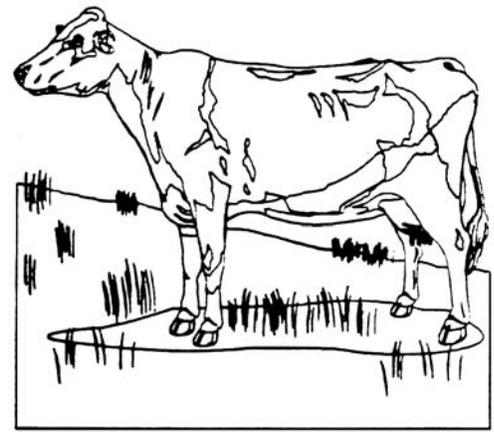


## Why Can a Cow Eat Grass?

# Why Can a Cow Eat Grass?



*Dr. Carla Gale Nichols, UK College of Agriculture*

### Worksheet 1

#### *Program Objective*

Introduce students to the concepts of anatomy of grass eating animals, species relations in zoological classification, evolution and symbiosis. Comparisons between human and grass eating animals digestive systems will be made.

#### *Valued Outcome*

1. Students construct meaning from messages communicated in a variety of ways for a variety of purposes through listening.
2. Students organize information through development and use of classification rules and classification systems.
3. Students complete tasks and/or develop products which identify, describe, and direct evolutionary change which has occurred or is occurring around them.
4. Students demonstrate understanding of measurement concepts.
5. Students use critical thinking in a variety of situations that will be encountered in life.
6. Students recognize the geographic interaction between people and their surroundings in order to make decisions and take action that reflect responsibility for the environment.

#### *Program Description*

Did you know that calves have baby teeth, just like humans? Or that cows have four compartments to their stomachs? How many gallons does a cow's stomach hold? This program will focus upon differences between cattle and human digestive systems, including zoological relatives, dental structures of calves and children to maturity and adult weight comparisons. You will take a video journey into a cow's stomach and then microscopically view the stomach contents. Ten year old cattle experts will share their "mooving" experiences with you.

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## Why Can a Cow Eat Grass?

Teacher Worksheet

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## Vocabulary List

**Abomasum**—The fourth compartment of the ruminant stomach. Often called the true stomach because this is where enzymatic digestion occurs, similar to the human stomach.

**Bull**—A male bovine (cattle). In humans, man or father are the analogous terms.

**Calf**—A sexually immature young bovine (cattle). In humans, child is the analogous term.

**Carbohydrates**—In the diet, foods that are starches and sugars. An energy source in the diet.

**Concentrates**—A broad classification of livestock feed high in energy and low in fiber i.e. grains.

**Cow**—A female bovine (cattle) that has had at least one calf. In humans, woman or mother are the analogous terms.

**Diaphragm**—The muscular body partition between the chest and the abdominal cavity in mammals.

**Enzymes**—In digestion, substances secreted by the body that induce or speed chemical reactions for the breakdown of food in the digestive tract.

**Esophagus**—The muscular tube connecting the mouth and the stomach.

**Fats**—Animal or plant matter that is energy rich esters, not soluble in water.

**Fermentation**—A chemical decomposition of foodstuff in digestion by enzymes produced by microorganisms usually involves the production of gases as a by-product.

**Fistulated**—An opening created (not normal) into an a body organ; in this case an opening created by surgical procedures into the rumen of cattle.

**Omasum**—The third compartment of ruminant stomachs with the major function of water absorption and reduction.

**Proteins**—In feed stuffs, those containing amino acids. Essential for living cells. Function in growth and renewal of body cells.

**Reticulum**—The second compartment of ruminant stomachs; functions in fermentation and houses forgone objects swallowed by the animal.

**Roughages**—Feed for livestock that is bulky and course plants or plant parts; contains high fiber and low nutrients; examples are grasses (growing) and hays (dried, stored and cured grasses).

**Rumen**—The first compartment of ruminant stomachs serving as the fermentation vat, housing the microorganisms that live in a symbiotic relationship with cattle.

**Ruminant**—Animals that have digestive systems with four compartments to the stomach including a symbiotic relationship with microorganisms to aid in digestion.

