STEMsational Ag:
The Virtual Farm

MIDDLE TENNESSEE STATE UNIVERSITY

Module 6: All About the Cows

UNIT 1: A DAY IN THE LIFE

Grades 6 - 8

USDA National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE

MIDDLE TENNESSEE STATE UNIVERSITY
CENTER FOR HEALTH AND HUMAN SERVICES

MIDDLE TENNESSEE STATE UNIVERSITY
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MT Fermentation Science

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STEMsational Ag—The Virtual Farm

Welcome to Module 6
Unit 1: A Day in the Life

Introduction to the Unit:

View the video screenshots and narration from the video, "How Milk Gets from Farm to Fridge" on pages 3 - 12. One of the activities in the lesson will ask you to use information from this video, so pay close attention!

How Milk Gets from Farm to Fridge

Also available online at: www.youtube.com/watch?v=Lo5Vfz3Bp-E

Dairy farmers feed and care for their cows.

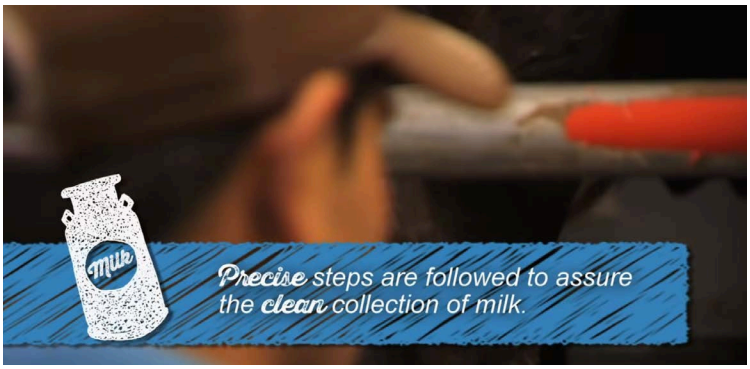
Nutritionists design a specially-formulated diet for the cows.

Farmers provide regular visits from a veterinarian to ensure their animals ...

are healthy and happy so they can live long lives.

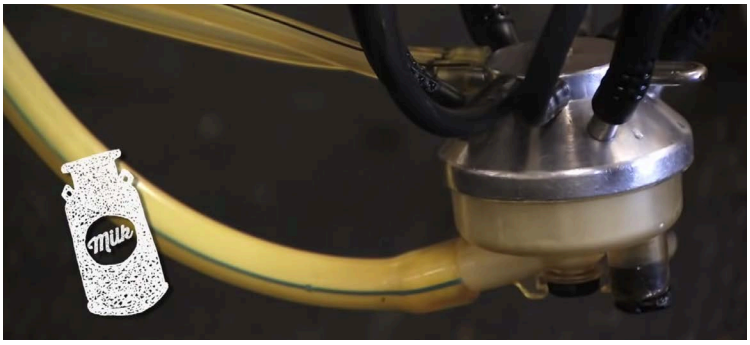
On average, farmers milk cows two to three times daily.

Great care is taken to ensure each cow is milked in clean and comfortable conditions.



This ensures that milk is safe and high-quality.

The milking process for each cow takes five to ten minutes two to three times each day.



Once the milking is done, the cows and milking equipment are cleaned. Then it's time to start again.

Milk leaves the cow at 100 degrees Fahrenheit and is quickly cooled in two hours down to 38 degrees.

This ensures optimum quality.

The cow's milk is then stored in a bulk tank on the farm where it's kept cool and fresh.

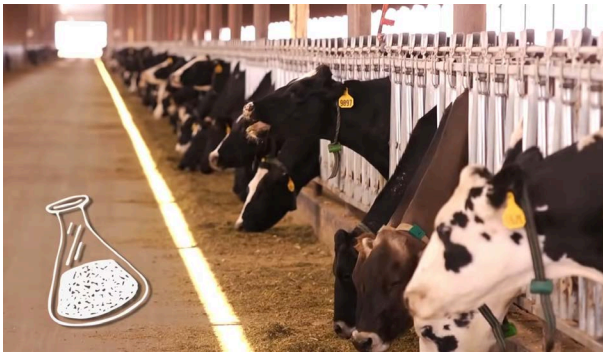
Milk is transported from the farm to the dairy processor by an insulated stainless steel truck.

