“Winging It” Chicken Wing Dissection

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"Winging It" Chicken Wing Dissection

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Abstract

The concept of muscle contraction working in concert with joints to produce a specific movement is often an abstract concept. Through this chicken wing dissection students can investigate bone anatomy, joint structure, movement production, and histological tissues. This dissection is a cost effective, efficient way to incorporate a lab activity that can summate a significant amount of information given in Anatomy and Physiology I. doi: 10.21692/haps.2017.046

Key words: origin, insertion, movement, long Bone

Target Audience: Undergraduate Level Anatomy and Physiology I or Advanced High School Students

Learning Outcomes:

HAPS:

F.3.1 Identify the structural components of a long bone, with emphasis on region of longitudinal growth.

F.8.3 Describe and demonstrate the generalized movements of synovial joints.

G.8 Identify the origin, insertion, and action of the major skeletal muscles and demonstrate these muscle actions.

Prior Knowledge: This activity is best done following a lecture on joints and gross muscle anatomy. As prerequisite knowledge students need to know general histology, bone anatomy, and a basic knowledge of gross muscle anatomy. This activity can also be used to review former topics including histological components of skin as a means of connecting those concepts to the thought of the different structures working as a unit. Knowledge of the sliding filament model is not required.

Time Required: 30-45 Minutes

Guidelines for Classroom Implementation:

Note safety concerns associated with the use of raw chicken in the student work sheet. I personally do not use gloves because I do not see the need for it as long as everyone is conscientious about washing their hands.

This lab usually costs less than $40 to run with a class of 70 students. Chicken wings are readily available from any grocery store. I use one chicken wing to four students. Choose the fresh (not frozen) whole chicken wings. Do not get the drumette and wingette cut pieces.

Check with your school and see if any animal research is done. We have a turtle research team and they asked me to save all of the scraps from the lab and place them in the freezer for baiting traps. This allows us to put the waste to good use and use our departmental money more efficiently.

The skin does not remove well on the posterior side of the elbow and below the wrist. Removing the skin below the wrist is not worth the time spent, in my opinion.

If you do not have needle holders or hemostats that can push down and lock, a hammer and a sandwich bag can be used. I have used a sandwich bag, but the needle holders work better. If a sandwich bag is used, take the students outside for this part and tell them NOT to beat the bone to a pulp with the hammer, one or two strikes with the hammer should be sufficient.

For our general education assessments we are required to assess the physical principles of a biological topic. I use an extended response questionnaire to satisfy that student-learning outcome.

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Instructor Observations: Seeing is understanding. This activity allows students to see what I have been teaching from the beginning. Even some of the brightest students have never thought about how muscles cause movement. This activity is a great way to demonstrate movement production.

The tissues of the body should have been covered prior to doing this activity. Areolar connective tissue is a tissue students struggle to understand in terms of location and structure. During this activity I specifically point out the areolar connective tissue to give students a better understanding of its structure, function, and location.

Dense regular connective tissue makes up the tendons. Students can actually see the fibers in the raw chicken wing. This is a light bulb moment for students.

I encourage students to create movement in several different ways. They can manipulate the wing to move at the wrist and the elbow. This allows them to understand the complexity of muscular contraction/relaxation that generates even the simplest motion with the arm. Appreciating complexity is important. My students also enjoy "raising their hand" with their chicken wing to get my attention and waving at each other from across the room.

Bones are vascularized. There is usually a nutrient artery entering the diaphysis of the bone, allowing students to see the vascularization of the tissue.

Bone marrow is subdivided into red and yellow marrow. Students associate yellow marrow with adipose tissue, but they do not usually realize the amount of vascularization that is found in the tissue.

Direct and indirect muscle attachment can be seen in the specimen. Usually this is a concept that is not fully understood, but can be clarified through this activity.