**Rumination**—The act of bringing swallowed food back to the mouth from the rumen; also know as “chewing the cud.”

**Saliva**—Liquid secreted by the mouth that aids in digestion.

**Symbiosis**—The living together of two dissimilar organisms for the mutual benefit of each.



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Worksheet

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## Classroom Presentation

### *Introduction*

Throughout the history of man, cattle have played an important role in supplying meat and milk as well as numerous other uses to benefit humans. Pictures in Egyptian tombs depict cattle being milked, consumed for meat and pulling wagons. The word cattle seems to have the same origin as *chattle* which means possession. Throughout history, men's wealth was often computed in terms of his cattle possessions, from the days of the Roman Empire to the "Cattle Baron" days of the 1880's in the United States to current primitive tribes in Africa and Asia. Cattle have always held a place of high esteem and symbolized wealth as evidenced by the fact that the earliest known coins depict the head of an ox.

The cattle industry in the United States has played an integral role in our country's growth and economic well-being. Cattle represent the largest segment of American agriculture and the beef business is conducted in an open and free market system. The sale of cattle and calves totals over \$158 billion, representing almost one-fourth of all cash receipts from farm markets in the U.S. Over one million people in the U.S. raise cattle and there are over 34 million head of cattle in the U.S.

The cattle industry converts resources with few or no alternative uses into essential nutrients for human consumption. About 85% of the feed consumed by beef cattle is from grasses or by-products of other foods and not edible by man. Without cattle and other ruminant animals, one billion acres of range and pasture land, land that generally is too rough, too high, too dry or too wet to grow crops, would have no use.

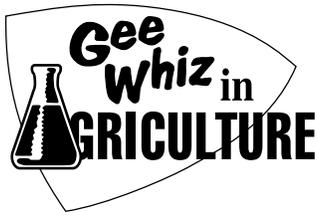
What gives cattle this ability to eat grass when we cannot? The video/ satellite program coming up will focus upon some of the unique aspects of cattle that mother nature through the process of evolution has designed.

### *View the Program*

### *Class Discussion*

After the program discuss the following questions.

1. What are some of the differences between cattle and kids digestive systems? Is it the same for deer? sheep? Other ruminant animals ?
2. Why do we consider cattle eating lower on the food chain than humans?
3. What is the symbiotic relationship in cattle digestion? Do you know of any other symbiotic relationships in nature?
4. What was the most unusual thing about cattle that you did not know before this class ?



## Why Can a Cow Eat Grass?

### Worksheet 4

#### Written Assignment

##### Objective

1. To teach students to communicate in a written form for a particular audience other than teachers.
2. To focus upon enhancement of written materials with illustrations to make understanding for readers easier.

##### Situation

The students in your class have been asked to write a chapter of a book for 5th grade science students across the United States about the differences between human and cattle digestive tracts.

##### Part One

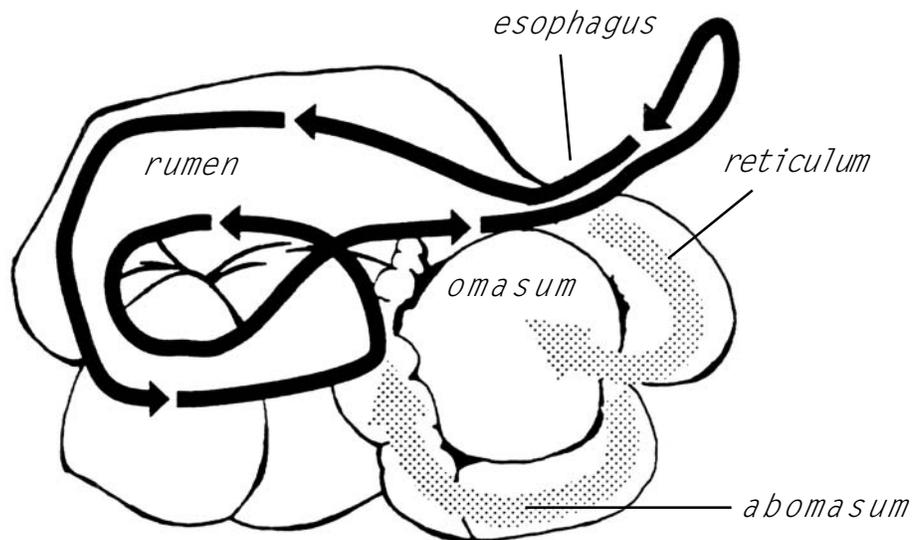
Ask the students to write a detailed description of the parts of a cow's stomach and how food moves through the digestive system.

##### Part Two

Choose one of the better descriptions and distribute to all students along with the diagram of a cow's stomach provided. Ask students to rewrite the description, utilizing the diagram as illustration to support their written material. Encourage them to be creative, adding color, etc. to enhance the ease of understanding by other readers.

#### A Cow's Stomach

The following diagram shows the compartments of cattle stomachs and the direction of food flow.