The truck keeps the milk cool and clean.

The bulk tanks are sealed to prevent contamination from an outside source on this journey.

Milk is continuously tested to ensure it is high-quality.

Quality commitment starts on the dairy with good animal care and extends to the milk tank trucks, the processor and the grocery store.



Rest assured, the dairy foods you enjoy are wholesome - and pure - just as nature intended.

At processing, milk goes through several steps, from pasteurization to homogenization before being packaged.

The first step in processing is milk is tested again for antibiotics.

When the milk passes inspection, it travels into large insulated containers to pasteurization.

Pasteurization begins once milk has successfully completed all quality and safety tests.

This food safety process heats the milk to destroy harmful microorganisms that may exist.

The heating is followed by a rapid cooling.

Pasteurization is recommended by the FDA and Center for Disease Control and has been affirmed by the American Medical Association and the American Academy of Pediatrics.

Following pasteurization milk is then homogenized and packaged before being distributed to retail stores, schools and homes.

From the milk processor, milk and other dairy products are moved to grocery stores, ...

where people can buy them for their homes.

From the farm to the fridge, rest assured, your dairy foods are safe, delicious and nutritious.

Pre-assessment:

Answer the following questions:

1. Why does milk have sugar?
2. How is cow's milk different from milk alternatives?
3. How many servings of dairy do adults and kids need each day?

Purpose:

- Students will evaluate serving size related to nutritional needs and identify agricultural products (foods) that provide valuable nutrients for a balanced diet.
- I CAN identify a nutritious meal utilizing "MyPlate."
- I CAN describe how milk goes from the farm to the fridge.
- I CAN compare cow's milk to milk alternatives.

National Agricultural Literacy Outcomes

Theme 3: Food, Health, and Lifestyle Outcomes

T3.6-8

C. Evaluate serving size related to nutritional needs.

G. Identify agricultural products (foods) that provide valuable nutrients for a balanced diet.

Vocabulary Words:

- **Cow:** female cattle
- **Bull:** male cattle
- **Calves:** baby cattle
- **Milk:** a product we get from dairy cows
- **Herd:** a group of cattle
- **Cowman:** a caretaker of cattle
- **Dairy:** milk and foods made from milk
- **Pasteurization:** the process of heating a liquid to a high temperature to kill germs and bacteria
- **Udder:** the part of the cow that hangs below the belly and produces milk
- **MyPlate:** the current nutrition guide published by the USADA's center for nutrition policy and promotion, a graphic depicting a place setting with a plate and glass divided into five food groups

Materials Needed:

- Measuring spoons
- Measuring cup
- Sugar
- Half-and-half (Alternatively, milk or heavy whipping cream may be used.)
- Vanilla extract
- Salt (Different types of salts, such as table salt or rock salt, will all work, but may give slightly different results.)
- 8 cups of ice cubes
- 2 Small, sealable bags, such as pint-sized or sandwich-sized Ziplocs
- 2 Gallon-size sealable bags
- Oven mitts or a small towel
- Timer or clock

Activity 1: Sequence of Events

Utilizing the information learned from the video in the unit introduction (i.e., ***"How Milk Gets from Farm to Fridge"***), create a sequence of events using pictures and one sentence descriptions of how milk goes from the farm to the fridge. Steps should include:

- Milking
- Cleaning
- Cooling
- Transportation
- Quality Control
- Processing
- Pasteurization
- Homogenization
- Packaging
- Distribution

Activity 2: MyPlate

In this activity, students will help the dairy farmer and her family enjoy a balanced meal based on MyPlate guidelines. Dairy foods are an important part of a balanced diet. Examples of dairy foods include yogurt, cheese, ice cream, and butter. It is important to eat healthy. The USDA provides MyPlate guidelines to help people eat balanced meals that include nutrients needed to maintain good health.