Safety Information

This lab involves the use of raw chicken. This increases the risk of coming into contact with *Salmonella enterica* bacteria, which may cause illness. All students should wash their hands after all chicken has been thrown away and clean up everything that could have been touched while the chicken was being handled. Use the bleach spray to clean the table.

This lab also involves sharp instruments. Use common sense and be careful. In the event of an injury please notify the instructor immediately.

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About the Author

Wendy Gean is an instructor of biology at Freed-Hardeman University in Henderson, Tennessee. Mrs. Gean taught high school for five years. During which time she earned her Masters degree is from Mississippi State University in General Biology. She then moved to higher education and is in her fifth year of teaching at the collegiate level.

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WINGING IT: CHICKEN WING DISSECTION ACTIVITY

Dissection Directions and Objectives For Students

As you observe the chicken wing reflect on prior lab units and think about the types of tissue that make up each structure. Think about how structures and functions coordinate. Begin to remove the skin at the "shoulder" and move toward the "elbow." This will include using your fingers to separate the superficial tissues from the muscle. Once the elbow is reached you will notice that removing the skin will be more difficult. One helpful maneuver is inserting your scissors while they are still closed, then open them to break the connective tissue. Find the loose (areolar connective tissue) that connects skin and muscle. This tissue is a clear layer that must be separated to remove the skin.

Isolate a piece of skin and examine the dermis and the pale yellow subcutaneous adipose tissue that remains with the skin. The skin can be cut with scissors to see the layers more easily.

You will note the muscle appears to be beige in color. Remember that each muscle is covered in a series of layers of connective tissues that are not visible to the naked eye.

Dissection Question 1. If you are looking at the *biceps brachii* muscle as a whole it is covered in layers of connective tissue. What is the name of the most superficial layer? Describe it.

Tendons are formed where muscle meets bone. They should be iridescent. Notice their fibrous consistency. Tendons are composed of dense regular connective tissue. Compare the tissue to what you saw as dense irregular tissue that made up the dermis.

Dissection Question 2. Describe the difference in the connective tissue of the dermis and the tendon. Include the direction of the fibers.

Using your probe or fingers pull on the muscles or tendons to mimic the shortening of a muscle. Try to make your wing move at the two different joints, the elbow and the wrist. Notice the motions produced.

Dissection Question 3. In the space below draw the elbow joint you are seeing. Include the humerus, ulna, radius, *biceps brachii*, and *triceps brachii*.

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Dissection Question 4. What type of motion does contracting the biceps produce?

Dissection Question 5. What type of motion does contracting the triceps produce?

Break the elbow joint. You will have to force the joint beyond its normal range of motion. You will find tendon attachments around the joint and articular cartilage in the joint. You may find some ligaments that connect the bones.

Dissection Question 6. What is the color of the articular cartilage? What does the color suggest about the articular cartilage blood supply?

Dissection Question 7. If you pull the connective tissue found around the bone all of the muscles, tendons, and other structures are stripped from the bone. What is the connective tissue covering the bone that contains the attachments called?

Clean off a bone. Attempt to find the nutrient artery entering the diaphysis. Use the needle holders to apply pressure to the diaphysis, then the epiphysis, until they crack. You will notice blood. Remember that bone is a highly vascularized tissue. You can also find the epiphysis and diaphysis contain different types of bone and marrow.

Dissection Question 8. What type(s) of bone are in the epiphysis? Draw an illustration below to show the arrangement and label it.

Dissection Question 9. What type(s) of bone are in the diaphysis? Draw an illustration below to show the arrangement and label it. Include the medullary cavity.

You may investigate your chicken wing further as desired, but keep it all in the tray and do not flick it around the table. You may try to find direct/indirect muscle attachments, blood vessels, nerves, ligaments, etc.

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Clean Up Instructions:

1. Pick up all of your chicken and your instruments. PUT ALL THE CHICKEN IN THE LARGE ZIP LOCK BAGS…NOT THE TRASH CAN OR DOWN THE SINK.
2. Wash all instruments and the dissecting pan. Put the instruments back into the pan and return the trays to your lab tables.
3. Clean your table with bleach spray and paper towels.

