

## LESSON 1 – WHY INCLUDE PROTEIN IN YOUR DIET

### Time Needed

- 15-45 minutes depending on skill level
- Supplemental activities for more advanced classes, and requiring more time and possibly done on different days:
  - Important proteins in your body
  - How muscles work
  - Making a working arm model
  - Antigen-Antibody match up activity
  - Taking your own pulse
  - Make your own biological clock

### Skill/Grade Level

- Grades 3-5

### Core Area

- Family and Consumer Sciences

### Life Skills

- Critical Thinking
- Decision making
- Disease prevention
- Healthy lifestyle choices

### Educational Standards

- Health Education 3.1.2 and 4.1.2

### Objectives

Through this first lesson of the Kentucky Farm to School Curriculum related to chicken, participants will:

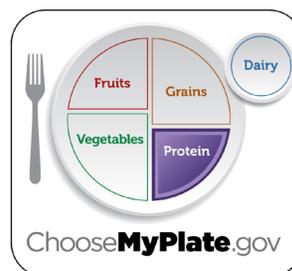
- **Learn** the importance of protein in the diet

Participants will be able to:

- **Explain** the benefits of healthy eating habits

### Introduction to Content

There is a lot of educational material available on the importance of including fruits and vegetables in a healthy diet. This lesson will teach youth about the importance of PROTEIN in the diet. The amount of information presented can be adjusted depending on the class level including the background of the students and their attention spans.



### Background Information

#### Vocabulary

There are some key vocabulary words all age groups should be taught, or already know.

- **Nutrients:** Things your body needs to function properly, grow and fight off disease organisms. The classes of nutrients include protein, carbohydrates, fats, vitamins, minerals, and water.
- **Proteins:** Found in every cell in your body. It is important for helping cells get energy from the food you eat. Protein helps build up and repair parts of your body. Protein is needed for blood to carry oxygen to every part of your body. Protein is important to build and help you flex your muscles.
- **Amino acids:** Proteins are made up of smaller parts called amino acids. There are many different amino acids, and the combination of amino acids determines the function of the protein.

Learn more at [www.kentucky4h.org](http://www.kentucky4h.org) or contact your county extension office.



# Protein

## Materials Needed

### *Activity 1 Items:*

Handout: 'What is protein?', with crossword

### *Activity 2 Items:*

Handout: 'Why is dietary protein important?'

Activity book: "Why you should eat protein" coloring book

Crayons or colored pencils

## Instructions for Activity 1

In this activity, youth will learn about protein

### *Prior to the activity:*

1. Make copies of the handout on 'What is protein?'

### *Activity:*

1. Go over the handout 'What is protein' and lead a discussion on where in the body proteins are found.
2. Have the youth complete the crossword puzzle, which also functions as a post-test for the activity.

## Instructions for Activity 2

In this activity, youth will learn about protein as an important component of their bodies.

### *Prior to the activity:*

1. Make copies of the handout on 'Why is dietary protein important?'

### *Activity:*

1. Go over the handout 'Why is dietary protein important?'
2. The youth can complete the coloring book as a reminder of what they learned.

## Reflection (5-10 minutes)

Debriefing the experience is what moves an experience from an activity to a learning experience. The primary purpose of processing the experience is to allow participants the opportunity to integrate their learning and provide a sense of closure or completeness to their experience.

**Share:** Examples of questions that can be asked to lead the discussion:

- What did we do?
- What did we learn about protein?
- What did we learn about including protein in the diet?

**Process:** What was the hardest thing to understand?

**Generalize:** What surprised you the most about what we learned today?

**Apply:** How will you include this information in your life?

# Protein

## Extended Learning:

- This lesson leads into future lessons which will look at using chicken as the protein source in the diet.
- The students can do some initial brainstorming about what kinds of proteins they are currently including in their diet.

## Reporting Your Success:

**Initial Outcomes:** As a result of this lesson, youth were able to:

- Understand the many kinds of protein in their body.

**Intermediate Outcomes:** Youth were able to:

- Understand the importance of protein in their diet, along with fruits, vegetables, grains, and dairy.

