

SC Farm Bureau
Ag in the Classroom
Post Office Box 754
Columbia, SC 29202

803.936.4237
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@SCAgintheClass

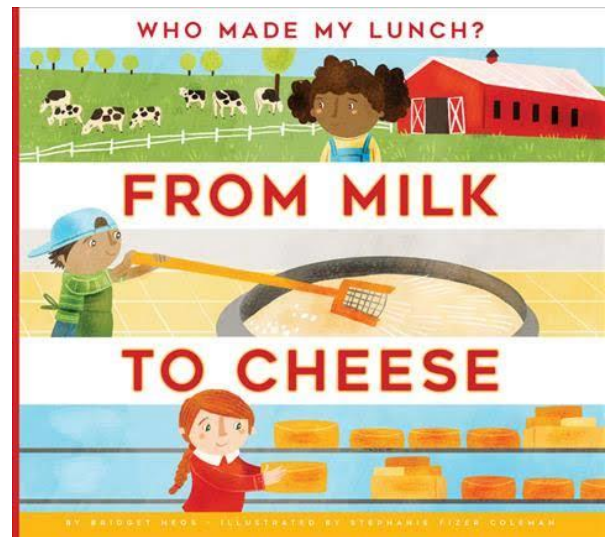
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From Milk to Cheese

By: Bridget Heos

“Extra cheese, please!”

In this narrative nonfiction, follow a child’s wondering of where cheese comes from and, through exploration, learn all about dairy farmers, how milk is produced, and how cheese is created from the milk. Included in the story are a map of where dairy cows are raised, a glossary, and resources that can extend students’ learning.¹



Did You Know? (Ag Facts) ³

- In the past, a person could take up to 1 hour to milk six cows by hand. Today, a person can milk 100 or more cows per hour using modern machines and technology.
- Arriving within 2 days of leaving the farm, milk is one of the freshest items in the grocery store.
- The U.S. dairy industry conducts more than 3.5 million tests each year to certify the milk we drink is safe and wholesome.

Discussion Questions

- Where does milk come from?
- Why do dairy farmers care so much about their cows’ health and safety?
- What is your favorite dairy product?
- What new information did you learn?

Grade Level(s): K-3

Purpose: Students will explore the journey of milk production and be able to identify byproducts of milk.

Vocabulary:

- **animal nutritionist:** a person who specializes in animal nutrition, concerned with dietary needs of animals in captivity such as livestock, pets, and animals in wildlife rehabilitation facilities
- **dairy cow:** a cow raised by a farmer for milk production
- **herbivore:** an animal such as a cow that feeds on plants
- **food processing:** the process of transforming raw agricultural products, like grains, vegetables, meat, or milk, into end products to be sold to consumers
- **raw:** food in its natural state; not yet processed or purified
- **homogenized:** to treat (milk) so that the fat is mixed throughout instead of floating on top
- **pasteurize:** to heat a food in order to kill bacteria
- **breed:** a group of animals within a species that have a distinctive appearance and characteristics
- **dairy farmer:** a career devoted to rearing cattle to produce milk for human consumption
- **milking parlor:** building where dairy cows are milked

Background Agricultural Connections: ²

In the United States, cattle are typically raised to produce beef and milk for our food supply. The term *cattle* can refer to any breed or gender of the bovine species. All breeds of cattle produce meat and all female cattle produce milk after they give birth. However, within the cattle industry, specific breeds of cattle are classified as either "beef" or "dairy" cattle due to their efficiency in producing either meat or milk.

Female cattle, or *cows*, produce milk. They begin producing milk after giving birth to their first baby, which is called a *calf*. Cows that are able to produce large quantities of milk are called **dairy cows** and they live on dairy farms.

Dairy farms produce milk and are found throughout the United States. California is the nation's leading dairy state in the nation. There are five **breeds** of dairy cows: Jersey, Holstein, Brown Swiss, Guernsey and Ayrshire. Each breed has its own unique country of origin, physical attributes, and production traits. The dairy cows are normally milked twice a day, depending on the farm, in a building called a **milking parlor**. Automatic milking machines are used today and help the dairy farmer keep accurate records regarding milk production from each cow.

Through time, many tools and technology have been developed to improve the quality, processing, and safe storage of milk and other dairy products. The following tools were used in earlier times before transportation provided refrigeration and adequate storage.

- A **milk tester** was used to test the fat content of milk and cream. It was produced by Dr. S.M. Babcock in 1890. These small hand- cranked devices were commonly found on dairy farms. Farmers used it to compare the butter fat content of milk from each cow.
- A **cream separator** was invented in 1890 by C.G.P. Delavai and was used to separate cream from the milk. This machine eliminated this task by hand for transporting whole milk to the creamery.
- A **butter paddle** was used after the cream was churned and the butter was put in a large bowl. This tool was used to separate the butter from the buttermilk and to form butter into a solid form.

