of smooth muscles include the muscles responsible for dilating and contracting arteries, the muscles responsible for goosebumps, and the muscles which dilate and contract your iris.

Part 3: Bones

Bones provide structure for our bodies. They can also protect fragile organs. Also, bones are where red and white blood cells are made. What material are bones made of? (hint, it's in milk!) Look at the skeleton on the worksheet.

Which bone protects your brain? Color it **blue**.

Which bone protects your heart and lungs and other organs? Color it **red**.

Which bone is your kneecap? It helps protect your knee joint. Color it **green**.

Which bones form your spine? Color them **orange**.

Have you heard of any other bones before? Color them **purple**.

Wrap up questions:

What are the three types of muscles? Which one(s) do you control? Which one(s) get stronger as you use them?

Do muscles do work as they contract or expand?

Name a bone. What does it do?