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Every Flex is Quite Complex

Structure and Function in a Chicken Wing

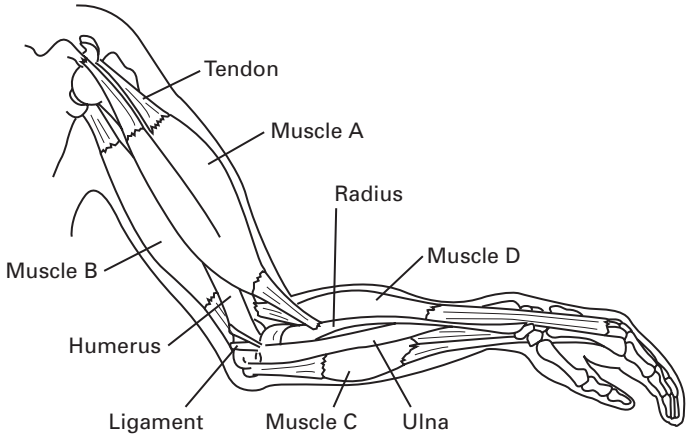
Question How do the tissues of a chicken wing work together during movement?

Lab Overview In this investigation you will carefully examine and dissect the tissues of a chicken wing to learn about its structure and to discover how bones, muscles, tendons, ligaments, and skin work together and function in movement.

Introduction In the Prelab Activity you will study the structure of the human arm and consider how the structure and function of the human arm may be similar to a chicken wing's structure and function. In the lab you will dissect the chicken wing and answer questions along the way about your observations.

During the lab, keep in mind that the surface of raw chicken may contain several different disease-causing species of *Salmonella* bacteria. To avoid infection, do not touch your eyes, nose, or mouth at any time while working with the chicken wing.

Prelab Activity Before beginning your dissection of a chicken wing examine the internal structure of a human arm, shown in the diagram below. Then answer the Prelab Questions on the next page.



Internal Anatomy of a Human Arm

1. Which labeled bone(s) is (are) found in the upper arm? Which labeled bone(s) is (are) found in the lower arm?

2. You may remember from Concept 27.5 in your text that muscles can only pull—they cannot push. Therefore, muscles work in pairs. When one muscle contracts and causes a bone to move, a relaxed opposing muscle can contract and move the bone to its original position. Which lettered muscle shown in this diagram do you think causes the elbow to flex (bend)? Which lettered muscle do you think is the opposing muscle that causes the elbow to extend (lengthen)? Explain your answer.

3. Which lettered muscle shown in this diagram do you think causes the wrist to flex (bend upward)? Which lettered muscle do you think is the opposing muscle that causes the wrist to extend (bend downward)? Explain.

4. How do you think the structures in a chicken wing will be similar to those in a human arm? How do you think they will be different?

Materials

- raw chicken wing
- scissors with pointed ends
- paper plate
- plastic gloves
- colored pencils or markers
- antibacterial soap

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Procedure

Part A: Comparing External Structure and Function

1. Compare the external structure of your arm with the external structure of the chicken wing. To compare the function of a human arm and a chicken wing, flex (bend) and extend (lengthen) your elbow and then your wrist. Then flex and extend the joints of the chicken wing. Record your observations below.

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2. Brainstorm at least one question about similarities and differences between the human arm and the chicken wing that you would like to explore further.

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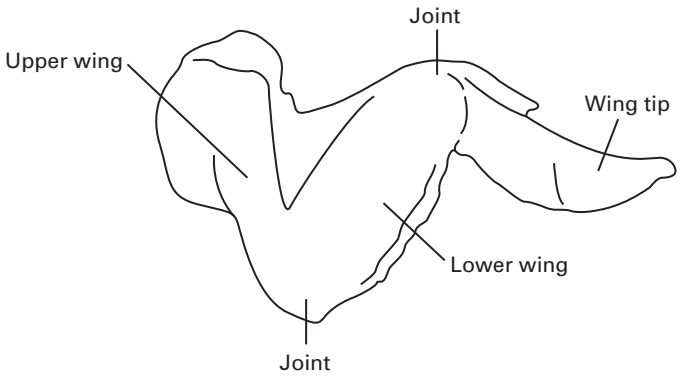
Part B: Examining the Skin

1. Use the scissors to cut under the skin of the upper wing down to the first joint. Repeat for both sides of the wing. **CAUTION:** *Handle sharp instruments with care to avoid injury.*



2. With your fingers, pull the skin of the upper wing away from the pinkish muscle. The now-visible film-like tissue that attaches the skin to the muscle is called the hypodermis. Just as in humans, the hypodermis is the connective tissue layer beneath the dermis of the skin. Compare the characteristics of the outer layer of skin (epidermis) to the hypodermis. Record your observations here.

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3. Completely remove the rest of the skin from the upper part of the chicken wing. In sections where the skin and muscles are strongly attached, use scissors to cut the skin away from the muscle. Be careful not to cut into the muscle, tendons, or ligaments as you remove the skin.
4. Repeat steps 1–3 to remove the skin from the lower wing.
5. Once you have removed the skin, observe the skin's elasticity by stretching it in different directions. Does the skin stretch in one direction more than another? Record your observations below.

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Part C: Examining the Muscles

1. With your fingers, gently separate the muscles from each other. Notice the layers of loose connective tissue between the muscles. In the space below, sketch an outline of the chicken wing. Draw in the muscles you observe.

2. Pull on each muscle one at a time to observe if the muscle causes a part of the wing to flex (bend) or extend (lengthen). Observe what happens to the nearest joint. Try to locate each muscle's opposing muscle. Color-code the opposing muscle pairs on your sketch above.

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Part D: Examining the Tendons, Bones, Ligaments, and Cartilage

1. Follow the muscles one at a time to the joint between the upper and lower wing. Cut the shiny white tendons that connect the muscles to the joint and remove the muscles.
2. Examine the bones of the upper part and lower part of the wing. Sketch the bones in the space below.

3. Observe the joint between the upper and lower wing. Do you think this joint is a pivot, ball and socket, hinge, or gliding joint? (See page 599 in your text to review the different joint types.) Explain your answer below.

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4. Now look for shiny white ligaments holding bones together at the joint. Cut the ligaments so that the joint falls apart.
5. Observe the cartilage that covers the ends of the bones. Record your observations below.

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Analysis and Conclusions

1. Review the questions you brainstormed in Part A. During the investigation, did you discover answers to any of your questions? If so, write your answers here. If you did not discover answers to any of your questions, describe an experiment that you could perform to find the answers.

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2. Describe the roles of bones, muscles, tendons, and ligaments in movement.

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3. How does the structure of cartilage fit its function?

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4. How does the structure of skin help enable movement to occur?

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5. Match the structures that you observed in this lab with a type of tissue. Some letters may be used more than once or not at all.

_____ ligaments	**a.** epithelial tissue
_____ hypodermis	**b.** nervous tissue
_____ bones	**c.** connective tissue
_____ tendons	**d.** muscle tissue
_____ cartilage	
_____ muscles	
_____ epidermis	

Extension

Now that you have examined the tissues of a chicken at a macroscopic level, examine tissues at a microscopic level, by observing prepared slides of various tissue samples. As you observe the slides, consider how the structure of each tissue at this level relates to the function of the tissue.