Wings and Arms

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Topic

Anatomy: skeletal muscles

Time

2 hours

Safety

Please click on the safety icon to view the safety precautions. Adult supervision is necessary. Be extremely careful when using scissors and knife. Do not cut toward your own or anyone else's body. Go slowly.

Materials

fresh chicken wing
small, sharp scissors
large needle
small, sharp knife
Styrofoam™
meat tray or cutting board
tweezers

Procedure

You will need a partner for this experiment.

1. Carefully remove the skin from the chicken wing. Be careful not to cut yourself. Use the tweezers to hold the skin while you cut it away from the muscle. Do not cut the muscle.
2. Find a large muscle on the big end of the wing. Carefully pull it slightly away from the other muscles around it. Do not tear the muscle in two. Find the place where it attaches to the bone. Be careful not to detach it by picking. How does the muscle change near the bone? Observe the tendon, the structure that connects the muscle to the bone. On the data table, describe the tendon.
3. While holding the loose end of the large bone, pull on one of the larger muscles around the large bone. (Pulling the muscle simulates what happens when the muscle contracts.) On the data table, describe what happens.
4. Find a muscle that causes the wing to move in the opposite direction from the larger muscle you pulled in step 3. Where is the opposite muscle attached to the bone? On figure 1, draw the two muscles, showing their positions around the large bone and where the tendons connect to the bones.
5. Put your lower right arm on the table with your palm up. Put your left hand on your arm halfway between your shoulder and your elbow. Have another person hold your hand down. Gently, try to lift your right hand. (You do not need to actually lift your hand.) On the data table, describe what you feel with your left hand.

DATA TABLE

Chicken wing

Description of tendon: _____

_____

What happens when first muscle is pulled? _____

_____

Description of direction of muscle fibers: _____

_____

Description of bone near joint: _____

_____

Description of ligament: _____

_____

Description of ends of bones: _____

_____

Human arm

What you feel on upper arm when trying to lift hand against pressure: _____

_____

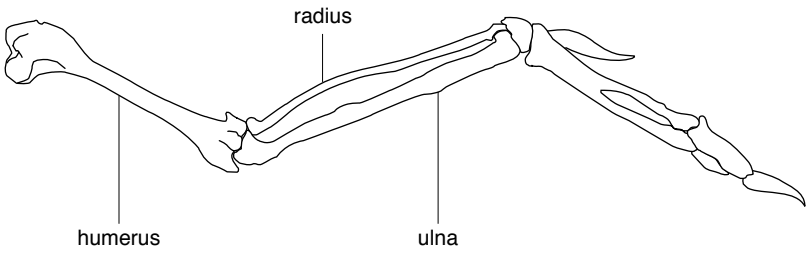
What you feel on arm when pressing hand down: _____