## Credits:

This lesson plan was written by Dr. Jacquie Jacob, Department of Animal and Food Sciences, University of Kentucky. March 2024. Development of this curriculum was funded by the US Poultry and Egg Foundation and the Kentucky Poultry Federation.

# Protein

## FOR MORE ADVANCED CLASSES:

### Available activities:

1. Important proteins in your body
2. How muscles work
3. Making a working arm model
4. Antigen-Antibody match up activity
5. Taking your own pulse
6. Make your own biological clock

These activities should be additional stand-alone activities on separate days because of the amount of content involved. It is meant for advanced classes only (Grade 5 or higher)

### Background Information

All living things are made up of cells. Human bodies are made up of many different types of cells. The body system is made up of multiple subsystems and these subsystems group to work together to form tissues and organs that are specialized for specific functions such as respiration, digestion, excretion, circulation, and the nervous system.

**Twenty percent of the human body is made up of protein.** There are many different types of proteins found throughout the body.

Types of proteins:

- **Muscle** is the most obvious protein in your body. There are different types of muscles including skeletal, smooth, and cardiac. **Skeletal muscles** help the body move, **smooth muscles** are in the intestines and move food along, and **cardiac muscles** are the heart muscles that pump blood throughout the body.
- **Enzymes** are also proteins and are important for assisting body cells to function. This includes building bone, cartilage, and skin. Enzymes are also important for digestion.
- **Hormones** are proteins and regulate many different functions in the body including growth and reproduction. Examples include growth hormone and insulin.
- **Hemoglobin** is a protein and is essential for carrying oxygen in the blood throughout the body.
- **Antibodies** are protein and are important for a strong immune system.
- **Collagen** is the principal protein of the skin, tendons, cartilage, bone, and connective tissue. Collagen is an essential part of the framework of our various body tissues.
- **Keratin** is a fibrous protein and is found in skin, hair, and finger /toenails.
- **Fibrin** is a protein that is important in forming scabs over wounds on your skin.
- **Elastin** is a protein that gives structure to skin and organs.
- **Myelin** contains a protein and insulates and protects nerves.

# Muscles

## ADDITIONAL ACTIVITY: IMPORTANT PROTEINS IN THE BODY

### Materials Needed

#### *Activity Items:*

Handout: 'Important proteins in your body'

PowerPoint Presentation: Important proteins in your body

Activity sheets: Important proteins in your body

### Instructions for Activity

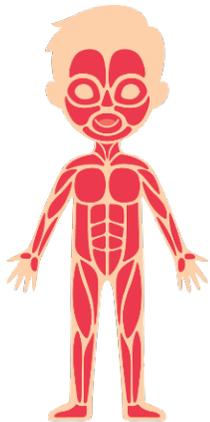
In this activity, youth will delve deeper into the types of protein in their bodies.

#### *Prior to the activity:*

1. Make copies of the handout on 'Important proteins in your body.'

#### *Activity:*

1. Go over the PowerPoint 'Important Proteins in Your Body' and lead a discussion on where in the body proteins are found.
2. The handout can be distributed for the youth to have a reminder of the information discussed in class.
3. The activity worksheet 'Important proteins in your body' can be used as a post-test on the information learned. For the worksheet the students need to identify which of the proteins are important for the functioning of the system.



muscular

#### **MUSCULAR SYSTEM**

Actin – YES: Actin is an important protein in skeletal muscle

Antibodies – NO, unless an infection is being battled in the muscles

Collagen – YES: Collagen is in the tendons that hold the muscles to the bones

Elastin – YES: Elastin is another important protein in connective tissue

Enzyme – YES: Every cell in the muscular system has enzymes to assist with chemical reactions.

