

Adopt-A-Cow: Beef

LESSON 4: BEEF ENERGY CYCLE

KEY TERMS

Byproducts, Energy, Photosynthesis, Ruminant

EDUCATION STANDARDS

English Language Arts

- SL.1, SL.2, SL.3

Educational Technology

- ET.EL.2

Science

- 4-LS.1, 5-PS3.1, 5-LS2.1

Science and Engineering Practices

- SEP 1, SEP 2, SEP 8

TIME NEEDED

Part 1: Lesson & Video (20 min)

Part 2: Activity Relay Race (20 min)

MATERIAL LIST

Materials for the whole class:

- Computer/Projector/TV/
Promethean board
- PowerPoint

Materials for the individual or teams of students

- Relay Cards



EXPECTED LEARNER OUTCOMES

OBJECTIVE 1 – Youth will explore the transfer of energy from the sun (solar energy) to them (chemical and physical energy).

OBJECTIVE 2 – Youth will begin to explain how foods, like hamburgers, move from the farm to their plate.

OBJECTIVE 3 – Youth will learn about ruminants and how their special stomachs digest food that humans cannot.

BACKGROUND

Animals and humans get the energy they need by consuming nutrient dense foods, like plants. Plants utilize photosynthesis to transform solar energy from the sun into energy needed for their growth and development. Much of this energy is stored as chemical energy in their cells. When animals consume these plants, their digestive system transforms the plants' stored energy so that the animal can use it to be active and grow.

Cattle utilize their food to not only provide energy for their body to thrive. The muscle that cattle build provides a valuable source of protein for humans. This protein provides structural material to be used in muscle growth, repair, and maintenance. It is also sometimes used for energy.

VOCABULARY

Abomasum – the fourth stomach compartment of a ruminant, that receives food from the omasum and passes it along to the small intestine.

Amino Acids – biochemical units that make up all proteins. There are nine essential amino acids that must be consumed daily.



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Chemical Energy – energy stored in the bonds of chemical compounds, like atoms and molecules. They are released when a chemical reaction takes place.

Complete Proteins – animal proteins that contain all nine of the essential amino acids.

Energy – power derived from the utilization of physical or chemical resources

Kinetic energy – the energy of motion

Omasum – the third stomach compartment of a ruminant animal, between the reticulum and the abomasum.

Photosynthesis – the process by which plants convert carbon dioxide, water, and light energy into sugars and oxygen to store energy; the opposite of cell respiration

Protein – an essential nutrient responsible for building tissue, cells, and muscle.

Reticulum – the second stomach compartment of a ruminant, that receives food from the rumen and passes it to the omasum.

Rumen – the first stomach of a ruminant, which receives food or cud from the esophagus and then passes it to the reticulum.

Solar Energy – energy generated by the sun.

LESSON PREPARATION

**Lesson is designed using a PowerPoint format. This is done to provide structure and speaking points. It also provides visual aids to help youth understand what is being discussed. In a less formal setting, a PowerPoint may not be appropriate, and educators may select not to use the formal presentation. Individual slides can be printed to provide visual aids.*

- Ensure the ability to play YouTube videos.
 - To make the Rumen video more interactive, purchase the following items to pass around as they are discussed in the video:



■ Silicone honeycomb ice cube tray (mimics Reticulum): (<https://a.co/d/5rxquIM>)



■ Microfiber knobby mitts (mimics Rumen): (<https://a.co/d/0SAIDgB>)



Large knobby ball (not inflated) (mimics Omasum): (<https://a.co/d/ipNG3H4>)



Silicone sheet (mimics Abomasum): (<https://a.co/d/hLZSfYj>)

- Prepare for Relay Race Activity
 - Make one copy of the relay cards for each group of youth. (To make it easy to sort the cards for groups, print each copy on a different color). Ideally, each group will have five youth. However, smaller groups can be utilized; youth in these smaller groups will need to go twice to complete the relay.

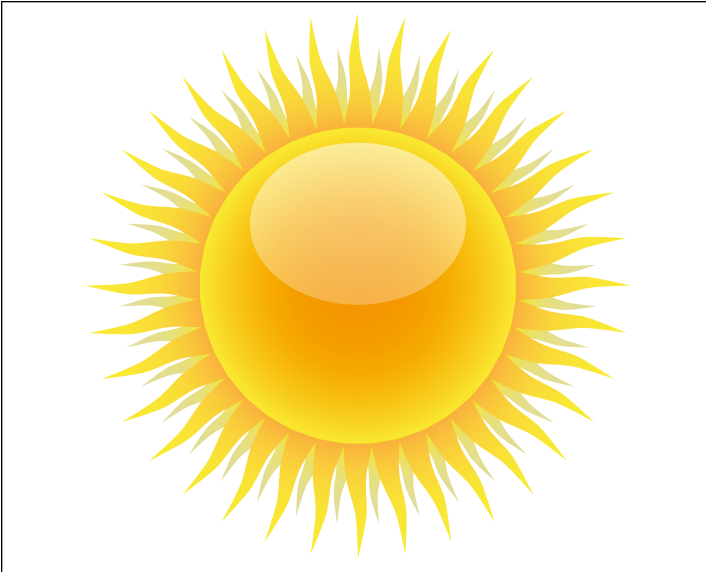
LESSON INSTRUCTIONS

**Detailed notes are contained within the PowerPoint notes section for each slide.*

- I. Lesson 3 Review (slide 2)
- II. Notice and Wonder (slide 3)
- III. What is energy? (slide 4)
- IV. What would you want to eat? (slide 5)
- V. Balanced Diets (slide 6)
- VI. Meat + Dairy = Strong Muscle and Bone (slide 7)
- VII. Energy transfer (slide 8)
- VIII. Let's follow the energy (slide 9)
- IX. Can we simplify it? (slide 10)
- X. Explore Ruminant Digestion (slide 11)
Video: youtu.be/VzfkR20iPbQ (9 min)
- XI. Meat + Dairy = Chemical Energy (slide 12)
- XII. Energy in Action Relay Race (slide 13)
 - a. Divide the class into groups of five. For smaller groups select one or more members to complete the relay twice.
 - b. Each group should form a single line across from where their group's cards are placed face down.
 - c. One at a time, individuals from each team will run to grab a card and return to their group.
 - d. When the group has all their cards, they will work to put the cards into the appropriate energy transfer order. The first team done then needs to describe the process indicating how energy is transferred from the sun to them.
 - e. To make this more physically challenging, you may have the youth do jumping jacks, jump rope, shoot a hoop, or other activity before they can access their cards. Additionally, an obstacle course can be placed between the team and their cards.



RELAY RACE CARDS



Solar Energy

Chemical Energy
(Sugar)

Chemical Energy
(Proteins, Fats, Vitamins,
and Minerals)

Physical Energy



LITERATURE TO EXPLORE

Looking for literature to further explore topics from this lesson? Check out these books:

The Journal of Rowdy the Cow Kid by Amanda Radke

Follow Rowdy on a 12-month adventure of being a cow-kid to learn how cattle help the land, water, and air alongside their caring beef farmers and ranchers.

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