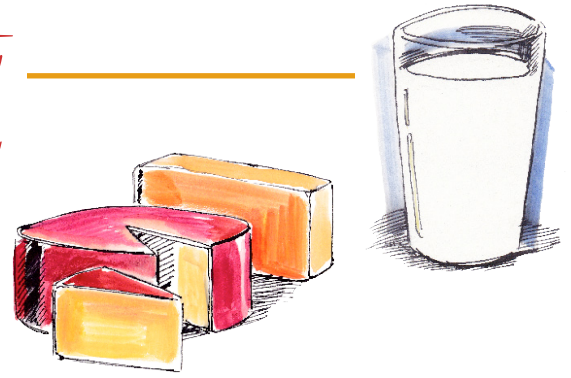


Classroom Bites

# Dairy



## Did You Know

- All dairy products are derived from mammal milk. Although milk most commonly comes from cows, Montana also has goat and sheep milk producers. People also consume milk from different animals including donkeys, horses, oxen, buffaloes, and camels.
- There are six main dairy cattle breeds in the United States, including: Holstein, Ayrshire, Brown Swiss, Milking Shorthorn, Guernsey, and Jersey. The Holstein cow produces the most milk of all breeds, about nine gallons of milk per day! Each cow produces an average of six to seven gallons per day, which is 2,500 gallons of milk annually. Besides the amount of milk produced, different breeds produce varying amounts of milk fat, making them more or less suitable for making dairy products like cheese.
- In 2015, Montana was home to approximately 13,000 dairy cows on nearly 65 dairy farms. The average herd size was about 210 cows in Montana.
- Cheese varieties are classified based on a number of characteristics, but most commonly according to firmness and moisture content. Moisture content may be as low as 30% in firm cheese, while soft or fresh cheese may be as high as 80%. Common cheese varieties include: fresh or un-ripened (mozzarella), soft ripened (Brie), semi-hard (cheddar), hard (Parmesan), blue-veined (Gorgonzola), processed (American), and cheese substitute.

Holstein



Brown Swiss



Ayrshire



Guernsey



Jersey



Milking Shorthorn



## Agriculture & Processing

The dairy supply chain starts with growing feed for the dairy cows, such as alfalfa hay. Dairy cows are housed on farms, fed high quality feed, and milked on average two times a day. The milk is then transported from the farm to one of several Montana dairy processing plants where it is pasteurized. The pasteurization process heats milk to a very high temperature (just below boiling) and then rapidly chills it, which destroys bacteria and extends the shelf life of the milk. Milk is then either packaged or turned into dairy products such as cheese, yogurt, or sour cream. After packaging, the milk and dairy products are distributed to grocers, schools, and other markets in refrigerated trucks, then stored in refrigeration.

Yogurt is milk that is fermented with lactic bacteria; once there is enough lactic acid produced, the milk begins to thicken. Cheese is created from the coagulation (thickening) and draining of milk, cream, or both. Similar to making yogurt, cheesemaking requires lactic acid produced by enzymes, acid, or a combination of heat and acid that will cause milk solids (curds) to form. The firm cheese texture is developed by separating and draining the curds from the whey (liquid) proteins. Cheese is then salted and aged (stored at different temperatures, humidity levels, and lengths of time) to develop different textures and flavors. Of the 72 varieties of cheeses, most age for at least 60 days, but fresh cheeses like ricotta, feta, or cottage cheese do not get aged or preserved.

## Selection

Dairy products include milk, yogurt, cheese, ice cream, butter, and other products. Milk is perishable, so use the sell by dates to select milk that is fresh.

## Storage

Dairy products should be refrigerated at or below 40°F and not be left at room temperature for more than two hours. Avoid storing milk in a refrigerator door where the temperature may fluctuate.

## Cooking

**Blend.** In a blender, mix plain low-fat or fat-free yogurt with fresh berries, fruit, and/or vegetables to make a smoothie for a healthy breakfast, snack, or dessert.