- The **self-acting cheese press** performs one step in the cheese making process by pressuring the cheese curds and helping drain the excess liquid. This press used the weight of the cheese to extract the moisture out of it. This type of cheese press was commonly used in smaller dairies.
- The **foot operated butter churn** was hands-free and allowed you to do something else! Butter churns separated the butter milk and butter. The primary purpose of having dairy cows was to provide a family with milk and butter. Farm production of butter started in 1791.
- The 8 gallon **milk can** was used to store and transport cooled milk. Until the adoption of farm bulk tanks and tanker trucks in the 1940s and 50s, milk was kept in these cans which came in 5, 8, and 10 gallon sizes. Sturges & Burn Manufacturing Company of Chicago, Illinois was a large manufacturer of milk cans.
- The earliest milk haulers used flat-bed **delivery trucks** to transport milk cans of various sizes along with other items such as eggs and ice.
- Milk was delivered to houses by a milk man in glass **milk bottles** that were thought to keep milk at its coolest temperatures.

Today, a dairy farmer is most concerned about the health of their cows for maintaining a good supply of milk. Three main areas of focus include a nutritious diet, healthy living conditions, and good medical care for the dairy cows. Most importantly farmers must provide a healthy diet of 100 pounds of food and 25 - 50 gallons of water each day for his/her dairy cows.

An **animal nutritionist** can aid a farmer in creating a feed formulated with the correct nutrients for a well-balanced diet. Dairy cows also spend time in a pasture for grazing and acquiring fiber for their **herbivore** diets. Today, the following tools and technology are used to provide delicious dairy products such as milk, yogurt, cheese, and ice cream.

- Dairy cows are kept in comfortable conditions in and out of the **milking parlor**, a separate building where cows enter for milking 2-3 times a day.
- Dairy cows have access to feed as well as fresh, clean water 24 hours a day in a **free-stall barn** that allows cows to eat, drink, and sleep whenever and wherever they choose.
- The cows are milked 2-3 times a day by the use of **milking machines** that automatically and safely remove milk from the cow's udder.
- The milking machines transport milk directly from the cow to a refrigerated **bulk tank**, located on the farm where milk is cooled to between 38 to 45 Fahrenheit to preserve freshness and safety.
- Milk is transported to processing plants by **tanker trucks** that are equipped to haul milk under safe conditions.
- Farmers use **ear tags** that contain a number assigned to a particular cow to help maintain accurate health and milk production records.
- A **methane digester** is used to convert cow manure into methane gas burned into fuel to create electricity used on the dairy farm.
- On larger dairy farms a storage building called a **silo** is used to store silage, a high-moisture forage eaten by cows.

The Journey of Milk ⁴

Materials:

- [The Journey of Milk](#) video
- Paper, pencils, crayons

Procedures:

1. Explain to students that the milk they enjoy every day comes from cows raised on local dairy farms. Dairy farmers not only put a lot of work and resources into caring for their cows, they also put a lot of effort into producing milk in a sustainable way that helps preserve the environment.
2. Show students 'The Journey of Milk' video.
3. Initiate discussion with students about the video using the following questions:
 - a. In what ways do dairy farmers show that they care about their cows?
 - b. What are some of the ways dairy farmers make sure that the milk we purchase at the store or drink at school is fresh and safe?
 - c. Why do you think it is important for dairy farmers to take good care of the land and water on a dairy farm?
4. Explain to students that dairy farmers put in a LOT of work for us to be able to enjoy milk and all of its byproducts. Ask the students to create and decorate thank-you cards that portray dairy farmers, milk production, or their favorite milk byproduct.
5. Allow the students to write a thank-you letter in their card and address it to local dairy farmers/agriculturists in the community.
6. Instruct students on how to properly format a thank-you letter with correct spelling, punctuation, and grammar.
7. Ask students to include the following components:
 - a. Greeting (*Dear...*)
 - b. Express thanks (*Thank you for...*)
 - c. Add specific details (*My family really enjoys eating fresh fruit...*)
 - d. Restate your thanks (*Again, thank you for...*)
 - e. End with your regards (*Sincerely...*)

More Cheese, Please ⁵

Materials:

- **For each student:** 1 napkin or plate, 1 slice regular American cheese, 1 slice low-fat American cheese, food labels for each cheese.
 - Note: Before starting the lesson, remove and save original cheese package labels. Then label one kind of cheese A and the other kind B
- 'Making Cheese' reader
- 'Tasty Cheese' student handout

Procedures:

1. Display (or hand out to individual students) the 'Making Cheese' reader. Discuss with students the process of making cheese. Give students the 'Tasty Cheese' handout.
2. Pass out a piece of cheese A and a piece of cheese B to each student. Students may place their cheeses on a plate or napkin. Remind them not to mix up Cheese A and B.
3. After students have tasted both cheeses and answered questions one to three, reveal the true low-fat cheese.
4. Count the number of students whose prediction was correct and the number of students whose prediction was incorrect. Use this information to complete the Students' Correct/Incorrect Predictions for Low-fat Cheese graph.
5. Discuss how well they liked/disliked the low-fat cheese. Be sure to mention that the low-fat cheese has fewer calories but the same amount of calcium. Ask "Does anyone already eat low-fat cheese at home?" Ask "Do you think you could ask your parents to buy low-fat cheese?"
6. Discuss how low-fat cheese and regular cheese are made.