_____

What you feel inside elbow when trying to lift hand against pressure: _____

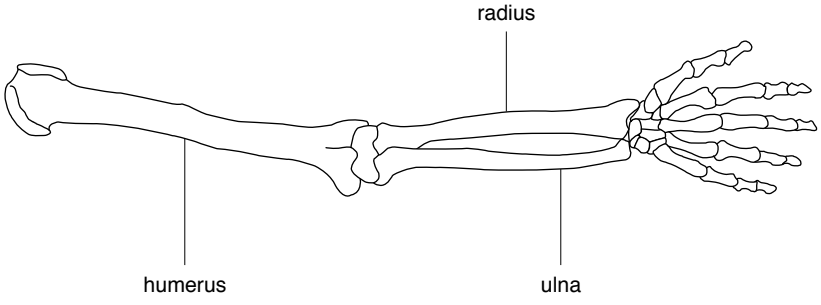
_____

Figure 1



6. Position your arm as in step 5, but this time gently push down on the tabletop with the back of your hand. On the data table, describe what you feel.
7. Position your arm as you did before, but this time put your left hand on the inner angle of your elbow. With someone again holding your hand down, try to lift your hand. Describe on the data table what you feel with your left hand.
8. Using the needle, pull apart the muscle tissue of the chicken wing. On the data table, describe the direction in which the strands of muscle fiber run.
9. Remove all the muscle from the bones of the chicken. The place where the two bones connect is a *joint*. On your data table, describe the appearance of the bone near the joint.
10. Describe the material, called *ligament*, that holds the bones together.
11. Carefully cut through the ligaments so that you can see the ends of the bones. (Be careful not to cut through the ends of the bones.) Describe the ends of the bones on the data table. How do they feel? Move the joint back and forth, and notice how the bones fit together.
12. What do muscles do?
13. What do tendons do?
14. What do you think would happen if a tendon were pulled or torn?
15. What do ligaments do?
16. What do you think would happen if a ligament were torn?
17. How do the texture and shape of the ends of the bones help make movement possible?
18. Thinking about the chicken wing and what you observed when you felt the muscles in your arm when you moved it, draw on figure 2 the muscles, tendons, and ligaments that you think are in your arm.
19. Describe how muscles work in pairs to move bones in different directions.

Figure 2



What's Going On

Skeletal muscles move the bones. Tendons connect muscles to bones. If the muscle were disconnected from the bone, it would be impossible for the bone to move in the way the muscle was designed to move. It would also be painful. Ligaments attach bone to bone; they hold the skeleton together. Without ligaments, bones would slip out of their joints, and movement would be difficult and painful. The ends of the bones are smooth and round. They fit into one another like balls in cups. Their shape tends to keep the joints together while the bones move and allow rotation. The smooth texture makes movement smooth and easy. Pairs of muscles, attached on either side of one bone, connect by tendons to another bone, allowing the bone to move in opposite directions.

Figure 3

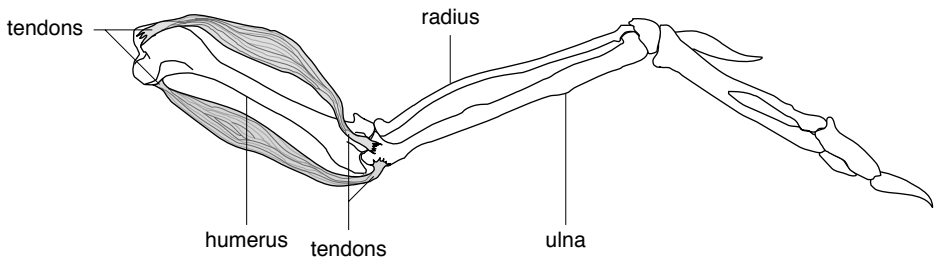
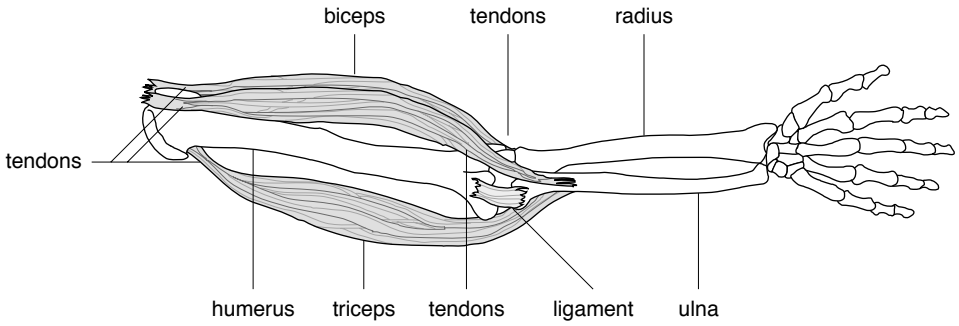


Figure 4



Connections

The skeletal *muscles* are long bundles of tissues that contract, or squeeze together, to move the bones. Each skeletal muscle narrows at both ends into *tendons* that connect the muscle to two bones, one of which moves when the muscle contracts. The two bones meet in a *joint*, where they are attached with connective material called *ligaments*. In this experiment, you investigated the muscles of a chicken wing and used your observations to analyze how your own arm muscles work.