Complete exercises below

Name:_____ **Lab Section:** _____

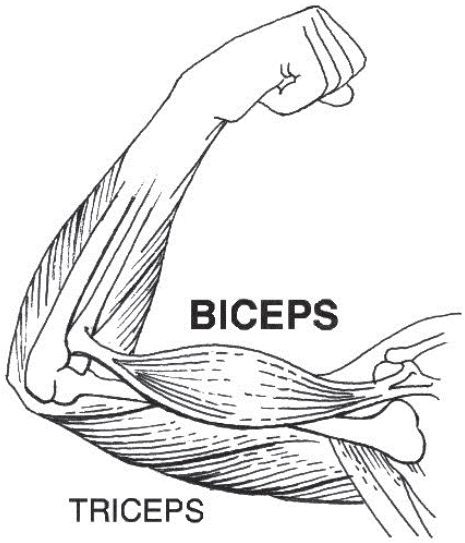
Be able to identify the following items on your chicken wing.

_____ Articular Cartilage
_____ Diaphysis
_____ Epiphysis
_____ Compact Bone
_____ Areolar Connective Tissue
_____ Adipose Tissue
_____ Creation of motion at the wrist
_____ Creation of motion at the elbow

_____Tendon
_____ Skeletal Muscle
_____ Spongy Bone
_____ Medullary Cavity
_____ Yellow Marrow
_____ Red Marrow

In this image (right) label the following:

1. Origin
2. Insertion
3. Biceps brachii



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4. If the nutrient artery is coming into the diaphysis of the bone, then this is associated with the primary ossification center or the secondary ossification center?

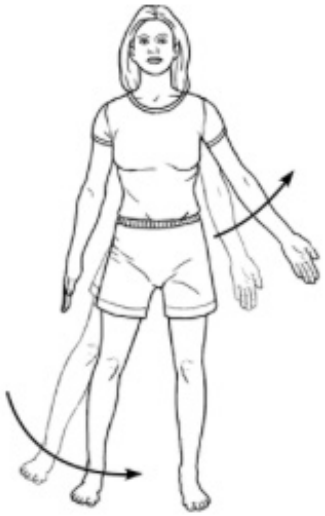
5. Provide an example of the antagonist to the *biceps brachii* from the lab activity. What evidence do you have to support your claim?

6. When you broke the elbow joint, what motion was required to do so? Explain.

7. For each of the following please label the types of motion seen in the images.

(a) _____ at the elbow

(b) _____ at the knee

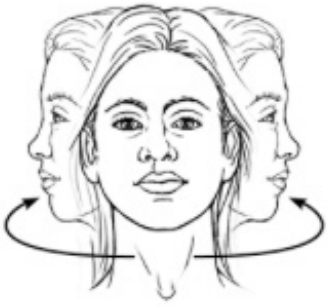


(c) _____ of the upper limb

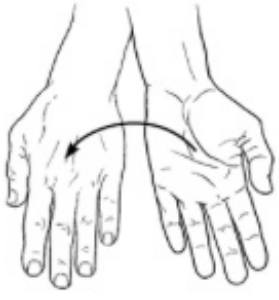
(d) _____ of the lower limb

(e) _____ of the upper limb

(f) _____ of the foot



(g) _____ of the head



(h) _____ of the forearm

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8. Compare and contrast the anatomy and physiology of the red and yellow marrow?

9. Why is the yellow marrow also red in your specimen?

10. An individual is having joint pain from 20+ years of competitive tennis play. He decides to take a chondroitin/glucosamine supplement daily. He does not note any change for at least 6 months. What property of the articular cartilage affecting the use of chondroitin/glucosamine supplements, and any other drug, and why does that impact the length of time needed to see results? How does this relate to the slow healing of articular cartilage?

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