After a hard day's work on the farm, it's time for the farmer and her family to enjoy a nutritious meal together. But is the family making balanced food choices? In this activity, you will help the family make healthy food choices.

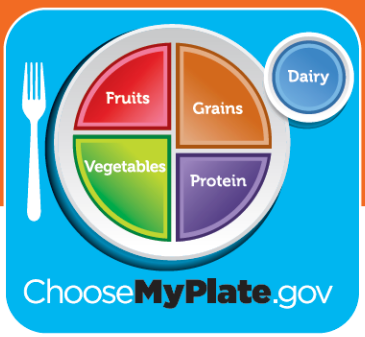
Activity Directions:

1. Complete the activity, "Nutrition Sums It Up," on page 16.
2. Review the MyPlate Guidelines.
3. Check your answers using the Activity 2 Answer Key at the end of the lesson on page 24.

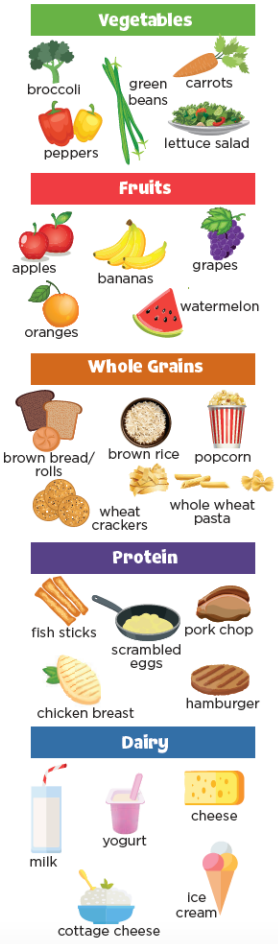
HEALTHY FAMILIES
ACTIVITY 3

Nutrition Sums It Up!

REPRODUCIBLE MASTER



It's been a busy day on the dairy farm, and now farmers are looking forward to enjoying a tasty meal with their family. Can you help the family make balanced food choices? Follow the USDA's MyPlate guidelines for nutritious eating to create balanced meals.



Part 1: The MyPlate graphic shows that a balanced meal should include five food categories — fruits, vegetables, whole grains, lean protein, and a serving of dairy, such as a glass of milk or cup of creamy yogurt.

First read the descriptions of what each family member recommends for dinner below. Check the food categories they have chosen. Then select foods from the column on the left to complete the meal so that it is balanced.

1. **Mom's meal suggestion:** pork chop, broccoli, and an apple. Is this a balanced meal? Check off the MyPlate food groups included in her meal:

☐ vegetables ☐ fruits ☐ whole grains ☐ protein ☐ dairy

What foods can she add to the meal to make it balanced?

_____

2. **Dad's meal suggestion:** pork chop, a whole grain roll, and two slices of cheddar cheese. Is this a balanced meal? Check off the MyPlate food groups included in his meal:

☐ vegetables ☐ fruits ☐ whole grains ☐ protein ☐ dairy

What foods can he add to the meal to make it balanced?

_____

3. **Kids' meal suggestion:** grapes, popcorn, and a large glass of milk. Is this a balanced meal? Check off the MyPlate food groups included in this meal:

☐ vegetables ☐ fruits ☐ whole grains ☐ protein ☐ dairy

What foods can they add to the meal to make it balanced?

_____

Add it up!

It's important to include foods from all five food groups for a balanced meal. If you eat three balanced meals every day, how many servings from each food group will you eat in a week?

_____ servings of each food group per week

Activity 3: Ice Cream in a Bag

We have learned throughout this lesson the importance of dairy in a nutritional diet. Dairy products are utilized to make a sweet, yummy treat - ICE CREAM!