Teacher Tips:

- Regular cheese is often made with whole milk. Low-fat cheese is usually made from 2% milk or part-skim milk. Fat-fat cheese is generally made from skim milk. Your students can find the ingredients used to make cheese on the Nutrition Facts panels.
- Extension: Explore the cheese labels.
 - Students may use food labels to compare the ingredients in regular American cheese and low-fat American cheese.
 - The class can identify the type of milk, salt and acid or enzyme used to make the cheese.
 - Students may compare the calories, fat and amount of calcium in the two cheeses.
 - Students may pick two different kinds of cheese and compare the ingredients and nutrients.
- You can print additional Nutrition Facts for cheeses from Kraft Foods: <http://www.kraftfoods.com/kf/Products/>

Extension Activities:

- Read the [SC Dairy Ag Mag](#) with your students. Compare and contrast dairy production in the past compared to the present. How has it changed? Why has it changed?
- View a virtual dairy farm tour with your students, starting with one here in South Carolina – Satterwhite Dairy in Newberry County! <https://vimeo.com/428603594>
- Bacteria for Breakfast: Complete the [math enrichment activity](#) included with this lesson. Students will learn about the beneficial bacteria found in yogurt and calculate serving sizes.
- Visit the *Interactive Map Project* website and view the [Dairy Cattle Inventory](#) map. As a class identify the highest milk producing states and discuss the factors which could contribute to the success of dairy farms such as climate, open space, etc. Identify where your state ranks in dairy cattle production and discuss the factors contributing to the statistic.
- Visit the *Interactive Map Project* website and view the maps representing [Milk and Cheese Production](#) in the United States. Identify the states that produce the most milk and cheese, then find where your state ranks for milk and cheese production. Ask students if they can find a correlation between the information found in the two maps. (The top producing cheese states also rank in the top for milk production.)

Suggested Companion Resources:

- [Farm Pop-Ups](#)
- [Big Book of Big Tractors](#)
- [Clarabelle](#)
- [Extra Cheese, Please!](#)
- [Has a Cow Saved Your Life?](#)
- [Hey, Hey, Hay!](#)
- [Let's Make Butter](#)
- [Make Mine Ice Cream](#)
- [Brittlelactica: Planet in Need](#)
- [Dairy in the Mountain West: Our Family of Farmers](#)
- [From Moo to You Video](#)
- [Hilmar Cheese Company Virtual Video Tour](#)
- [Make Mine Milk](#)
- [Moo 2 You DVD](#)
- [NMSU Field Trip: Milk](#)
- [The Journey of Milk](#)

- [Ag Today](#)
- [Dairy Reader](#)
- [Discover Dairy](#)

Sources/Credits:

1. Heos, Bridget. *From Milk to Cheese*, Amicus, 2017.
2. California Ag in the Classroom
3. Illinois Ag in the Classroom
4. New England Dairy & Food
5. FoodMaster

Suggested SC Standards Met:

English/Language Arts:

- K.RI.5.1 With guidance and support, ask and answer who, what, when, where, why, and how questions about a text; refer to key details to make inferences and draw conclusions in texts heard or read.
- K.RI.5.2 With guidance and support, ask and answer questions to make predictions using prior knowledge, pictures, illustrations, title, and information about author and illustrator.
- K.RI.6.1 With guidance and support, retell the central idea and identify key details to summarize a text heard, read, or viewed.
- 1.RI.5.1 Ask and answer who, what, when, where, why, and how questions to demonstrate understanding of a text; use key details to make inferences and draw conclusions in texts heard or read.
- 1.RI.5.2 Make predictions using prior knowledge, pictures, illustrations, title, and information about author and illustrator.
- 1.RI.6.1 Retell the central idea and key details to summarize a text heard, read, or viewed.
- 2.RI.5.1 Ask and answer literal and inferential questions to demonstrate understanding of a text; use specific details to make inferences and draw conclusions in texts heard or read.
- 2.RI.5.2 Make predictions before and during reading; confirm or modify thinking.
- 2.RI.6.1 Retell the central idea and key details from multi-paragraph texts; summarize the text by stating the topic of each paragraph heard, read, or viewed.
- 2.RI.7.1 Compare and contrast topics, ideas, or concepts across texts in a thematic, author, or genre study heard, read, or viewed.
- 3.RI.5.1 Ask and answer literal and inferential questions to determine meaning; refer explicitly to the text to support inferences and conclusions.
- 3.RI.7.1 Compare and contrast diverse texts on the same topic, idea, or concept.

