Science

Rumination Navigation

Grade Level
4-6

Length of Lesson
45-60 minutes

Objective
By the end of this lesson, students will have a better understanding of the digestive system of ruminant animals.

Materials Needed
- Containers (resealable snack size baggies or solo cups)
- Plastic spoons
- Paint cone strainers
- Paper Towels
- Carbonated drink
- Water
- Potato Sticks*
- Pop Rocks candy
- Measuring cups: 1/4 cup, 1/8 cup, 1 tablespoon, 1/2 teaspoon
- Permanent markers
- Copies of student worksheet

Standards
NGSS
4-LS1-1; 5-PS1-4; 5-PS3-1; MS-LS1-3; MS-LS1-7

Lesson Summary
This lesson is a fun, hands-on activity designed to help students understand the process of rumination and how digestive systems break down food for energy. It is best to be used as an extension lesson as some understanding of the ruminant digestive system is beneficial to understand the steps in the activity.

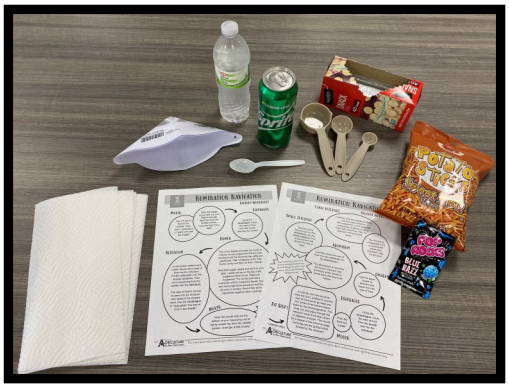
*If you don't have access to potato sticks, any type of potato chip or even a half slice of bread would work just fine.

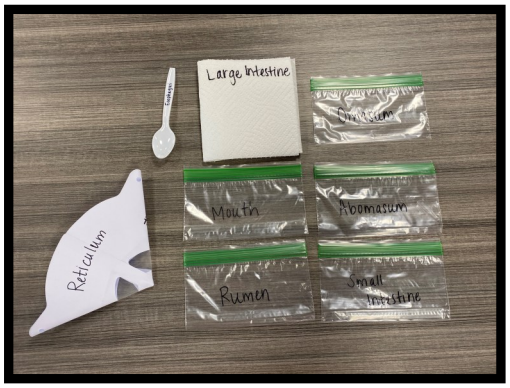
Suggested Sequence of Events:
1. Set Up: To save time, have the materials divided so that all the materials for one group are together. If time allows, you can have the 1/4 cup of potato sticks measured and ready in a container.
2. Read through the IAITC Beef Ag Mag and Dairy Ag Mag to learn more about two important ruminant animals! Interactive online versions can be found on our website.
3. Complete the activity following the procedures:
    - Divide students into groups of 2-3 and have one person from each group collect the materials.
    - Hand out the student worksheets so that each student has their own, and read through the introduction together.
    - Read through the "Set Up" on the first page of the student worksheet as a whole class so students are aware of what they need to do first.
        - Students need to label their baggies and strainer, measure the 'digestion' materials and put them into the appropriate baggies, and then follow the steps on their student worksheets.
    - When finished, have students clean up their materials according to your classroom instructions!
    - Once cleaned up, have students work together, or individually, to answer the questions on the student worksheet.
4. Whole class discussion and reflection of activity.

TEACHER RESOURCES

Extension Ideas:

- Have students color code the steps to the cattle diagram by coloring in the instruction shape and the matching digestive system part the same color.
- Have students write map directions for the route food takes in ruminant digestive systems.
- Read through our “Moovin’ On Through” non-fiction text that explains the different parts of the ruminant digestive system in more detail.
- Compare and contrast the ruminant digestive system to a monogastric digestive system.
- Have student define the word ‘rumination’. Compare that definition with the definition for ‘monogastric’.
- Invite a beef cattle farmer into your classroom to talk with your students!
- Learn more about beef by-products.
- Learn about the history of cattle in the United States.
- Have students share their favorite beef recipes.
- Learn about what cattle eat and how they are cared for by farmers and ranchers.
- Research cattle breeds in the United States and compare to cattle breeds around the world.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!