Begin by gathering all the materials and ingredients you will need for this exercise:

- Measuring spoons
- Measuring cup
- Sugar
- Half-and-half (Alternatively, milk or heavy whipping cream may be used.)
- Vanilla extract
- Salt (Different types of salts, such as table salt or rock salt, will all work, but may give slightly different results.)
- 8 cups of ice cubes
- 2 Small, sealable bags, such as pint-sized or sandwich-sized Ziplocs
- 2 Gallon-size sealable bags
- Oven mitts or a small towel
- Timer or clock

Directions:

- In each small sealable bag, place one tablespoon of sugar, ½ cup of half-and-half (or milk or heavy whipping cream), and ¼ teaspoon of vanilla extract.
- Seal both bags well.
- Add four cups of ice cubes to one of the large, gallon-sized bags.
- Then add ½ cup of salt to the bag.
- Before you continue with the directions, write down your answer to this question:
- What you think the salt will do?
- Directions (continued):
- Put one of the small bags you prepared into the large bag with the ice cubes.
- Be sure both bags are sealed shut.
- Put on oven mitts or wrap the bag in a small towel and then shake the bag for five minutes.
- Feel the smaller bag every couple of minutes while you shake it and take a peek at it.

Time for an observation:

- What happens to the ingredients over time?
- When five minutes are up, how do the ingredients look?
- What about the ice cubes — how do they change over time, and how do they look by the end?

Directions (continued):

- Now add four cups of ice cubes to the other large, gallon-sized bag, but this time do not add any salt to it.

Take a break and write down your answer to this question:

- What do you think will happen without using salt?

Directions (continued):

- Put the other small bag you prepared into this large bag.
- Be sure both bags are sealed.
- Put on oven mitts or wrap the bag in a small towel and then shake the bag for five minutes, as you did before.
- Again, feel the smaller bag every couple of minutes while you shake it, and peek at it.

Time for an observation:

- Compare how cold the different ice cube bags feel. Does one feel much colder than the other?

Activity Complete!

- If you successfully made some ice cream, you could enjoy it now as a tasty reward for your chemistry challenge!
- Go on to the next task to read about the reactions during this activity.

Activity 4: Ice Cream in a Bag: What Happened?

You should have seen that the ice cubes in the large bag with salt melted much more, and felt much colder, than the ice cubes in the large bag without salt. Because it was cold enough (several degrees below freezing), the ice cube bag with salt should have been able to cool the ingredients enough to harden them and turn them into ice cream. In contrast the ice cube bag without salt was not cold enough to do this and the ingredients should have remained fluid.

Do not worry, the second bag is not wasted — you can go back and turn the still liquid ingredients into ice cream! Simply put the small bag in the large bag that had ice cubes and salt and shake them for another five minutes.

If you have ever made ice cream with an old-fashioned hand-crank machine, you probably packed a mixture of ice and rock salt around the container holding the cream. The salt allows the ice and salt mixture to get colder than pure water ice. This extra-cold mixture of salt and ice can freeze the ingredients in the ice cream machine (and in the bags you used in this activity) and turn them into ice cream.

Activity 5

Read *"Top Questions About Milk and Dairy Foods"* from drink-milk.com to prepare for the post-assessment.

Reference:

https://www.drink-milk.com/top-five-questions-about-milk-and-dairy-foods/

Top Questions About Milk & Dairy Foods

You asked, and we listened!
Here are answers to the most commonly asked questions about dairy foods.
Karen Bakies RDN LD FAND

Which type of milk is the healthiest to drink — fat free, low fat, reduced fat or whole milk?

The primary difference between these milks is the amount of fat they contain, which is reflected in the calorie amounts you see on the label. What doesn't change — from whole to fat free, organic or lactose-free — is the package of nine essential nutrients they all provide.

While the Dietary Guidelines for Americans (DGA) continues to recommend low fat and fat free dairy foods, they also allow for up to 10% of calories coming from saturated fat. So, whole milk dairy foods can be a part of a healthy eating pattern, you will want to be mindful of other food choices to balance saturated fat and calorie intake.

Why does milk have sugar?

No sugar is added to regular white milk, regardless of fat content. The 13g of total sugars in an 8 oz. serving of milk you see listed on the Nutrition Facts Panel comes from a naturally occurring carbohydrate called lactose. Milk has just three simple ingredients: milk, vitamin A and vitamin D, making it one of the most naturally nutrient-dense beverages you can drink.