**Breakfast.** Combine plain low-fat or fat-free yogurt and granola for a delicious breakfast, snack, or dessert. Add fresh berries and fruit to hot or cold cereals with low-fat or fat-free milk. Substitute milk for water to prepare hot cereals, such as oatmeal.

**Cook.** When heating milk in a recipe, be sure to heat slowly and stir often to ensure that the milk does not burn.

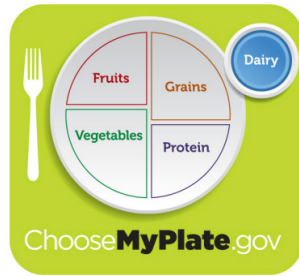
**Dip.** Use low-fat or fat-free yogurt with herbs, seasonings, or peanut butter as a dip for fruits or vegetables.

**Freeze.** Hard cheeses, including cheddar, may be frozen for up to four months. Cream cheese, cottage cheese, and some creams may not freeze well. Frozen dairy is often best used for cooking and should be thawed in the refrigerator prior to use.

**Snack.** Enjoy milk, yogurt, or cheese for a calcium-rich snack.

**Substitute.** Use plain low-fat or fat-free yogurt instead of sour cream for a low-fat option.

**Top.** Shredded low-fat or fat-free cheese adds nutrients to casseroles, soups, stews, or vegetables.



## Activities

### Butter Making

*Adapted From:*

- *Butter Making, Gallatin Valley Farm to School*
- *Butter Making, Project Seasons, Shelburne Farms*
- *Milk Made for You, American Dairy Association curriculum*
- *From Moo to You Activity Sheet, Pennsylvania Department of Agriculture*

### Grades

K – 3

### Objectives

Students will be able to:

- Describe two processes that milk undergoes at the dairy processing plant, including pasteurization and homogenization.
- Explain the steps and materials required to make butter



- Identify two products that people get from cows
- Identify the importance of cows in Montana

### Supplies

- An old-fashioned butter churn or a picture of one
- Half pint of Montana heavy whipping cream at room temperature (will make about 1/4 pound of butter)
- 8 oz jars and lids or other containers that seals securely (one per group)
- One marble per jar
- Colander
- Bowl
- Butter knife
- Crackers or bread
- Butter making recipe (one per student)
- Harvest of the Month poster
- Harvest of the Month at Home handouts (one per student)
- *The Milk Makers* (Reading Rainbow Book), by Gail Gibbons

### Directions

#### Preparation:

An hour before beginning this activity, remove the cream from the refrigerator. Cream at room temperature will turn into butter more quickly than cold cream.

#### Part 1, From Cow to Bottle: 10 minutes

Engage students by asking them, where does milk come from? *Dairy cows!* Dairy cows live on dairy farms where **dairy farmers** milk them every day, usually using milking machines. Explain to students that today they will learn about how milk gets from the dairy farm to the store or school for us to drink and enjoy. For younger students, K-1, use *The Milk Makers* (Reading Rainbow Book) by Gail Gibbons for explanation of the steps milk must go through before it reaches them.

1. **Ask students:** How does milk get from the farm to the dairy plant?

**Explain:** A tank truck driver picks up the milk from the farm. The driver pumps the milk into a refrigerated tank truck. The tank truck is like a thermos bottle on wheels. It keeps the milk cold. The tank truck driver also takes samples of the milk. The milk samples are tested at a laboratory by lab technicians to make sure the milk is safe and fresh for us to drink. The driver takes the milk to the dairy processing plant.

2. **Ask students:** Does anyone know about a dairy processing plant near your home? *Write the word "processing" on the board.*

**Ask students:** What does the word "processing" mean? *Accept all reasonable responses.*



**Explain:** When raw milk arrives at the dairy processing plant, it moves through a series of special equipment as part of the processing and packaging process. As the raw milk moves through the plant, the milk undergoes **pasteurization** and **homogenization**.

3. Write the word “pasteurized” on the board. Then ask students: Has anyone ever heard or seen the word “pasteurized” before? Where? Accept all reasonable responses.

