RUMINANT DIGESTION

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VOCABULARY

Rumination- or cud-chewing is the process by which the cow regurgitates previously consumed feed and chews it further.

Fermentation- a process that converts ingested feed into energy sources for the host. Fiber scratches the rumen wall to start a series of contractions. These contractions lead to rumination, which is the process that physically breaks down the fiber source.

Microbial protein- the major source of protein in a cow's diet. They break down Rumen Degradable Protein(RDP) to amino acids, then ammonia. Microbes are continually flushed from the rumen, through the omasum to the abomasum, where they are killed and digested by the cow. The amino acids produced from the digested microbial protein are absorbed through the small intestine.

Regurgitate- bring (swallowed food) up again to the mouth.

Rumen- is the largest compartment of the ruminant stomach. Food is fermented in the rumen, because the environment has no oxygen. That allows for increased microbial action and high concentrations of bacteria. The rumen is capable of changing poor-quality protein (such as the nitrogen in grass) to a good-quality microbial protein. The rumen has fingerlike projections called "papillae" that increase the surface area on which microorganisms do their work.

Reticulum (Honeycomb) - is attached to the rumen and consists of bands of smooth muscle. Its main functions are to first detect large feed particles that need to be broken down further, and second to regurgitate or force those particles back up the esophagus to the mouth so they can be chewed and then swallowed again.

Omasum - made up of many folds or layers of muscle (called "plies"). These folds increase the compartment's surface area, which helps it absorb nutrients from feed and water. The omasum squeezes water from the feed particles and continues to break them down into smaller particles.

Abomasum - or the "true stomach" because it's the equivalent of the stomach of a monogastric animal. This is where digestive juices mix with and prepare feed for enzyme breakdown and absorption in the small intestine.

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Overview:
This lesson is designed to teach young people about animal digestion. Participants will complete an activity in which they "digest" a slice of bread the way their stomachs would. They'll also discuss the basic differences in how various species of livestock digest feed. In the interactive lesson, they'll also learn the importance of acids to the process of digestion.

Objectives:
After completing this activity, participants will be able to:

- Discuss how digestive acids break down carbohydrates.
- Explain the difference between monogastric and ruminant animals.

Setting:
An outdoor/indoor space with a supply station and an easy-to-clean floor; seating is optional.

Duration:
20 to 30 minutes

Materials:

- Resealable plastic sandwich bags
- Sliced white bread
- 2-liter bottle of orange juice or cola
- 3-ounce disposable cups

Procedure:

1. Layout all of the materials for each participant - bread, plastic bag, and juice or coke in a 3-ounce cup.
2. Ask the participants to verbally label what each item will represent in the digestive process.
3. Insert a piece of white bread into the bag, *this represents the grass entering into the rumen.*
4. Pour in the juice or coke to the bag and seal it tightly. Wait a few moments and observe what is happening to the bread. *Note the changes that the bread is going through. This resembles the food particles as they enter into the abomasum, or true stomach, into the enzymes (juice in this case).*
5. Gently massage the bread to break up the piece of bread for two minutes, *this emulates the breakdown and absorption process as the abomasum contracts. The food must go through this process before entering into the small intestine.*
6. Once the bread looks like it is fully processed the activity is done. *This is where the broken down food particles would exit to the small intestine. There, the vital nutrients will be absorbed and unnecessary particles will be discarded out of the body.*

Activity adapted from:

Thelen, Julie. *A Stomach at Work [activity].* Animal Science Anywhere. Michigan State University Extension. Retrieved from https://extension.purdue.edu/4h/Documents/Volunteer%20Resources/Livestock%20Volunteers/4H1659_AnimalScienceAnywhere-DigestiveSystem.pdf.

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