How is cow's milk different from milk alternatives?

Although cow's milk and plant-based alternatives sit side-by-side in the dairy case, non-dairy alternatives often do not provide the same nutrient profile as cow's milk. For example, an 8 oz. glass of cow's milk provides eight times more naturally occurring protein (8g) than a glass of almond beverage (1g).

The DGA does not include alternative beverages (other than soy beverages fortified with calcium, vitamin A and D) in the dairy group because their overall nutritional content is not similar to dairy milk and fortified soy beverages. The DGA recommends three servings of low-fat or fat-free dairy foods per day for people nine years and older.

National health organizations do not recommend plant-based, non-dairy milks for children ages 1-5 years old because they are not an adequate nutritional substitute for dairy milk (except for fortified soy beverages). The nutrient content of plant-based beverages varies widely, while cow's milk contains many nutrients essential for healthy growth and development.

Be sure to read food labels, non-dairy alternatives may contain added ingredients such as sugar, salt, syrups and thickeners.

How many servings of dairy do adults and kids need each day?

Dairy foods can play an important role in every stage of life. The DGA recommends 3 servings of low fat or fat free milk, cheese or yogurt daily for those nine years or older, 2 1/2 servings for those four to eight years old, and 2 servings for those two to three years old. USDA recommends that one serving of dairy is equal to an 8 ounce glass of milk, a 6 or 8 ounce container of yogurt, or 1 1/2 ounces of natural cheese.

Is Greek yogurt healthier than regular yogurt?

Just like traditional yogurt, Greek yogurt contains a powerful nutrient package that includes essential nutrients like calcium and protein, plus some contain live and active cultures.

Some people choose Greek yogurt because of the thicker and more tart taste. Greek yogurt also contains about twice the protein and 14% less lactose (naturally occurring sugar) than regular yogurt, although this can vary depending on the brand. While regular yogurt has about 15% more calcium than Greek yogurt. So, choose whichever yogurt you prefer — they're both healthy options!

What dairy products have probiotics?

Both fermented and probiotic foods are made with microorganisms. However, not all fermented foods are considered probiotics. Probiotics are live microorganisms that, when consumed in adequate amounts may deliver health benefits.

Yogurt can be a probiotic food because the traditional cultures, or good bacteria, in yogurt have been studied for their ability to help with lactose digestion. These live cultures can help digest lactose, the naturally occurring sugar in milk. You may see a "live and active culture" seal on the package of some brands of yogurt. This indicates that the good bacteria remained alive after the fermentation process is complete. The use of this seal is voluntary, so yogurt brands that do not list this seal may still contain an adequate amount of live cultures.

What is A2 milk?

A2 milk is a type of milk from certain dairy cows that produce milk highly concentrated in A2 beta casein. All milk contains beta casein, a protein that has two common forms: A1 and A2. A2 milk only contains the A2 beta casein, which is thought to be easier to digest, however, there is only preliminary science to support the theory that A2 milk has additional health benefits to regular cow's milk. The A2 milk concept will remain a theory until there is more science to support it. When it comes to the dairy case, you have many options to choose from, but rest assured, all cow's milk contains the same essential nutrients in an 8oz serving.

Post-Assessment

Answer the following questions:

- Why does milk have sugar?
- How is cow's milk different from milk alternatives?
- How many servings of dairy do adults and kids need each day?

Complete the Activity:

1. Using "MyPlate" on page 16, create your favorite meal using all the food groups. Don't forget to include dairy!
2. Share your completed "MyPlate" with your parents, guardian, siblings, or friends to share your knowledge of the importance of nutrition.

Answer Keys

Activity 2 Answer Key (page 16)
Food groups missing from each meal
1: whole grains, dairy
2: vegetables, fruits
3: vegetables, protein.

"Add it up!": 21 servings of each food group per week

Post-Assessment Answer Key (page 23)
View the article in activity 5, "Top Questions About Milk and Dairy Foods," to view the answers to the pre- and post-assessment questions.