##### Part Three

Have a young scientific writers contest (with students from another class serving as judges) to choose the chapters to be "submitted to press." Award each with a carton of chocolate milk!

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### Worksheet 5

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### *Classification Assignment*

#### **Objective**

1. To have students collect and organize information by classification.
2. To make students aware of what they eat.
3. To make students use critical thinking skills and logical thinking to solve problems or questions.

#### **Situation**

Cattle and humans have very different diets. Cattle eat grasses, hays, feed grain by-products, some grain and assorted other things. What do people eat? How do the two compare in terms of protein, carbohydrates, fats and plain old junk?!

#### **Assessment**

Ask students to keep a 2 day log of EVERYTHING they eat. Classify each item as protein, carbohydrate (sugars and starches), fats and junk (little nutritional value). Also classify items under headings of “Can’t Feed it to a Cow” (meat products mostly here, remember no canine teeth! And anything that would require cutting, no incisor teeth) or “Kids and Cow Food” (all vegetables, fruits, grains etc. will work as well as potato chips, cookies etc.). Ask for reasonable explanations as to why cattle could or could not utilize the various items.

### *Evolution Assignment*

#### **Objective**

1. To allow students to develop an illustration of evolution and evolutionary changes in mammals related to cattle.
2. To have students research information, use logical thinking and present results.

#### **Situation**

The Bronx Zoo in New York City is setting up a new exhibit on ruminant animals for elementary school students. They are trying to decide what animals to exhibit and need your help. The main focus will be upon cattle, since they are so important to the economy of the U.S., being one fourth of all cash receipts from farm marketing and a \$36 billion industry. The display will highlight cattle and depict other grass eating animals that are relatives. Your class has been asked to do a preliminary design for the display in the form of visual and written material.

#### **Assignment**

This will be a team assignment in groups. Ask each to choose a species other than cattle, that also eats grass and research similarities and differences between cattle and that species. They may help each other and utilize any resources they wish. This should involve some library work. Encourage use of more exotic animals such as antelope, mountain goats, elephants, etc. Does this species live in groups or herds? Do they have horns in the wild? Do they have cloven or solid hooves. Do they have four stomach compartments? If not, what allows them to eat grass? As a group, the assignment is to design a large bulletin board or poster with picture and characteristic list that depict how close these other species are related to cattle.



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### Worksheet 6

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### *Math Assignment*

#### **Objectives**

1. To help students understand number and measurement concepts.
2. To encourage understanding of the metric system.

#### **Assignment**

See *Student Assignment Sheet*

#### **Answers**

1. Molly's father is 10.5% of a ton, the bull is 115% of a ton.
2. One gallon = 3.8 liters, 40 gallons = 152 liters

### *Just for Fun*

#### **Objective**

1. To discuss a little world geography and history.
2. To discuss word origins.

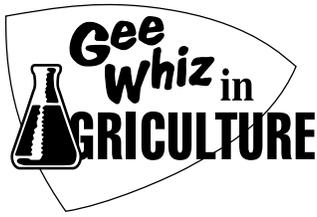
#### **Assignment**

Give students the following multiple choice question.

*In what country was "hamburger" first made?*

- a) United States
- b) Germany
- c) China
- d) Russia
- e) Asia

*Germany should be the logical guess because of the city of Hamburg, but the real answer is Russia. People in the region of Tartar in Russia preferred their meat finely chopped, raw with salt and pepper added (Tartar Steak). When travelers from this region in Russia stopped in Germany at the port of Hamburg, the Germans decided they liked beef fixed this way also. Soon the Germans changed the name to "Hamburg Steak," then many years later, the chopped meat cooked Hamburg style became known as "Hamburger."*



Why Can a Cow Eat Grass?

Worksheet 7

# Student Activity Sheet 1

*Just for Fun*

*Word search*

COW  
CALF  
BULL  
CUD  
PROTEIN  
ABOMASUM  
OMASUM  
RETICULUM  
RUMEN

C	A	O	M	U	M	S	L	I	X
A	M	M	U	S	A	M	O	C	E
N	B	U	L	L	E	C	S	F	S
I	U	S	L	N	I	E	L	M	N
E	C	A	E	U	B	A	T	A	O
T	O	M	T	D	C	O	W	D	U
O	U	O	C	H	U	I	I	W	B
R	O	B	T	Z	D	A	T	R	O
P	R	A	B	D	E	I	T	E	R
R	U	M	E	N	E	L	L	O	R

*Cow QUIPS (not CHIPS!)*

What two members of the cattle family are with you all the time?

*Your calves!*

Where do cows go to dance?

*The meat ball!*

What do you call a sleeping bull?

