Objective
The student will trace the path a cow’s food follows through its body. Students will ask and answer questions to clarify comprehension. Students will listen to and follow directions given by the teacher.

Background
Have you ever noticed, whenever you see a cow, it always seems to be chewing something? That is because the cow has to chew its food twice. What you are watching is the cow “chewing its cud.”

A cow is a ruminant animal. Other ruminants include sheep, goats, deer, camels, giraffes, yaks, antelope and llamas. The stomach of a ruminant animal has four compartments—the rumen, the reticulum, the omasum, and the abomasum. Each compartment is designed to perform a different function. By having this four-part stomach, the cow is able to digest and efficiently use foods that humans and non-ruminant animals, such as the pig and chicken, cannot use. Grass and hay are examples of a food that ruminants can eat that humans cannot. These foods are high in cellulose, which is very difficult to digest if you only have one part to your stomach.

After the ruminant takes a bite of grass or hay, the first place the food moves is to the rumen. Here the food is partly digested by the bacteria that live in the rumen. The food is then passed to the reticulum, which is a membrane with ridges like a honeycomb. The ridges break the food down into smaller pieces. Then the cow regurgitates those pieces so it can chew them again.

The partly-digested food that comes back into the ruminant’s mouth is the cud. The animal rechews the food with its powerful back teeth to break it down even more. This is what a cow is doing when it “chews its cud.” As the ruminant swallows and saliva washes the cud back into the animal’s system, the food now flows into the omasum (oh mah’ sum), the third section of the stomach. During this process the food breaks down into vitamins and nutrients that the animal’s body absorbs to meet its daily nutritional needs.

The fourth division of a ruminant’s stomach is the abomasum. The final digestive process takes place here. In the abomasum the animal’s system gets all the remaining good value it needs from the food before letting it pass to the intestines. The intestines store the unused food portions and continue to absorb some nutrients from them until there is enough to push out the back side of the cow as waste material, or cow manure.

Some experts think a ruminant’s digestive system developed as it did for survival. Since ruminants are hunted animals in the wild, they must eat quickly and eat as much as possible while they have the chance. The grasses the animal eats are stored in the second stomach until it finds a safe place to eat. Then the animal brings up the food, the cud, to chew.
The cow’s ability to digest grass helps humans by providing a food source on lands that are too not suitable for agricultural crops. According to the USDA, that includes about 85 percent of all land in the US. Cattle turn that grass into food for us to eat and double the land area that can be used to produce food.

**Language Arts**

1. Students will use online and library resources to research ruminants. Students will find the following in their research:
   — Definition of ruminant
   — Characteristics of ruminants
   — Examples of ruminants.
2. Read and discuss background and vocabulary. Discuss key points and main ideas.
   — How do ruminants benefit humans?
   — How do ruminants affect our food supply?
   — How do cows use grass and hay, which people cannot eat, in order to feed humans?
3. Students will assist in developing a word bulletin board with the word “Chew.” Use words and pictures that represent the word, e.g., bite, grind, eat, manipulate, masticate, bread down into bits, etc.
4. Provide students with copies of the Reading Page and the discussion and writing exercises. Students will read and discuss individually or as a class and complete the writing exercise individually.
5. Students will write a summary of the lesson, concluding with a personal opinion statement. How does all this relate to me?

**Science**

1. Hand out student worksheets.
   — Students will trace the path of the cow’s food with their fingers as you read the background.
   — Read the directions from the student worksheet to your students before allowing them to complete the color work.

**Extra Reading**

Cronin, Doreen, and Betsy Lewin, *Click, Clack, Moo: Cows That Type*, Little Simon, 2011.


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**Vocabulary**

**abomasum**—the fourth compartment of the ruminant stomach that follows the omasum and has a true digestive function

**bovine**—any of a group of ruminant mammals including the oxen, bison, and buffalo that have hollow horns and are related to the sheep and goats

**cud**—food brought up into the mouth by some animals (as a cow) from the rumen to be chewed again

**intestine**—the part of the alimentary canal that is a long tube composed of the small intestine and the large intestine, that extends from the stomach to the anus, that helps to digest food and absorb nutrients and water, and that carries waste matter to be discharged

**manure**—material that fertilizes land; especially bodily waste from birds and animals in stables and barnyards

**omasum**—the third chamber of the ruminant stomach that is situated between the reticulum and the abomasum

**reticulum**—the second compartment of the stomach of a ruminant in which folds of the mucous membrane form hexagonal cells

**rumen**—the large first compartment of the stomach of a ruminant in which cellulose is broken down by the action of symbiotic microorganisms

**ruminant**—a cud-chewing mammal
Have you ever noticed, whenever you see a cow, it always seems to be chewing something? That is because the cow has to chew its food twice. What you are watching is the cow “chewing its cud.”

A cow is a ruminant animal. Other ruminants include sheep, goats, bison, deer, camels, giraffes, yaks, antelope and llamas. The stomach of a ruminant animal has four parts—the rumen, the reticulum, the omasum, and the abomasum. Each part has a different job. Having a four-part stomach helps the cow digest and use foods that humans and other animals cannot. Grass and hay are some of the foods that ruminants can eat that humans cannot. These foods are high in cellulose. Cellulose is very difficult to digest if your stomach only has one part.

After the cow takes a bite of grass or hay, the first place the food moves is to the rumen. Here the food is partly digested by the bacteria that live in the rumen. The food is then passed to the reticulum. The reticulum is a membrane with ridges like a honeycomb. The ridges break the food down into smaller pieces. Then the cow regurgitates those pieces so it can chew them again.

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DISCUSSION

A ruminant is a cud-chewing animal. On the Reading Page you learned that goats, sheep, bison, deer, camels and other animals are also_____________.

Look at the picture of cattle grazing at right. List three things you notice they are doing.

Some experts think a cow’s digestive system developed as it did for survival. Since ruminants are hunted in the wild, they must eat quickly and eat as much as possible. Use an online search engine to find photos of grazing wild ruminants like deer and antelope. Compare them with the photo of these cattle.

WRITE

Some of these cattle seem to be walking as they eat. In your opinion, why are they doing that? Use evidence from the reading.

1. State opinion.

2. Give your reasons.

3. Provide evidence.

4. Restate your opinion.

What word in the following text means “to chew again?” ______________

The partly-digested food that comes back into the cow’s mouth is called cud. The cow rechews the food with its powerful back teeth to break it down even more. This is what the cow is doing when it “chews its cud.”
Use a green crayon to trace from the mouth to the rumen to the reticulum.
2. Use a yellow crayon to trace the path back to the mouth.
3. Use a blue crayon to trace from the mouth to the omasum to the abomasum to the intestine.

Oklahoma Ag in the Classroom is a program of the Oklahoma Cooperative Extension Service, the Oklahoma Department of Agriculture, Food and Forestry and the Oklahoma State Department of Education.