Point to the word “pasteurized” on the milk label.

**Explain that:** Milk undergoes **pasteurization**. During this step, milk is heated to kill bacteria. After the milk is heated, it is cooled very quickly. When this is done, the milk is called pasteurized milk.

4. **Ask students:** Has anyone ever heard or seen the word “homogenized” before? Where? Accept all reasonable responses. Point to the word “homogenized” on the milk label.

**Explain that:** Milk undergoes **homogenization**. This process spins the milk, pushing the fat through smaller and smaller holes until the milkfat particles are small enough to float throughout the milk. This makes the milk smooth and helps it last longer. If milk were not homogenized, the cream would separate and rise to the top. You would have to shake or stir the milk before drinking it. Milkfat or cream is removed to make milk with less fat. One example of this is low-fat (1%) milk.

5. **Ask students:**

- Can you get low-fat (1%) milk in the cafeteria?
- Can you name other kinds of milk that have the some or all of the milkfat removed? Reduced fat milk (2%) and nonfat (fat-free) milk. Does anyone drink whole milk (3.25%)?

**Explain:**

- After the milk is processed, special machines are used to package the milk. These special machines:
  - Put milk into bottles and cartons.
  - Seal the bottles and cartons.
  - Load the bottles and cartons into milk crates.
- Milk is stored in a large refrigerated room until it leaves the dairy processing plant. Trucks deliver the milk to schools and stores. Explain that while some of the milk is packaged for us to drink, some milk is used to make other dairy products.

## Part 2, Butter Making: 20 Minutes

1. Ask students what food products are made from milk? List answers on the board. Explain that you will be reading a few riddles and they need to guess which milk product you are describing.

*Cold and creamy,  
A frozen treat,  
In a cone or a shake,  
It can't be beat!  
(Ice cream)*

*A thick, tart, custard,  
Fruit flavored or plain,  
Curdled and cultured,  
With a unique name.  
(Yogurt)*

*Rich, creamy, yellow,  
Salted or sweet,  
On toast or corn,  
A little bit is good to eat.  
(Butter)*

2. Explain to students that they will get a chance to make their own butter. Ask how butter is made. What ingredients are needed? Record their ideas. Show them an old-fashioned butter churn or a picture of one. How was it used? What did it do?
3. Divide the class into groups of five to eight students each, or sit as a whole group with younger students. Ask groups to sit or stand in a circle facing each other. Pour about an inch of heavy cream into each jar, add a marble, and attach the lid tightly. Ask students why the marbles are put in the container with the cream. Discuss how marbles help churn the butter like an old-fashioned butter churn.
4. Hand one jar to each group and instruct them to shake the jar side-to-side or in a twisting motion like turning a door knob, rather than up and down. If the marble hits the bottom of the jar too hard, it can break the jar. Using the small jars also helps prevent this from happening.
5. Ask one student to shake a jar and have everyone listen to the sound of the cream and marble in the jar. What do they think will happen to the sound as the cream begins to thicken? Ask the students to predict how long it will take to make butter. Have each group record their predictions and starting time.
6. Since it takes 5-10 minutes to make a batch of butter, teach the class the butter making song, *Shake It!* (lyrics below), passing the jar after each chorus. Take breaks to listen to the sound of the marbles in the jar. When do they notice a different sound? You can also turn the process into a competition to see which group can make butter first.
7. When the marbles in the jars start making louder thumping noises instead of high-pitched “clinking” noises, check the jars. Reveal to the students what they have made—butter! Record finish time. The thick yellow “blob” is butter (all the fat molecules in the cream sticking together) and the thin liquid is buttermilk. Drain off the buttermilk into the bowl and discard. This is different than buttermilk you can buy which is cultured.
8. Now it's time to enjoy the taste of homemade butter! Have students spread butter on salted crackers or bread, and you can also have students add herbs or honey to make flavored butter. Store the butter in the refrigerator after removing the marbles.

