

What Do Cows Eat?

Deconstructing Dairy Cow Diets



Overview:

The *What Do Cows Eat? Deconstructing Dairy Cow Diets* lesson is designed to add a visual and hands-on component to an important focus of understanding feed management, health and behavior of dairy cows. As a group, participants will discuss and identify important feedstuffs of a dairy cow's diet and see how these ingredients are mirrored in the human diet.



Objectives:

After completing this activity, participants will be able to:

- ▶ List the major components necessary for a balanced cow diet.
- ▶ Explain why each of the feedstuffs are important for a cow to be healthy and productive.
- ▶ Discuss the benefits for feeding dairy cows as practiced on many operations.

Skill Level:

Beginner to intermediate

Life Skills:

Communication, critical thinking, and decision-making

Setting:

An outdoor or indoor space with a supply station and an easy-to-clean floor; seating is optional

Time:

20–25 minutes

Materials:

- One 11-ounce bag of individually wrapped hard-shelled, bite-sized candies (such as Skittles or M&Ms)
- One 40-ounce bag of gummy bears
- Loaf of sliced bread with slices cut in quarters (2 slices per group)
- Plastic knife
- One 16-ounce container of peanuts (or other nuts or dried beans depending on allergies)
- One 9-ounce or larger package of romaine lettuce, chopped or shredded
- 0.25 pounds of fresh green beans (or drained and rinsed canned beans, or frozen beans, if out of season)
- Medium-sized bowl (20 ounces or larger) for each group (big enough participants can put their hands in and mix ingredients without spilling all ingredients out of the bowl)
- Snack-sized re-sealable plastic bags (one for each ingredient above, with each group getting all six ingredients)
- Trash bag (one or more depending on the size of your group)
- Thin-tip permanent marker (optional)
- Flipchart or other large paper (optional)
- Easel or display space (optional)

PROCEDURE:

Before the meeting:

1. Review the lesson and gather any supplies you will need.
2. Set up your supplies for each group. For the activity, groups should be made up of four to six participants, with no more than six participants per group. Based on the number of groups, set out the following supplies:
 - 1 bag of individually wrapped hard-shelled bite-sized candies
 - 10 gummy bears in a snack bag
 - 2 slices of bread, quartered, in a snack bag
 - 20 peanuts, other nuts or dried beans in a snack bag
 - Two romaine lettuce leaves cut up or a handful of pre-cut romaine lettuce in a snack bag
 - Handful of green beans in a snack bag

Each group will need all the supplies listed above plus a medium-sized bowl.

3. Optional: Use the marker, flip chart and display space to take notes throughout the activity for participants to visually see what is being discussed and to complete a table if desired.

During the meeting:

1. Introduce the activity by reading aloud or paraphrasing the following:

Just as humans do, cows require a balanced diet to meet their needs during various stages of production. Because of this, farmers feed their cows a Total Mixed Ration, or a TMR. Today, we are going to look at the parts of a cow's diet using human foods to demonstrate the major parts of the diet. As we go through the lesson, keep in mind the importance of both humans and cows consuming a balanced diet, and similarities you may notice between ingredients in the two diets.

2. Divide participants up into groups of four to six people. Have each group collect a bowl and one snack-sized bag of each of the six ingredients. Have groups spread out slightly from the other groups.
3. Ask participants the following questions to reinforce understanding.
 - a. What major nutrients do people need to stay healthy? (*Protein, fat, carbohydrate, vitamins, minerals and water*)
 - b. What major nutrients do cattle need to stay healthy? (*Protein, fat, carbohydrates, vitamins, minerals and water*)
 - c. Do humans and cattle need the same nutrients? (*Yes*)
 - d. Do humans and cattle eat the same foods to obtain these nutrients? (*Sometimes, but not always. For example, both humans and cattle can eat corn, but cows can digest the whole plant and humans cannot. Cows are ruminant animals,*

meaning they have a four-compartment stomach. One of those compartments, the rumen, has microbes such as fungi, bacteria and protozoa that can break down plant fibers a human stomach can't. This means cows can eat many different feeds that humans or nonruminant animals, such as pigs, can't digest.)