Fibrin – NO: Protein involved in blood clotting

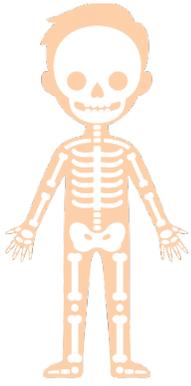
Hemoglobin – YES: Skeletal muscles need oxygen, and hemoglobin is important for carrying oxygen

Hormone – NO, but could argue that growth hormone is important in muscle growth

Keratin – NO: Keratin is a major protein in hair

Myelin – NO, but you could argue that there are nerves joining the muscles to tell them what to do, but that would be under the nervous system.

Myosin – YES: Myosin is an important protein in skeletal muscle.



skeletal

### **SKELETAL SYSTEM**

Actin – NO: Actin is an important protein in muscles

Antibodies – NO

Collagen – YES: Collagen is found in bone, cartilage in the joints between the bones, and in the ligaments that hold the bones together at the joints.

Elastin – NO: Elastin is an important protein in connective tissue

Enzyme – YES: Bone is living tissue, and the bone cells require enzymes to help complete their required chemical reactions.

Fibrin – NO: Fibrin is important in blood clotting

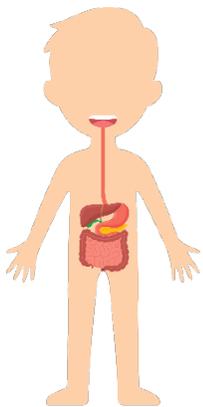
Hemoglobin – NO: Hemoglobin is found primarily in the blood

Hormone – NO, but you could argue that growth hormone is important in growth

Keratin – NO: Keratin is a major protein in hair

Myelin – NO: No myelin is important for covering nerves

Myosin – NO: Myosin is an important protein in muscles



digestive

### **DIGESTIVE SYSTEM**

Actin – YES: Actin is an important protein in the smooth muscles in the stomach and intestines

Antibodies – NO: Only if there is an infection in the body being fought off

Collagen – YES: Collagen is the main component of connective tissue and there is a lot of connective tissue in your digestive system.

Elastin – YES: Elastin is another important protein in connective tissue

Enzyme – YES: The cells of your digestive tract are living and need enzymes for necessary chemical functions AND the digestive system secretes digestive enzymes to help break down food consumed.

Fibrin – NO: Only if there is bleeding since fibrin is involved in blood clotting

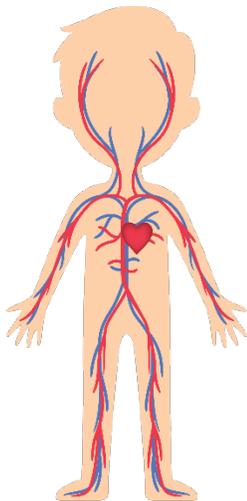
Hemoglobin – YES: All cells require oxygen which is carried by the blood to all the different in the digestive system

Hormone – YES: Hormones regulate the function of the digestive system.

Keratin – NO: Keratin is a major protein of hair

Myelin – NO, although you could argue that nerves are attached to parts of the digestive system, and myelin covers nerves

Myosin – YES: Myosin is an important protein in the smooth muscles in the stomach and intestines.



circulatory

### **CIRCULATORY SYSTEM**

Actin – YES: Actin is an important protein in the smooth muscles of the arteries and veins of the circulatory system.

Antibodies – NO, although it could be argued that the antibodies are carried in the blood in reaction to an infection. Testing for antibodies for a particular disease organism can determine whether you have protein, like measles.

Collagen – YES: Collagen is in the arteries and veins.

Elastin – YES: Elastin is in the arteries and veins.

Enzyme – YES: Every cell in the circulatory system has enzymes to assist with chemical reactions.

Fibrin – YES: Fibrin is important in blood clotting after an injury.

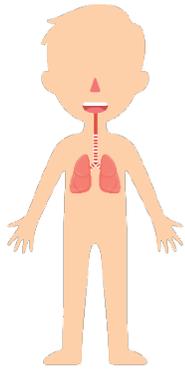
Hemoglobin – YES: Hemoglobin is important for carrying oxygen in the blood.

Hormone – YES: Hormones are constantly circulating in the blood to be carried from where they are produced to where they act.