Safety Precautions

READ AND COPY BEFORE STARTING ANY EXPERIMENT

Experimental science can be dangerous. Events can happen very quickly while you are performing an experiment. Things can spill, break, even catch fire. Basic safety procedures help prevent serious accidents. Be sure to follow additional safety precautions and adult supervision requirements for each experiment. If you are working in a lab or in the field, do not work alone.

This book assumes that you will read the safety precautions that follow, as well as those at the start of each experiment you perform, and that you will *remember* them. These precautions will not always be repeated in the instructions for the procedures. It is up to you to use good judgment and pay attention when performing potentially dangerous procedures. Just because the book does not always say "be careful with hot liquids" or "don't cut yourself with the knife" does not mean that you should be careless when simmering water or stripping an electrical wire. It *does* mean that when you see a special note to be careful, it is extremely important that you pay attention to it. If you ever have a question about whether a procedure or material is dangerous, stop to find out for sure that it is safe before continuing the experiment. To avoid accidents, always pay close attention to your work, take your time, and practice the general safety procedures listed below.

PREPARE

- Clear all surfaces before beginning work.
- Read through the whole experiment before you start.
- Identify hazardous procedures and anticipate dangers.

PROTECT YOURSELF

- Follow all directions step by step; do only one procedure at a time.
- Locate exits, fire blanket and extinguisher, master gas and electricity shut-offs, eyewash, and first-aid kit.
- Make sure that there is adequate ventilation.
- Do not horseplay.
- Wear an apron and goggles.
- Do not wear contact lenses, open shoes, and loose clothing; do not wear your hair loose.
- Keep floor and work space neat, clean, and dry.
- Clean up spills immediately.
- Never eat, drink, or smoke in the laboratory or near the work space.
- Do not taste any substances tested unless expressly permitted to do so by a science teacher in charge.

USE EQUIPMENT WITH CARE

- Set up apparatus far from the edge of the desk.
- Use knives and other sharp or pointed instruments with caution; always cut away from yourself and others.
- Pull plugs, not cords, when inserting and removing electrical plugs.
- Don't use your mouth to pipette; use a suction bulb.
- Clean glassware before and after use.
- Check glassware for scratches, cracks, and sharp edges.
- Clean up broken glassware immediately.

- Do not use reflected sunlight to illuminate your microscope.
- Do not touch metal conductors.
- Use only low-voltage and low-current materials.
- Be careful when using stepstools, chairs, and ladders.

USING CHEMICALS

- Never taste or inhale chemicals.
- Label all bottles and apparatus containing chemicals.
- Read all labels carefully.
- Avoid chemical contact with skin and eyes (wear goggles, apron, and gloves).
- Do not touch chemical solutions.
- Wash hands before and after using solutions.
- Wipe up spills thoroughly.

HEATING INSTRUCTIONS

- Use goggles, apron, and gloves when boiling liquids.
- Keep your face away from test tubes and beakers.
- Never leave heating apparatus unattended.
- Use safety tongs and heat-resistant mittens.
- Turn off hot plates, bunsen burners, and gas when you are done.
- Keep flammable substances away from heat.
- Have a fire extinguisher on hand.

WORKING WITH MICROORGANISMS

- Assume that all microorganisms are infectious; handle them with care.
- Sterilize all equipment being used to handle microorganisms.

GOING ON FIELD TRIPS

- Do not go on a field trip by yourself.
- Tell a responsible adult where you are going, and maintain that route.
- Know the area and its potential hazards, such as poisonous plants, deep water, and rapids.
- Dress for terrain and weather conditions (prepare for exposure to sun as well as to cold).
- Bring along a first-aid kit.
- Do not drink water or eat plants found in the wild.
- Use the buddy system; do not experiment outdoors alone.

FINISHING UP

- Thoroughly clean your work area and glassware.
- Be careful not to return chemicals or contaminated reagents to the wrong containers.
- Don't dispose of materials in the sink unless instructed to do so.
- Wash your hands thoroughly.
- Clean up all residue, and containerize it for proper disposal.
- Dispose of all chemicals according to local, state, and federal laws.

BE SAFETY-CONSCIOUS AT ALL TIMES