

Buffalo Trace Education Box Lesson 5

Chomp! Plop! How A Bison Gets Food In and Out

Purpose: Students will discover what a bison eats, how the bison eats and how food is digested.

Subject Areas: Life Science, Language Arts, Engineering (Construction of a Model)

Materials Needed: Select the type of lesson and amount of time available. An information page (“Chomp! Plop!”) is provided for students along with this lesson.

- **Model of a Bison’s Digestive System (Two days):** foam boards for mounting the model, pipe cleaners, art supplies, straws, plastic tubing, milk jugs, balloons, plastic bottles, string, food containers
- **Bison’s Digestive Process (50-60 Minutes):** two plastic sealing baggies (quart size) for each student or two baggies for a group, a half-gallon of orange juice or a liter of soda, small cups for the liquid, a piece of bread for each student or a group, a cracker for each student or group
- **Comparison of Bison Digestive System vs Human Digestive System (45 minutes):** about 78 yards of yarn (any color), 8 popsicle sticks, yard stick, marker
- **Sequence of Bison’s Digestive System (20 minutes):** index cards, marker

Steps for “Model of a Digestive System” (two-day lesson):

1. Have students read the information page “Chomp! Plop!” Make labels for each part of the digestive system: mouth, esophagus, stomach with four parts, small intestine and large intestine.
2. You will need the household materials listed above for groups to build a model of a bison’s digestive system.
3. Allow time for students to share models with other groups.

Steps for “Bison’s Digestive Process” (50-60 minutes):

1. Have students read the information page “Chomp! Plop!”
2. You will need the items listed above for students or at least four groups. (The four groups will represent the four compartments in a bison’s stomach.)
3. Place the piece of bread into the baggie for each student or group. (You may want to place each baggie into another baggie for double sealing safety!) Fill the cups with about 3 ounces of the liquid, one cup for each student or group. The baggie will represent the bison’s stomach. Save one baggie with bread for Step #8.
4. Pour about 3 ounces of the liquid into the baggie and seal tightly. Observe what is happening to the bread.

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5. Model the four compartments of the stomach by squeezing the bags. Imitate the first compartment by squeezing the baggie gently.
6. The second compartment squeeze a bit more. Then the third and fourth compartments.
7. Observe what is happening to the bread in each baggie (stomach compartment).
8. Show students what happens if only water is added to the baggie with bread. (The digestion is slower; water does not contain the acid like orange juice or soda does.)
9. Discuss how the human digestion process starts in our mouth with our teeth and saliva. Have each student chew the cracker ten times.

Steps for “Comparison of Digestive Systems: Bison vs Human” (45 minutes):

1. Have students read the information page “Chomp! Plop!”
2. Label the three Popsicle sticks with the parts of a bison’s digestive system: mouth/esophagus/stomach, small intestine, large intestine. Label the five popsicle sticks with the parts of a human’s digestive system: mouth, esophagus, stomach, small intestine, large intestine.
3. Measure the yarn for each bison part as shown below:
 - mouth, esophagus, stomach -- 3 feet 3 inches
 - small intestine -- about 158 feet
 - large intestine -- about 33 feet
4. Measure the yarn for each human part as shown below:
 - mouth -- 3 inches
 - esophagus -- 10 inches
 - stomach -- 6 inches
 - small intestine -- 13-20 feet
 - large intestine -- 4 feet
5. To make the bison’s digestive system, tie each yarn piece to the corresponding popsicle stick. Connect each end of the yarn to the next system part in sequence. You should have one continuous sequence for the bison. Do the same to make one continuous sequence for the human.
6. Compare the length. Discuss how the intestine is contained inside the small space of a bison and a human.

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Steps for “Sequence of Bison’s Digestive System” (20 minutes):

1. Prepare an index card for each part of a bison’s digestive system: mouth, teeth, tongue, esophagus, rumen, reticulum, omasum, abomasum, small intestine, large intestine, buffalo chip.
2. Have 11 volunteers hold the cards.
3. As you read aloud the information page “Chomp! Plop!” have students line up, holding the index card, to form the sequence of a bison’s digestive process.