Keratin – NO: Keratin is an important protein in hair

Myelin – NO, although you could argue that nerves are attached to parts of the circulatory system, and myelin covers nerves

Myosin – YES: Myosin is an important protein in the smooth muscles of the arteries and veins of the circulatory system.



respiratory

## RESPIRATORY SYSTEM

Actin – YES: Actin is an important protein in the smooth muscles of the respiratory system.

Antibodies – NO: Unless there is an infection being battled

Collagen – YES: Collagen is an important part of the connective tissue in the respiratory system.

Elastin – NO: Elastin is in the arteries and veins

Enzyme – YES: Every cell in the respiratory system has enzymes to assist with chemical reactions

Fibrin – NO: Only if there is bleeding since fibrin is important in blood clotting

Hemoglobin – YES: Hemoglobin is important for the carrying of oxygen picked up in the lungs.

Hormone – NO: Hormones are produced in one place and carried in the blood to act in another place

Keratin – NO: Keratin is a protein important in hair

Myelin – NO, although you could argue that nerves are attached to parts of the respiratory system, and myelin covers nerves

Myosin – YES: Myosin is an important protein in the smooth muscles of the respiratory system.

## NERVOUS SYSTEM

Actin – NO: Actin is an important protein in smooth muscles found in circulatory, digestive, and respiratory systems

Antibodies – NO: Unless there is an infection being battled

Collagen – YES: Collagen is an important part of the connective tissue in the respiratory system.

Elastin – NO: Elastin is in the arteries and veins

Enzyme – YES: All living cells require enzymes to assist with the many chemical reactions required for them to function

Fibrin – NO: Only if there is bleeding since fibrin is important in blood clotting

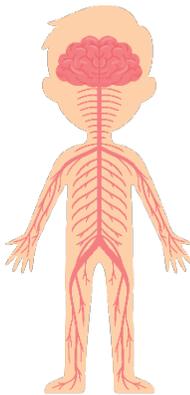
Hemoglobin – YES: Hemoglobin is important for the carrying of oxygen picked up in the lungs.

Hormone – NO: Hormones are produced in one place and carried in the blood to act in another place

Keratin – NO: Keratin is a protein important in hair

Myelin – YES: The myelin sheath is 20% protein and is important for coating the nerve cells

Myosin – NO: Myosin is an important protein in the smooth muscles found in circulatory, digestive, and respiratory systems



nervous

## INTEGUMENT SYSTEM (Skin)

Actin – NO: Actin is an important protein in smooth muscles found in circulatory, digestive, and respiratory systems

Antibodies – NO: Unless there is an infection being battled

Collagen – YES: Collagen is an important component of skin, and a loss of collagen leads to aging of the skin

Elastin – YES: Elastin is an important component of skin and gives skin its elasticity

Enzyme – YES: All living cells require enzymes to assist with the thousands of chemical reactions they need to perform

Fibrin – NO, unless you have a scab over a wound

Hemoglobin – NO: Hemoglobin is important for the carrying of oxygen to the cells of the skin.

Hormone – NO: Hormones are produced in one place and carried in the blood to act in another place

Keratin – YES: Keratin is a major component of hair

Myelin – NO: Myelin sheath is important for coating nerve cells

Myosin – NO: Myosin is an important protein in the smooth muscles found in circulatory, digestive, and respiratory systems



**Metabolism** is the chemical reactions in the body's cells that change food into energy. Our bodies need this energy to do everything from moving to thinking to growing.

## Reflect (5-10 minutes)

Debriefing the experience is what moves an experience from an activity to a learning experience. The primary purpose of processing the experience is to allow participants the opportunity to integrate their learning and provide a sense of closure or completeness to their experience.

**Share:** Examples of questions that can be asked to lead the discussion:

- What did we study today?
- What did you learn about the different types of proteins found in our bodies?