- Review the supplies with participants by holding up each individual ingredient one at a time. Ask participants to guess what each ingredient represents (fat, carbohydrates and so on) as well as the role it plays in the diet. Use the following table to help explain the ingredients. If desired, use the flip chart paper and marker to create it.

Table 1. What Do Cows Eat?

Item	What it represents	Role it plays in the diet
Bite-sized candy (such as M&M's)	Fat	Supplies long-term energy and adds flavor
Gummy bears	Vitamins and minerals	Provides supplemented nutrients to the cow to meet requirements and keep them healthy
Bread	Carbohydrates	Simple sugars that are readily digested to produce energy
Peanuts or dried beans	Protein	Provides slow release, long-term energy, which is used for muscle growth and support
Romaine lettuce	Forages such as long-cut hay	Main part of diet, allows for digestive health and rumen "bug" health
Raw green beans	Forages such as short-cut hay	Main part of diet, allows for digestive health and rumen "bug" health

- Ask each participant to select a food item he or she would like to consume. If multiple group members select the same ingredient, have team members point to the item held up by a teammate. Hold up the items so everyone can see your selection.

- Read aloud or paraphrase the following:

Look around at what your teammates have selected. Some of you chose the healthier options such as the nuts or vegetables, while some of you chose another option you really like the taste of but is the less healthy item, such as the candy. Cows would do the same thing if we let them. If we had each individual ingredient laid out so that cows could pick what they wanted to eat the most, they might not pick what is best for them. As humans do, they might instead pick what tastes the best. This could also create some competition and fighting if multiple animals want the same feed item. Cattle could also pick the wrong amounts of ingredients, thus they would not be eating a balanced diet to support themselves, produce milk if lactating or gestate if pregnant.

7. Have participants return all selected items back in the center of their group. Then, have participants take each snack bag and empty the bags into the bowl, one bag at a time. Participants should then gently mix the ingredients together so they are evenly distributed.

8. Read aloud or paraphrase the following:

To make sure their cows are getting the nutrients they need, most dairy farmers will feed a Total Mixed Ration, or TMR. This diet is balanced to meet all the nutritional needs of the dairy cow to keep them healthy and producing milk. A TMR is a feed that has uniform particle sizes so the cows cannot completely sort the ingredients. Cows have the ability to use their tongue and lips to sort out their favorite parts of their feed, much as a person would do with their hands. One way to think about a TMR is that it is similar to a smoothie or a casserole. People might not like every ingredient, but when it is blended or mixed together, people eat those ingredients anyway.

9. Ask each individual to take turns pulling out a handful from the bowl. After the participant has examined the handful, he or she should put it back and let the next group member take a turn. Repeat this until all group members have held the “feedstuff.”

10. Read aloud or paraphrase the following:

As you looked at your handful of ingredients, you may have noticed that it was made up of mostly the bread, green beans and lettuce. That was the goal. You want more of the healthy food needed for a balanced diet as opposed to the less healthy ingredients. Each handful represents a mouthful for a cow, so they will be eating a mix of the ingredients with each bite. Additionally, each bite is uniform, which makes it harder for the cows to sort out ingredients they don't want to eat. This is why farmers choose to feed TMRs.

11. Collect all bowls and supplies. Clean and dispose of the supplies properly.

12. To summarize, read aloud or paraphrase the following:

By feeding cows a TMR, farmers can better meet the nutrient requirements of their cattle. Just as humans do, cows need different amounts of certain feed ingredients throughout the stages of their lives. To keep animals healthy, animal caretakers must observe the animals daily and monitor their nutrition. Understanding and meeting basic animal needs is one of the most important roles of animal production.

