THE SKELETAL MUSCLES

MATERIALS

ANATOMY

- Fresh chicken wings
- Dissecting kit
- Dissecting trays

PHYSIOLOGY

- Pan for ice water
- Ice
- Cloth measuring tape
- Tape
- String and weights
- Sphygmomanometer
- Cellophane tape
- Strips of paper
- Tongue depressor
- Stopwatch

OBJECTIVES

- To study the various tissues working together, viewing the muscle as an organ
- To identify the surface muscles of an experimental animal
- To locate and label the surface muscles in humans
- To explain the effect of temperature on muscular contraction
- To determine the relationship between muscular activity and heart rate

PROCEDURES

Certain principles of muscle function help us to understand bone-muscle relationships. First, skeletal muscle contracts only if it is stimulated by the nervous system. Second, skeletal muscles usually produce movements by pulling on bones across joints. The bones serve as levers and the joints serve as fulcrums. Third, muscles usually lie next to the bones they move. And, finally, muscles usually act in groups.

I. ANATOMY

1. Antagonistic activity of wing muscles. Place an uncooked chicken wing in your dissecting tray. Observe the external feature, noting the direction of movement of the lower wing. Note also how tightly the skin fits over the surface.
2. Carefully remove the entire skin without disturbing the muscles beneath. Note the blood vessels just beneath the skin surface. With a probe, or your fingers, separate

muscles form one another without tearing or cutting them. (Did you have to go through a thin white tissue to separate the muscles?)

3. Draw the chicken wing you examined. Label the skin, muscle, tendon, origin, and insertion. Then answer Data sheet questions 1-4.

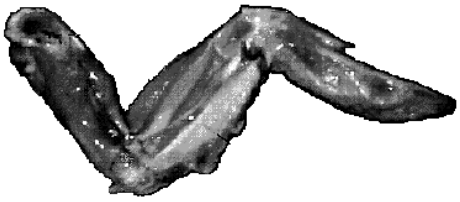

Figure: Chicken Wing

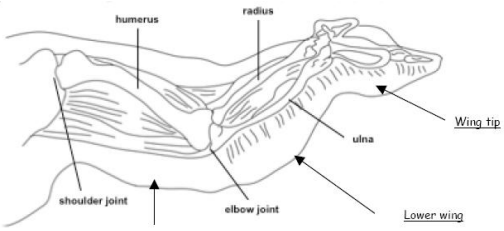

Figure: Chicken Wing Bones

II. PHYSIOLOGY

1. The effect of temperature on muscle contraction.
2. Write your name three times before starting this experiment. Place your writing hand in a pan of water containing ice cubes for 1 to 2 minutes. Again, write your name three times.
3. Warm you hand by massaging it or placing it in warm water until it returns to a normal temperature. Again, write your name three times.
4. Record your results in the chart on the Data Sheet. Compare the results of the three trials and explain them in terms of effect of temperature on muscular contraction by answering Data Sheet questions 8-10.
5. Other person the recorder. Roll up the sleeve of the subject. The recorder, using a cloth tape, measure the distance around the upper arm over the biceps while the arm is hanging loosely at the side of the body. Fasten a strip of paper firmly about the upper arm over the subject? s muscle, using cellophane tape at the end of the paper.
6. The subject then flexes the arm strongly at the elbow. Note the effect of this motion on the paper. The recorder measures the circumference of the arms at the same place as the original movement. Note the difference. Answer Data Sheet questions.
7. Have the subject press the toes of the right foot firmly on the floor and raise the body on the same foot. The recorder measures the calf muscle (gastrocnemius) with the cloth tape around the lower leg before and after the experiment. Answer questions on the Data Sheet.
8. The subject now flexes his foot sharply at the ankle. Notice the effect on the muscles on the front of the leg. Answer questions on Data Sheet.

II. ISOMETRIC AND ISOTONIC CONTRACTIONS.

1. Sit relaxed with one arm resting on a table, palm of the hand up.
2. Place an object too heavy to lift on the palm of your hand.
3. Keep your elbow on the table and try to lift the weight.
4. Observe and feel the muscles of the upper arm. Answer Data Sheet questions.

5. Sit relaxed with your arm resting on a table.
6. On the palm of your hand, place an object that you can lift by flexing the forearm.
7. Observe and feel the muscles of the upper arm. Answer Data Sheet questions.

