Does My Meat Look Fat?

Nutritional Physiology

Grade Level
9-12

Lesson Length
2 periods x 55 Minutes

STEM Careers
- Microbiologist, Food Scientist, and Nutritionist

Nebraska Science Standards
- SC12.3.1 (Structure and Function of Living Systems)

Next Generation Science Standards
- LS1.B (Growth and Development of Organisms)

Food Science
- 3. (Evaluate factors that affect food safety from production through consumption)

These lessons aim to bring the science, skills of inquiry, critical thinking, and problem solving to life through an agricultural context.

Learning Objectives

By the end of the unit, students should be able to:
- Describe the molecular structure of glycerides, phospholipids and sterols.
- Define saturated, monounsaturated, and polyunsaturated fatty acids.
- List categories of lipids based on the physical state and dietary sources.
- Relate physical characteristics of lipids to their performance in foods.
- Examine the function of lipids in food preparation.
- Analyze the nutritional impact of lipids in the diet.
- Develop a lab to evaluate fat content of various ground meat products.

Materials List – (per student team)

- Electronic balance
- 400-mL beaker
- 100-mL graduated cylinder
- hot plate
- glass rod
- beaker tongs
- electric skillet
- bent-edged spatula
- instant read thermometer
- 100 mL water
- waxed paper
- 1 pound each of various ground meat products

Preparation

- Print Power Point slides and lab reports
- Collect, organize, and prepare materials to be used for the creation of an experiment to test fat content of ground meat products.

Do

Introduction (Interest Approach)

Have ground meat samples open and available for viewing by students. Have them observe the samples and record anything that they notice. Once they have made notes, come together and answer these questions:

What similarities can you see between the samples?
What differences can you see?
What are some things that you cannot see?

Lead into lesson by discussing how fat content is something that is difficult to see. How can we see fat content in meat? How do these samples vary in fat content?

Essential Questions

- *What relationship exists between the percent fat content and the price per pound of each variation?*
- *Comparing taste, texture, and appearance, which ground meat product has the best flavor?*
- *When might you render fat when preparing foods at home?*

Learning Activity 1: What does lean mean?

Have students read the following articles that explain fat content in ground beef:
https://meat.tamu.edu/ground-beef-labeling/

http://www.cargillgroundbeef.com/nutrition-leanpointedu.aspx

When finished reading, discuss the following questions:

1. What is lean point?
2. What is the purpose of having fat in ground beef?

3. Which is better an 85% lean ground or a 73% lean ground?

Learning Activity 2: Explore fat in ground meat

Distribute the "Fat in Meat" guidelines to each student. Students may work in teams of 2-5 depending on class size.

Ground meat varies greatly in fat content, and it is important to understand these differences as a consumer and/or as a producer.

Teams of students will design an experiment to determine the fat content difference of various ground meat products. Fat will be rendered from the meat products by cooking them in water for 15 minutes. The fat will rise to the surface and harden during cooling for easy removal. If time and supplies allow, you can also compare taste and juiciness of burgers pan-broiled from each ground product.

Ground meat products that they may wish to test include…

1) ground beef
2) ground chuck
3) ground round
4) extra lean ground beef
5) ground turkey
6) vegetable burger
7) grass fed ground
8) OTHER – can you think of any other ground products to test?

Prior to conducting the rendering process experiment, students must create a written plan of action that includes a research problem, hypothesis, materials list, procedure, and data tables. The written plan of action must be approved by the instructor prior to students conducting the experiment.

Students will conduct their experiment, and each student in the group will use the provided lab report to document their findings.

Reflection

Student teams must choose one ground meat product and create a promotional video for that product based upon their research findings. The video can be shared with the class.

Apply

Given what you have learned from this lab, research information regarding conventional meat vs. plant based meat or conventional meat vs. grass fed meat. Create three teams, one each for conventional, plant based, and grass fed. Create a forum where each team has to support that their meat is the best based up the lab results and researched information.

References:

- Ward, Janet D. Principles of Food Science Third Edition. 2013.

Fat in Meat Experiment Guidelines

Objective: Determine differences of fat content in various ground meat products.

Guidelines:

1. Develop a comparative experiment to evaluate the fat content of different types of ground meat products. Create a table to record all required information.
2. A written plan of action must be submitted before experimentation may begin. This experimentation plan should include a research problem, hypothesis, materials list, procedures, data tables, and a safety plan.
3. Each student in the group will use the provided lab report to document their findings.

Procedures:

1. All safety guidelines must be followed:
    a. Wear safety glasses when heating glass beakers
    b. Use a separate cutting board for each type of raw meat product
    c. Wash all surfaces contaminated by raw meat products with hot, soapy water
    d. Wash hands with hot, soapy water for 20 seconds before and after handling raw meat products.
2. You must test at least three types of ground meat.
3. Mass 100 g of your chosen ground meat products and place them in the 400 mL beaker.
4. Add 100 mL of water to the beaker.
5. Place the beaker on a hot plate or range and heat until the water comes to a boil. Reduce heat and simmer for 15 minutes, stirring occasionally.
6. Remove the beaker from the heat with beaker tongs. Place it on a hot pad in the refrigerator overnight.
7. While the ground meat product is simmering, divide the remaining ground meat products into equal portions, one for each lab group. Shape the product into patties.
8. Place the patties in an electric skillet over medium heat and cook until the product reaches an internal temperature of 74C (165F), approximately 5 minutes per side.
9. Taste a bite of each type of ground meat product. Record your observation of the taste, texture, and appearance of each variation. Also record the price per pound of all the ground meat products as provided by your teacher.
10. The next day, carefully lift the hardened fat off the top of the water and ground meat product.
11. Tear a sheet of waxed paper to use as a weighing paper.
12. Mass the collected fats. Record the masses in your data table.
13. Calculate the percent fat content for each variation and record it in the data table. Percent equals part (mass of the fat) divided by the whole (mass of the ground meat product before cooking).

Name:

Lab Report

Please complete the following report during the design and implementation of your experiment.

Research Problem
- Describe what you are investing and justify why you are investing the problem.

Hypothesis
- Formulate one or more hypotheses for your experiment.

Procedures
- Create the steps you will follow for your experiment.

Data Collection
- Describe the data that you will collect during your experiment.
- Provide graphs, tables, charts, and raw data as necessary.

Results
- Explain your results.

Conclusion
- Based on your data:
    - What can you conclude?
    - Were your hypotheses supported?
    - Were their limitations to your experiment?
    - What are new research questions that derived from this study?