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Student Worksheet

Introduction: Food is made up of ingredients that provide nutrients and minerals to our bodies! All animals, including humans, need these nutrients and minerals for our bodies to function properly and to have energy. The digestion system is responsible for breaking down the food we eat, taking as many of those nutrients and minerals as the body needs, and then gets rid of what is not needed. Unlike humans, ruminant animals (like sheep, cattle, goats, and even camels) have a more intricate digestive system. This is because they eat plants, like grass, that is harder to break down than the foods we eat. Let's get a hands-on understanding of what happens to the food during rumination.

Set Up

Let's get the materials set up so that you can easily navigate your way through the ruminant digestive system!

1. Check to make sure you have all of the following materials:
   - 5 baggies
   - 6 paper towels
   - 1 strainer
   - Carbonated drink
   - Pop Rocks candy
   - Food
   - Water
   - Spoon
2. **Label** your materials so that you know which material represents which part of the digestive system.
   - Baggie 1: Mouth
   - Spoon: Esophagus
   - Baggie 2: Rumen
   - Strainer: Reticulum
   - Baggie 3: Omasum
   - Baggie 4: Abomasum
   - Baggie 5: Small Intestine
   - 2 Paper towels: Large Intestine
3. Now we need to measure out some of our materials and put them into the correct baggies!
   - Rumen: 1/4 cup water
   - Omasum: 2 folded paper towels
   - Abomasum: 1/8 cup carbonated drink
   - Small Intestine: 2 folded paper towels

Now that your materials are set up, it's time to ruminate! The instructions on the next pages will refer to all the containers as the **scientific name** of the digestive system section they are modeling. Start with the mouth and follow the arrows!

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Student Worksheet

Mouth

Add 1/4 cup of food to the **mouth**. Then add 1 tablespoon of water and seal the baggie!

Keep the baggie closed and use your fingers to break apart the food into smaller pieces. Form the food into a wad!

Esophagus

Using the **esophagus**, move the wad of food from the mouth and into the rumen!

Rumen

The rumen liquids and walls are home to millions of microorganisms that are now starting to eat the food that the cattle just swallowed. Add 1 teaspoon of the Pop Rocks candy and listen to them 'eating'!

Seal that baggie closed and set it on your table. Lightly pull up on the top of the baggie and then let go. What just happened? The rumen just had a contraction which moved the liquids, food, and microorganisms around so that they all come in contact. Kind of like stirring ingredients together when cooking!

Reticulum

A contraction spilled some rumen liquids and a wad of food into the reticulum. Put the **reticulum** over the opened **omasum**. Then pour everything from the **rumen** into the **reticulum**.

The wad of food is too big to pass into the omasum and needs to be chewed more. Use the **esophagus** to "regurgitate" the wad of food to the **mouth**!

Mouth

Close the mouth and use the bottom of your measuring cup to lightly smash the food into smaller pieces—it will get a little mushy!

This is called "chewing the cud"

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Student Worksheet

Mouth

Form the food into a wad!

Esophagus

Using the **esophagus**, move the wad of food from the **mouth** and into the **omasum**!

Omasum

Use the paper towels to absorb more liquid from the wad of food.

Abomasum

Carefully dump the wad of food from the **omasum** into the **abomasum**!

The abomasum is most like the human stomach and produces acidic liquids to break down the food even further!

Keep in mind that nutrients and minerals are being absorbed from the food, through the walls in each section, and are sent throughout the body for use!

Small Intestine

Carefully dump everything from the **abomasum** into the **small intestine**! The small intestine will absorb the rest of water.

Large Intestine

Carefully drop the undigested food onto the large intestine. Microorganisms in this area will break down anything of value that's left in the food. Add 1/2 teaspoon of Pop Rocks candy.