*A bulldozer!*

What do you call a cow without a calf?

*De-calf-inated!*

What's another name for a cattle rancher?

*Hamburger Helper!*

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## Student Activity Sheet 2

*Math and Problems Solving. Show all work.*

1. Molly's dad weighs 210 lbs and the bull weighs 2300 lbs. A ton is 2000 pounds. What percentage of a ton is Molly's father? What percentage of a ton is the bull?
2. A cow's rumen can hold up to forty gallons of fluid and food. One gallon is the same as four quarts. One quart is the same as .95 liters. How many liters can a cow's rumen hold?
3. A bull calf weighs 70 pounds at birth, 1000 pounds at one year of age and 2300 pounds at six years of age and older. They can live to be twenty years old or more. A boy weighs 8 pounds at birth, 20 pounds at one year of age, 45 pounds at six years of age and 155 pounds at age twenty (and they are still growing!). Draw a graph illustrating the relationship between age and weight for the human and the bull on the same graph using using a key to illustrate which line belongs to the human and which to the bull. These are called "Growth Curves."

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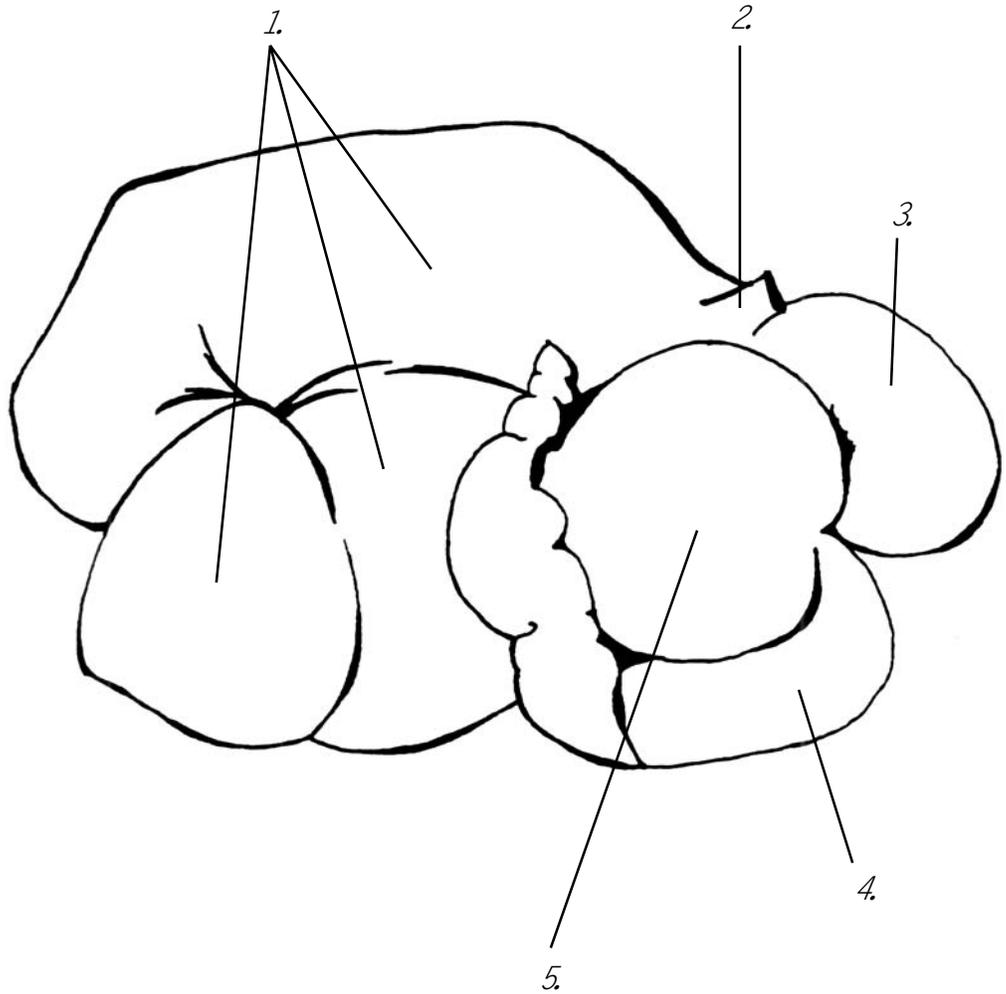


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# Student Activity Sheet 3

Diagram of a cow's stomach

Worksheet  
**9**



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1. \_\_\_\_\_
2. \_\_\_\_\_
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4. \_\_\_\_\_
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4-H 715

August 2000

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