## Shake it!

(Sing to the tune of "I Have Something in My Pocket" or the "Brownie Smile Song." Project verses on the board for the class to follow).

*We're going to make butter,  
Rich and creamy too,  
With milk from a cow's udder  
Before you can say moo*

### Chorus:

*So, shake, shake it, shake it,  
Shake it if you can  
Shake it like a milkshake  
And pass it to a friend.*

*Put some cream into a jar,  
You can add a marble or two,  
Make sure the lid is on tightly,  
That's all you have to do.*

*Repeat chorus.*

*We're learning while we're churning,  
Hey this is lots of fun!  
It's easy to make butter,  
Let's eat it when it's done.*

*Repeat chorus.*

*Oh, listen very carefully,  
It's sounding different now,  
Hooray it's finally butter!  
Be sure to thank the cow!*

## Wrap up: 5 minutes

9. Ask students to discuss with a partner why cows are important in Montana (they give us food!). Next, have them think of one new thing they learned today. Have partners share and hear a few ideas as a class.

## Optional Extensions:

- Discuss the physical process of butter making—from a liquid to a solid.
- *From Moo to You Activity Sheet* ([https://www.americandairy.com/\\_resources/documents/moo\\_to\\_you.pdf](https://www.americandairy.com/_resources/documents/moo_to_you.pdf)), review the instructions with the students. Let students start by coloring in any dairy products they have eaten today.

## Book Nook

*Kiss the Cow*, by Phyllis Root,  
Will Hillenbrand

*It's Milking Time*, by Phyllis Alsduf

*Out and About at the Dairy Farm*, by Andy Murphy

*Cows Can Moo! Can You?* by Bonnie Worth

*The Milk Makers (Reading Rainbow Book)*, by Gail Gibbons



## Recipe

### Razzle Dazzle Smoothie

*Create-a-Smoothie, New England Dairy and Food Council*

### Servings

6

### Ingredients

- 1 1/2 cups Fat-free milk
- 3 cups Vanilla yogurt, *low-fat*
- 1 1/2 cups Mixed berries, *frozen*
- 1 Banana, *frozen*

### Preparation

1. Collect and measure all ingredients.
2. Add the fruit and yogurt to the blender.
3. Pour the milk into the blender.
4. Blend for about 30-45 seconds until smooth.
5. Refrigerate leftovers immediately. Drink within 2 days.

## Nutrition Information

Dairy products are rich in calcium, potassium, B vitamins, and protein, and they are often fortified with vitamin D. Not many foods contain vitamin D, as our bodies are designed to produce it with the help of sunlight. Vitamin D promotes calcium absorption and bone growth. Calcium is necessary to maintain healthy bones and to carry out other body functions. Dairy products such as milk, yogurt, and cheese are excellent sources of calcium and constitute a majority of Americans' calcium intake. The Dietary Guidelines for Americans recommend choosing low-fat and fat-free dairy foods most often. Some individuals are lactose intolerant. This means they do not produce enough lactase, a digestive enzyme used to break down the milk sugar, lactose. Individuals with lactose intolerance can try alternatives such as fortified lactose-free yogurt or milk. School-aged children are recommended to enjoy 2 1/2 to 3 servings of dairy per day and adults 3 servings per day. A serving is one cup of milk or yogurt or 1 1/2 ounces of natural cheese.

## Dig Deeper

For sources and photo credits along with more recipes, lessons, quick activities, resources, and guides, visit: [mtharvestofthemoth.org](http://mtharvestofthemoth.org).

## 4 Montana Harvest of the Month: Dairy



The Montana Harvest of the Month program showcases Montana grown foods in Montana communities. This program is a collaboration between Montana Farm to School, Office of Public Instruction, Montana Team Nutrition Program, National Center for Appropriate Technology, Montana State University Extension, Gallatin Valley Farm to School, FoodCorps Montana, and Montana Department of Agriculture. More information and resources are available at: [mtharvestofthemoth.org](http://mtharvestofthemoth.org).

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