The remaining undigested food is considered waste and excreted. Yep– it's the poo!

Pit Stop!

In real life, the cow would re-chew the food, swallow it, and the wad of food would go back into the rumen to be further broken down by the microorganisms. The food can only pass through the reticulum once it's broken down, or digested, enough. This would be a repeat of the previous page, but today we are going to fast forward to the omasum!

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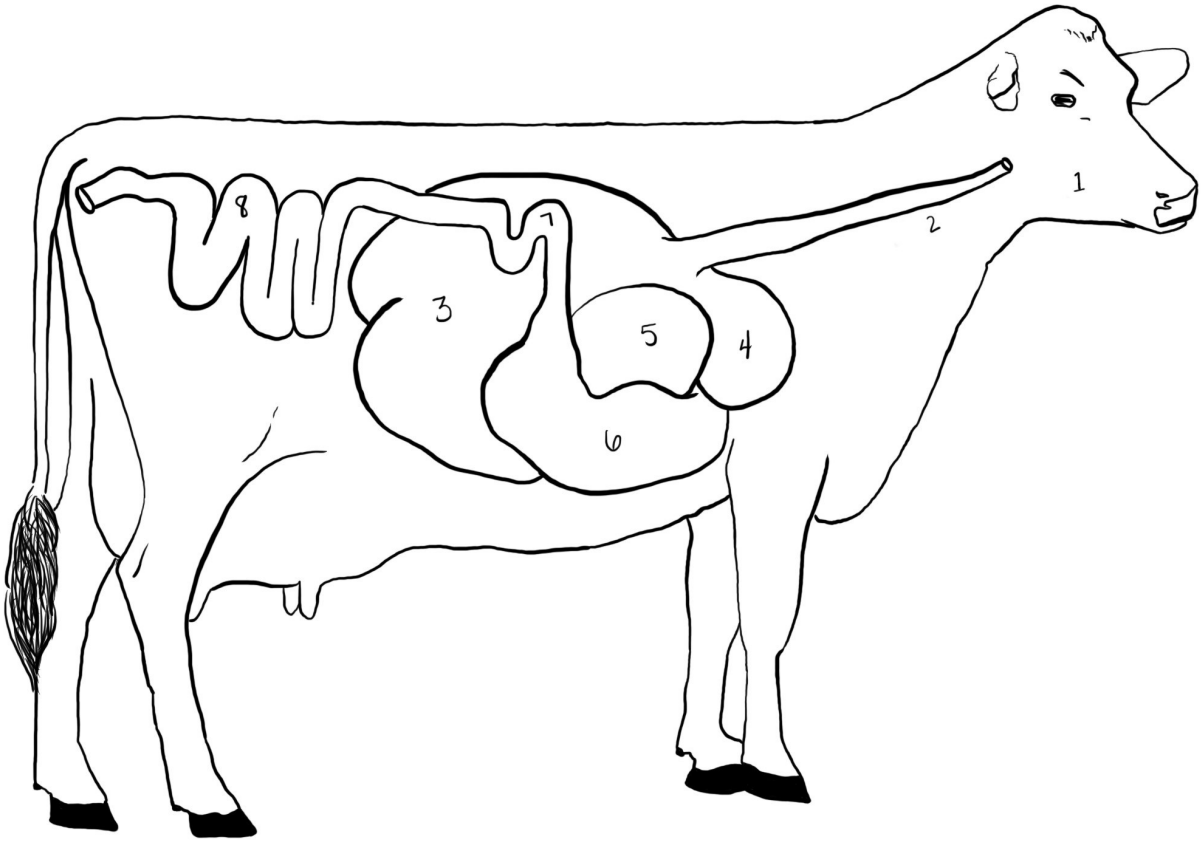
Student Worksheet



1. You added water to the mouth to help break down the food. What did that water represent? Think about what happens when you chew your food.

2. You added Pop Rocks candy two different times in the activity. What did the Pop Rocks candy represent and why are they important in digestion?

3. Why do cows regurgitate their food?