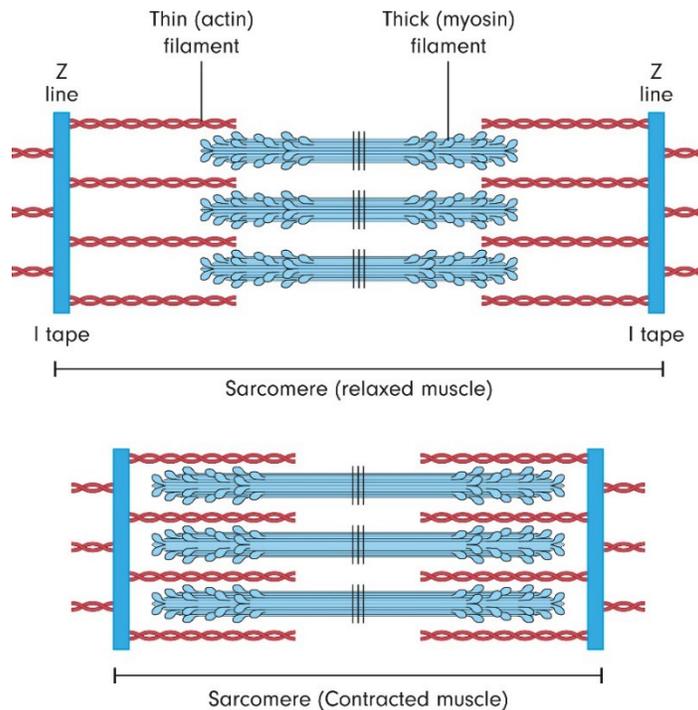
**Process:** What was the hardest thing to understand?

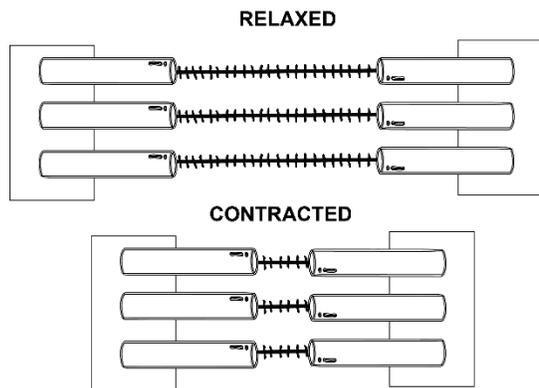
**Generalize:** What surprised you the most about what we learned today?

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# Muscles

## ADDITIONAL ACTIVITY: HOW MUSCLES WORK





## Materials Needed

*Activity Items per group or individual:*

Handout: Function of muscle proteins with assembly instructions

Two small pieces of cardboard

Two wide straws cut into 3 pieces

One pipe cleaner cut into 3 pieces

Tape

Scissors

## Instructions for Activity

In this activity, youth will learn how muscle fibers function.

*Prior to the activity:*

1. Make copies of the activity worksheet “How muscles work” with instructions for assembling the muscle fiber model.

*Activity:*

1. Handout the materials to groups of youth to work as teams assembling a model.
2. Have the students complete the assembly of the model showing how muscle fibers work.
3. Discuss how our muscles are made up of billions of different muscle fibers like these and they all have to work together to expand and contract a muscle.

## Reflect (5-10 minutes)

Debriefing the experience is what moves an experience from an activity to a learning experience. The primary purpose of processing the experience is to allow participants the opportunity to integrate their learning and provide a sense of closure or completeness to their experience.

**Share:** Examples of questions that can be asked to lead the discussion:

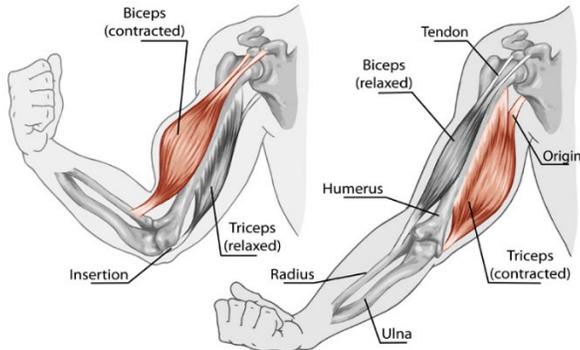
- What did we study today?
- What did you learn about how muscles function?

