HELPFUL STOMACH BUGS?

Not all bacteria are created equal. Learn how different stomach bugs can help a cow digest its dinner.
Helpful Stomach Bugs?

Not all bacteria are created equal. Learn how different stomach bugs can help a cow digest its dinner.

About the Activity

When we think about bacteria, it’s common to think of different illnesses and how these microorganisms can make us sick. But did you know not all bacteria are bad? In this activity, you will learn about different types of bacteria (and other types of microorganisms) in a cow’s stomach that help transform its food into fuel.

Supplies

These simple supplies are all you’ll need for this activity.

- 1 can of modeling clay (e.g. Play-doh®)
- Large sponge
- Scissors
- Glue stick
- 5-6 Pipe cleaners
- Table tennis (ping pong) ball
- Cotton twine (10 foot)

Grades: 3-8

Topic: Animal Science, STEM, Biology
Time: 30 minutes
Activity Steps

The rumen is the first of four sections in a cow’s stomach, and it has a very important job – to transform its food into energy. It does this with the help of many microorganisms, including bacteria, protozoa, and fungi. Each microorganism carries out different functions and digests different types of nutrients. In this activity, we learn about each type of microorganism and how they help to aid in digestion.

1. Build your bacteria

While we typically think about germs when we hear the word “bacteria,” there are also good forms of it that can help animals stay healthy! For cattle, bacteria are important to help digest fiber, starch, and sugars. Bacteria also help to transform food into nutrients.

A couple different examples of common rumen bacteria are Ruminococcus flavefaciens and Streptococcus bovis. We are going to use Play-doh® to build our bacteria.

Break the Play-doh® into 12 separate pieces.

Using your hand and the table, roll out 8-10 small balls. Use the remaining pieces to roll out a couple of long tubes.

Once you are done rolling your shapes, clump 3-4 of the small balls together. You have now made a model of rumen bacteria.

Each small ball of Play-doh® represents a single bacteria. These bacteria can make different formations by forming chains and clumps.

DID YOU KNOW? Bacteria are typically considered bad regarding food safety. But certain bacteria that are found in the stomach can actually play a positive role in processing food (not only in animals, but in people too).

2. Cut your pipe cleaner protozoa

Protozoa are the largest microorganisms that can be found in a cow’s rumen, but there aren’t as many of these as bacteria. However, they are super large – 40 times larger than the bacteria we talked about! While their role in the rumen is not completely clear, they do aid in digestion, and will actually feed on different types of bacteria, too – yikes!

To create a model of this powerful protozoa, grab your pipe cleaners, scissors, and sponge.

Cut 5-6 pipe cleaners into varying shorter lengths; anywhere from 2-6 inches is good.

Stick the pipe cleaner pieces into one end of the sponge. Curve the tops of the pipe cleaners slightly at the end.

You have now made a model of a rumen protozoa. The sponge represents the body of the protozoa, which also contains the “mouth.” The mouth allows it to consume and digest nutrients and bacteria inside the rumen. The pipe cleaners represent cilia around the mouth.

DID YOU KNOW? Without rumen microorganisms, cattle would not be able to digest grasses, leaves, and sticks from their own grazing. Instead, they would have to eat oats and other grain-based feeds, similar to pigs and horses.

3. Have fun with fungi

Fungi – yes, cows produce actual fungi in their stomach to help digest their food – make up about 8 percent of the total mass of the rumen. They only work in an oxygen-free environment. Fungi produce enzymes that are important in the digestion of fiber that the animal eats. This digestion leads to an increase in the energy available to other rumen microorganisms.

Grab your twine, ball, scissors, and glue to get started.

Cut 8-10 pieces of twine, each 10- to 12-inches long.

Cut another piece of twine, this time only 2-inches long. Use this piece to tie the longer strands together on one end.

Glue the tied end of the twine strands to the ball and allow a few minutes to dry.

You now have a model of rumen fungi. The ball represents the main body of the fungi while the twine strands represent the flagella that helps the fungi move around in the rumen. A couple examples of common rumen fungi are Aspergillus and Anaeromyces.

DID YOU KNOW? Rumen fermentation results in volatile fatty acids, which are the main source of energy for the cow. This rumen fermentation gives cattle the ability to turn lower-quality feeds into high quality meat and milk.
See how much you’ve learned about the inner workings of a cow’s stomach.

QUESTION 1
What types of microorganisms can you find in a cow’s rumen?
- Bacteria
- Protozoa
- Fungi
- All of the above

QUESTION 2
True or False: Not all bacteria is bad.
- True
- False

QUESTION 3
Why are rumen microorganisms important?
- They help transform cattle’s food into energy
- They protect the grass after the cow eats it
- They eat the bacteria
- None of the above

QUESTION 4
True or False: microorganisms help to break down food into energy.
- True
- False

QUESTION 5
True or False: Fungi need oxygen to work.
- True
- False

Reflection Questions

Bonus questions to inspire wonder:

- What was your reaction to learning about the different types of microorganisms -- also referred to as “bugs” -- in the cow’s stomach? How will learning about stomach bugs in cattle help you to do a better job feeding your beef cattle in the future?
- What is the role of the microorganisms in the digestive process?
- If beef cattle did not have rumen microorganisms, how would you feed them differently?
- Are there other things you can think of in your life that are beneficial to some areas and bad in other areas?
Take your new knowledge to the next level.

When we talk about the science of farming and raising animals, we tend to use a lot of big words. This can be confusing! And that’s okay! Now, practice some of these new words you’ve learned about cow digestion! You might want to grab a grownup for support, and use a dictionary or the internet to look up the below words.

Once you find each word, think or talk about how each one relates to farming and the process of digestion in the rumen.

- Fermentation
- Cellulose
- Hemi-cellulose
- Enzymes
- Forages

Brought to you by:

This work is supported by the USDA National Institute of Food and Agriculture, AFRI - Education and Workforce Development project 2021-67037-33376.