TALKING IT OVER:

Ask the group the following questions:

- ▶ How are animals and humans similar in nutritional requirements?
- ▶ Why is it important for farmers to observe their animals daily?
- ▶ How do management strategies such as feeding TMRs make animal production more efficient for farmers?
- ▶ In what other ways could animal production become more efficient?

ADAPTATIONS & EXTENSIONS:

For older or more experienced participants:

- ▶ Have participants research a TMR to come up with the amounts of each food item they would need to feed a cow at a specific nutrient requirement. Have participants present their findings in group settings, discussing why their results may be different from others (example reasons for differences: different ages of cows, lactating vs. nonlactating).
- ▶ Have participants compare the differences in diets between two animal species. Ask participants to explain why the two species might have similar or different diets.
- ▶ Looking at other animals species, determine what ingredients would make up their diets and repeat this lesson with their feedstuff. Discuss with participants how not having a nutrient may affect the animal.
- ▶ Have each participant create an individual TMR ration with the human ingredients. Bring in a food scale and have participants weigh each ingredient to determine the percentage of the diet that it represents. Have participants then correct the ration to fit what they think would be appropriate for cattle at different stages of production. Discuss the differences with participants.

For younger or less experienced participants:

- ▶ Provide three options for what each food represents narrowing down the options. Then explain how the animal utilizes each item.
- ▶ Create participant cards with each nutrition category written on a card. Ask participants to work with a partner to match the word on the card to the food it is representing. Work with participants to correct misconceptions.
- ▶ Create sample cattle individual TMR rations with a teen leader working with younger youth to individually explain each nutrient.

ALIGNMENT TO SCIENCE AND ENGINEERING PRACTICES:

How does 4-H increase science literacy?

Nationally and in Michigan, 4-H has long enjoyed a reputation for engaging young people in positive, experiential (hands-on), and nonformal activities that are inquiry-based. The lessons in the *4-H Animal Science Anywhere* series can be used to enhance classroom science education. The lesson activities are aligned with the eight Scientific and Engineering Practices from [A Framework for K-12 Science Education](#) (National Research Council, 2012, p. 42).

The activities in the 4-H Animal Science Anywhere: What Do Cows Eat? Deconstructing Dairy Cow Diets lesson were evaluated for their alignment with the Science and Engineering practices by Michigan State University Extension Educator Tracy D'Augustino in 2017.

Table 2. How This Lesson Aligns With the Science and Engineering Practices (National Research Council, 2012, p. 42)

Science & Engineering Practice	Action	Activity Step
▶ Asking questions and defining problems	▶ Participants brainstorm the nutrients needed by humans and dairy cows.	3
▶ Developing and using models	▶ Participants make a model TMR and use it to discuss the amounts needed of each type of nutrient.	7-12
▶ Planning and carrying out investigations		
▶ Analyzing and interpreting data	▶ Participants compare feedstuff (TMR) nutrients to human nutrient needs.	3
	▶ Participants analyze the nutrients in a handful (mouthful) of feed.	9
▶ Using mathematics and computational thinking	▶ Participants evaluate the differing amounts of nutrients needed for a balanced diet in a dairy cow.	9-10
▶ Constructing explanations and designing solutions	▶ Participants obtain evidence from their discussions to review TMRs and animal production stages.	10, Talking It Over
▶ Engaging in argument from evidence	▶ Participants explain how management strategies such as feeding TMRs make animal production more efficient.	Talking It Over
▶ Obtaining, evaluating, and communicating information	▶ Participants obtain information about dairy cow nutrient needs, evaluate the value of TMRs and share the information with others during the lesson.	Whole lesson

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Author: Alycia Drwencke, Michigan State University Undergraduate Student, Class of 2017

Author: Melissa Elischer, 4-H Dairy Science Educator, Michigan State University Extension

Reviewer: Julie Thelen Conover, 4-H Livestock and Veterinary Science Educator, Michigan State University Extension

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