**Process:** What was the hardest thing to understand?

**Generalize:** What surprised you the most about what we learned today?

# Muscles

## ADDITIONAL ACTIVITY: MAKING A WORKING ARM MODEL



### Materials Needed

*Activity Items per group or individual:*

- Handout: 'Making a working arm model'
- Three sheets of 11x14 inch posterboard
- Masking tape
- Two long balloons (and pump)
- Marker
- Straight pin
- Large paperclip

### Instructions for Activity

In this activity, youth will delve deeper into how pairs of muscles work together to make bones move. This activity reinforces additional educational standards learned in earlier grades. K-PS2-1 and KP-PS2: Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.

*Prior to the activity:*

1. Make copies of the handout on 'Making a working arm model.'
2. Handout the supplies needed to make a model, either to teams of youth or individuals.

*Activity:*

1. Instructions are in the handout for making the working arm model.
2. Discuss how the opposing muscles work together to move a limb. One of the pair of muscles expands while the other contracts and then reverses the roles.

### Reflect (5-10 minutes)

Debriefing the experience is what moves an experience from an activity to a learning experience. The primary purpose of processing the experience is to allow participants the opportunity to integrate their learning and provide a sense of closure or completeness to their experience.

**Share:** Examples of questions that can be asked to lead the discussion:

- What did we study today?
- What did you learn about how pairs of muscles help us move bones?
- What pair of muscles are needed to straighten and bend your arm?
- What pair of muscles are needed to straighten and bend your leg?

**Process:** What was the hardest thing to understand?

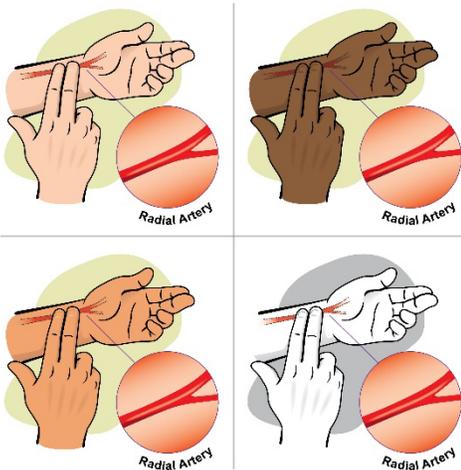
**Generalize:** What surprised you the most about what we learned today?

# Muscles

## ADDITIONAL ACTIVITY: TAKING YOUR OWN PULSE

When your heart beats, blood is pumped to all the parts of your body through blood vessels called arteries and veins. Arteries carry blood away from your heart while veins bring blood back to your heart.

When an artery lays over a bone you can press a finger against your skin to feel the blood pumping. This is called your PULSE. It is a measure of how fast your heart is beating. A typical resting pulse rate is about 70-80 beats per minute.



### Materials Needed

*Activity Items per group or individual:*

Activity worksheet: 'Take your pulse'

### Instructions for Activity

This activity follows up on cardiac muscles and the circulatory system. The students take their own pulse while resting and then after doing jumping jacks and chart the change in pulse with increasing numbers of jumping jacks. Only copies of the activity sheets are needed. The activity builds on previous educational standards. KY-5-OA.3 – Generate numerical patterns for situations .... Use tables and graphs to represent the relationships between quantities.

*Prior to the activity:*

1. Make copies of the activity worksheet on 'Taking your own pulse.'

*Activity:*

1. Divide the youth into groups or pairs and have them take their pulse before and after doing activities.
2. Discuss with the class how exercise affected the pulse/heart rate.

### Reflect (5-10 minutes)

Debriefing the experience is what moves an experience from an activity to a learning experience. The primary purpose of processing the experience is to allow participants the opportunity to integrate their learning and provide a sense of closure or completeness to their experience.

**Share:** Examples of questions that can be asked to lead the discussion:

- What did we study today?
- How does exercise affect a person's heart rate?