III. DEMONSTRATION OF MUSCLE FATIGUE. (See Fig. 6-1.)

1. Tape your index finger to a tongue depressor to form a splint that allows flexion at the knuckle only.
2. Place your hand palm up on a table with your finger extending over the edge of the table.
3. Tie a weight to the tongue depressor (as shown above).
4. Raise the weight as rapidly as possible with you partner keeping track of track of track of track of track of lifts per 30-second period of time.
5. Repeat ten times and keep a record of the number of lifts per trial.
6. Graph your results by plotting the number of lifts per trial on the vertical scale against the number of trials on the horizontal scale.
7. Rest a few minutes, and then place a blood pressure cuff around the upper arm.
8. Inflate the cuff until the radial pulse cannot be felt, indicating that blood supply to the hand has been cut off. (A tourniquet may be substituted for a blood pressure cuff.)
9. Raise the weight as rapidly as possible for 30 seconds and record the number of lifts. How did this trial compare with the experiment above? (Caution: Loosen blood pressure cuff or tourniquet immediately after trial.) Answer Data Sheet questions.
10. Use the blood pressure cuff for only 1 trial lasting 30 seconds.

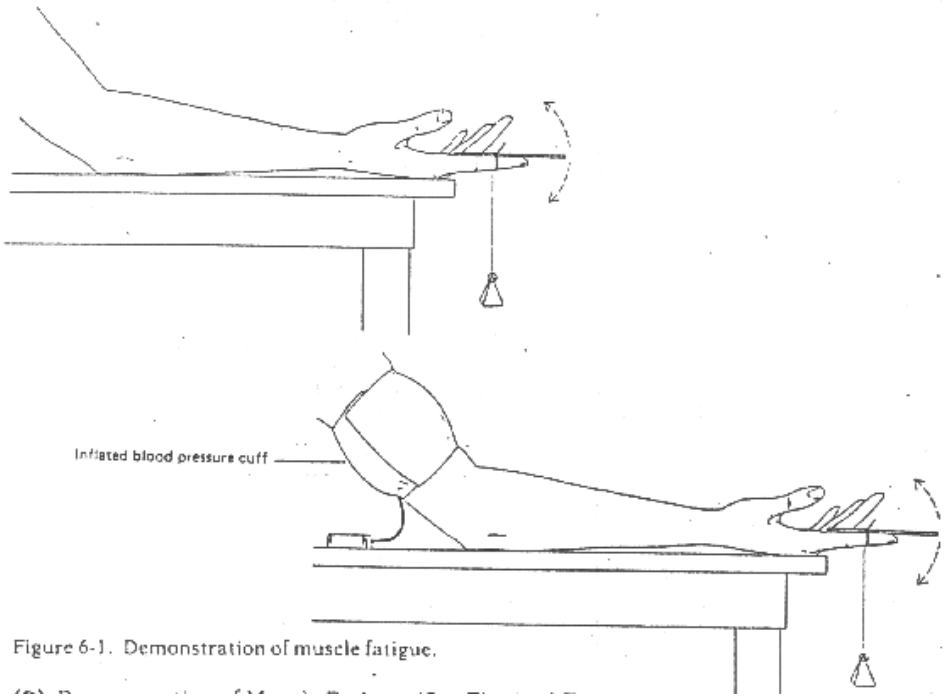

Figure 6-1. Demonstration of muscle fatigue.

Questions

1. Does the lower portion of the wing have an active or passive action in flight?
2. What function does the skin serve?
3. What tissue is referred to when one speaks of the "meat" of the chicken?
4. Of the tissue associated with the wing, which ones are concerned with the movement of the wing?
5. Was there any discomfort while your hand was immersed in the ice water?
6. What effect did the cold have on muscle coordination?
7. What conclusion can you draw from this experiment?
8. What happened to the paper strip when the arm was flexed?
9. What does this indicate about the action of a muscle when it is contracted?
10. When the subject pressed the toes on the floor raising the body on the right foot, what happened to the calf muscle?
11. Even though your hand did not lift the weight, what did you observe about the muscles in your upper arm?
12. This investigation is an example of what kind of contraction?
13. In the second demonstration, your arm lifted the weight. What did you observe about the muscles in you upper arm this time?
14. What is required in each of these examples (in addition to muscles, nerves, and bones)?
15. Which type of contractions produces work? Explain.
16. What is the effect of fatigue as shown by your results?
17. Describe the relationship between blood supply and muscle fatigue.