Resources:

- “Animal Digestion -- A Stomach at Work,” Michigan State 4-H Activities (4h.msue.msu.edu) Resource page has illustrations of cow and pig digestive systems.
- “Got Guts?” New Hampshire Agriculture in the classroom (nhagintheclasse.org) Further details about building a model of a digestive system.
- “Comparing Asian Buffalo and Zebra Digestive Systems” charts and lesson plan (calacademy.org/educators/lesson-lans/ruminating-on-the-digestive-system)
- “Chew It Twice,” lesson plan from Oklahoma and reading page for the cow’s digestive system (agclassroom.org/ok)
- “Ruminant’s Digestive System,” how our beef spends the day (thebeefsite.com/articles/2095/understanding-the-ruminant-animals-digestive-system)
- “The Incredible Human Body,” many experiments and “Eater’s Digest” mini-book (Scholastic 1996 by Esther Weiner)
- “Human Body (Easy Make and Learn Projects)” digestion poster and organizers (Scholastic 1999 by Donald Silver and Patricia Wynne)
- For a fun edible buffalo chip, try Ree Drummond’s recipe for cow patties, made with chocolate and fruit (www.foodnetwork.com/recipes/ree-drummond/cow-patties.html).
- Here is a line from Jim Stafford’s song “Cow Patti”: “You’ve got to watch your step when the chips are down.”

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Chomp! Plop! Information Page

Chomp! That's the sound of a bison biting down on a clump of grass.

A bison spends about one-third of a day grazing, which is walking around, eating and drinking. A bison needs 24 pounds of food daily. That means a bison may eat 4-9 times a day. That's a lot of chomps a day! A bison eats mostly grass, but will also eat hay, flowers, and acorns from a burr oak and woody plants. A bison needs 10-12 gallons of water a day. A bison may drink water only one time a day.

Along with the food and water, a bison needs salt, also called sodium. A bison may lick the sodium from the soil or a salt block. The salt is especially important in the spring time when a bison is growing. The salt helps a bison's bones and muscles.

How does a bison eat? A bison has 32 teeth. A bison has no cutting teeth on the front of the upper jaw. So a bison wraps its tongue around a clump of grass. Then the grass is pinched off between the tongue and lower teeth. Chomp!

A bison chews its food twice. The first time a bison chews its food only a little while. A bison can produce 50 quarts of saliva a day inside its mouth. The saliva helps the bison swallow the food practically whole!

The food travels from the mouth down a tube with strong muscles called the esophagus. The second time is when you may notice a bison "chewing its cud." The food, or cud, travels up through the esophagus and into the mouth to be chewed again.

A bison is a ruminant animal. Some other ruminant animals are cows, sheep, antelopes, giraffe, goats and deer. Those animals also spend time "chewing cud." A bison (and other ruminant animals) has a stomach with four parts. Each part of the stomach has muscles that do a different job.

After traveling down the esophagus, the grass moves to the first part of a bison's stomach, called the rumen. This part can hold 40-50 gallons of food. The rumen muscles squeeze the gallons of food. The rumen contains bacteria that starts digesting the food.

The second part of the stomach is called the reticulum. The bacteria start breaking down the food into smaller pieces. The larger pieces of food have to be chewed again. So the stomach's muscles push the food up, back to a bison's mouth! A bison can spend one-third of a day "chewing the cud" a second time.

After swallowing the food again, the food travels to the omasum, the third part of the stomach. This is where water and nutrients are absorbed into the body. The omasum squeezes the food with strong muscles. The fourth part is the abomasum is called "the true stomach." Powerful bacteria help digest the cellulose, a sugar found in grass and plants.

This is the final part of the digestion process.

From the stomach, the food travels through the intestine. A bison has a small intestine and a large intestine. The small intestine is about 158 feet long and can hold 20 gallons of digested food. The large intestine is about 33 feet long. The intestine stores food until there is enough to be pushed out the back of the bison.

Plop! That's the sound of the waste material landing on the ground. There are other names for the waste: manure, buffalo chips, cow patty, dung, scat, dried poop. Whatever a bison's waste was called, the pioneers thought it was great for making a fire out on the prairie. Since there was no firewood, the pioneers had plenty of buffalo chips because a bison may produce a patty every hour. Plop!