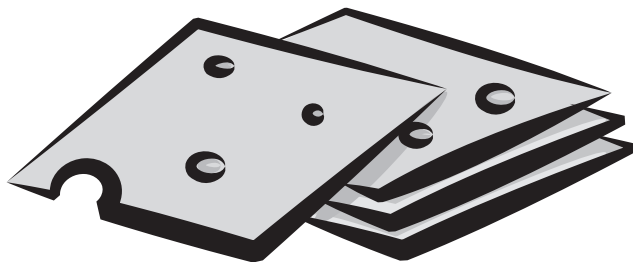
Science:

- K.L.2: The student will demonstrate an understanding of organisms found in the environment and how these organisms depend on the environment to meet those needs.
- 1.E.4B.2: Obtain and communicate information to explain ways natural resources can be conserved (such as reducing trash through reuse, recycling, or replanting trees).
- 2.L.5: The student will demonstrate an understanding of how the structures of animals help them survive and grow in their environments.
- 3.L.5A.2: Develop and use a food chain model to classify organisms as producers, consumers, and decomposers and to describe how organisms obtain energy

Social Studies:

- K.H.2 Examine ways in which individuals change or stay the same over time.
- K.E.3 Explain why people have jobs, and describe the economic benefits for self and community.
- 1.H.1 Identify similarities and differences between one's community and other South Carolina communities over time.
- 1.E.1 Compare goods and services in the school, community, and state.
- 1.E.2 Explain how goods and services change over time
- 3.2.2.ER Identify and analyze the ways people interact with the physical environment in different regions of the state, the country, and the world

Making Cheese



Did you know cheese is made from milk?

There are hundreds of different kinds of cheese. There are **hard cheeses** like cheddar cheese and colby cheese and **soft cheeses** like cottage cheese and cream cheese. There are even **moldy cheeses** like blue cheese. All cheeses are made from milk in four to six basic steps.

The first step is to **pasteurize** the milk. Milk is pasteurized by heating it to a temperature that kills harmful bacteria. This makes the milk safer to drink/eat. Milk you buy from the grocery store is already pasteurized.

The second step is to form **curds**. Milk is heated and an acid or enzyme is added. Acids are used to make soft cheeses like cottage cheese. Enzymes are used to make harder cheeses like cheddar cheese. Both acids and enzymes help curdle the milk. As milk curdles, the milk proteins separate forming clumps called curds and a liquid called **whey**.

Step three is to drain the whey. The curds are pressed into a strainer and the liquid whey is drained off. The crumbly curds will become cheese.

Step four is to salt the curds. Salt adds extra flavor to the cheese. Some cheeses like cottage cheese are now ready to eat.

The fifth step is to press the curds into chunks of cheese. Step six is to age the cheese. Cheese is stored for days or even years to allow stronger flavors to develop. After aging, the cheese is ready to eat!

DOODLE BUGS

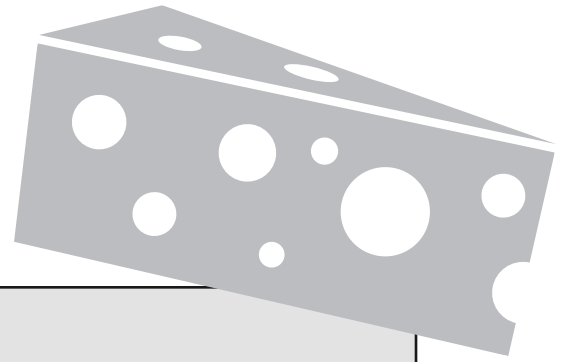
In the reading, circle the word that means to heat milk to kill harmful bacteria.

Draw a box around the cheese that is salted but not pressed or aged.

Write the number of each step beside the description.

___ To age ___ To form curds ___ To drain the whey
___ To pasteurize ___ To press into chunks ___ To salt

WHILE YOU WAIT: Tasty Cheese



You will need:

1 plate or napkin
1 slice cheese A

1 slice cheese B

Tasting Time:

Taste a piece of cheese A. Next, taste a piece of cheese B. Compare the look, taste and feel. Then circle your answers below.

- 1. Which cheese looks better?** Cheese A Cheese B Same
- 2. Which cheese tastes better?** Cheese A Cheese B Same
- 3. My prediction (my guess):** I think cheese _____ (A or B) is the low-fat cheese. (Fill in the blank.)
- 4. Count how many students predicted (guessed) the low-fat cheese correctly. Then complete the bar graph.**

Students' Correct/Incorrect Predictions for Low-fat Cheese