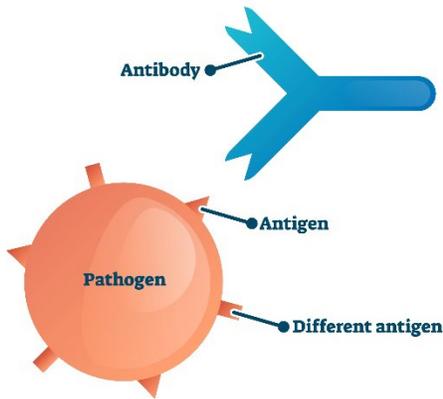
**Process:** What was the hardest thing to understand?

**Generalize:** What surprised you the most about what we learned today?

# Immune Function

## ADDITIONAL ACTIVITY: MATCHING ANTIBODIES AND ANTIGENS

### ANTIGENS



### Materials Needed

*Activity Items per group or individual:*

Cut outs of the antigens and antibodies from the activity sheets

### Instructions for Activity

In this activity, youth will learn more about how antibodies work to deactivate invading bacteria.

*Prior to the activity:*

1. Cut out a set of antigens and antibodies from the activities sheets and give each group or individual all the different combinations together

*Activity:*

1. Have the groups match the correct antigen with the antibody.
2. Discuss how antibodies, which are proteins produced by the body, are important in fighting off disease and how an antibody produced by a body's immune system works only on a specific bacterium (antigen). Different antibodies are needed for different bacterial infections.

### Reflect (5 minutes)

Debriefing the experience is what moves an experience from an activity to a learning experience. The primary purpose of processing the experience is to allow participants the opportunity to integrate their learning and provide a sense of closure or completeness to their experience.

**Share:** Examples of questions that can be asked to lead the discussion:

- What did we study today?
- What did you learn about fighting of disease and antibodies?
- How do you think your body gets the antibodies (infection and/or vaccination)?

**Process:** What was the hardest thing to understand?

**Generalize:** What surprised you the most about what we learned today?

# Hormones

## ADDITIONAL ACTIVITY: CREATING YOUR OWN BIOLOGICAL CLOCK



### Materials Needed

*Activity Items per group or individual:*

Only copies of the activity sheets are needed.

### Instructions for Activity

This activity follows up on the role of hormones, which are another body protein, in our everyday lives, including the biological clock that determines when you get up, eat, feel full, and go to bed.

*Prior to the activity:*

1. Make copies of the activity sheets

*Activity:*

1. Have the groups or individuals create their own biological clocks.
2. Discuss how hormones play a role in the routine functioning of the body.

### Reflect (5 minutes)

Debriefing the experience is what moves an experience from an activity to a learning experience. The primary purpose of processing the experience is to allow participants the opportunity to integrate their learning and provide a sense of closure or completeness to their experience.

**Share:** Examples of questions that can be asked to lead the discussion:

- What did we study today?
- What did you learn about how hormones regulate your body functions?

**Process:** What was the hardest thing to understand?

**Generalize:** What surprised you the most about what we learned today?

Opportunities to use the knowledge gained in this lesson: 4-H Chicken BBQ and 4-H Turkey BBQ contests. More information on these contests is available at <https://afs.ca.uky.edu/event/chicken-and-turkey-bbq-contest>.

# PROTEINS

## Additional Resources

- <https://kids.kiddle.co/>
- <https://study.com/>
- <https://www.ducksters.com/>
- <https://www.greatschools.org/>



## Reporting Your Success

**Initial Outcomes:** As a result of this lesson, youth were able to:

- Understand the role of different proteins in their body

**Intermediate Outcomes:** As a result of this lesson, youth were able to:

- Understand the importance of protein in their diet, along with fruits, vegetables, grains, and dairy

**Long Term Outcomes:** As a result of this lesson, youth

- Paid attention to the level of protein in the diet
- Included exercise in their daily routine to strengthen their muscles

## Credits

This lesson plan was written by Dr. Jacquie Jacob, Department of Animal and Food Sciences, University of Kentucky. March 2024. Development of this curriculum as funded by the U.S. Poultry and Egg Foundation and the Kentucky Poultry Federation.

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