

Discover Dairy Science!

Dear Educator,

When children savor the creamy texture of a refreshing smoothie or load their taco with a healthy helping of cheese, they aren't likely to consider the source of these tasty treats — fresh, nutritious milk from your local dairy farmers.

Milk and milk products like cheese and yogurt are important components of a balanced, healthy diet for children. Dairy Farmers of Wisconsin and the curriculum specialists at Young Minds Inspired (YMI) are pleased to bring you this free educational program that will help students discover the science behind dairy production.


As they complete these activities, your students will learn how milk from your local dairy farmers provides the basis for cheese and yogurt, tasty favorites that embrace and expand the nutritional benefits provided by milk itself.

We hope you will share this program with other teachers in your school. Although the materials are copyrighted, you may make as many copies as needed for educational purposes.

Please let us know what you think of this program by visiting [ymiclassroom.com/feedback-WisconsinDairy](https://www.ymiclassroom.com/feedback-WisconsinDairy) to provide feedback. We look forward to hearing from you.

Sincerely,
Youth and Schools Team at
Dairy Farmers of Wisconsin

Dr. Dominic Kinsley
Editor in Chief
Young Minds Inspired

 For questions, contact YMI toll-free at 1-800-859-8005 or by email at feedback@ymiclassroom.com.



Target Audience

Students in grades 2-4 and their parents.

Program Objectives

- Build student awareness of the science involved in milk, cheese, and yogurt production.
- Foster an appreciation for the role of local dairy farmers in providing nutritious dairy products.
- Spotlight the nutrition offered by consuming dairy foods as part of a balanced diet.

Program Components

- This one-page teacher's guide.
- Three reproducible activity sheets.
- A reproducible *Milk from Cow to You!* information/coloring sheet handout
- A reproducible *The Art of Cheesemaking* information/coloring sheet handout

Please comment online at [ymiclassroom.com/feedback-WisconsinDairy](https://www.ymiclassroom.com/feedback-WisconsinDairy).

How to Use This Program

Photocopy and distribute the activity sheets and coloring sheets for class and take-home use. Visit [ymiclassroom.com/WisconsinDairy](https://www.ymiclassroom.com/WisconsinDairy) to review the program's alignment with Common Core State Standards and Health and Science Standards.

Activity 1 It's in the Process

Part A: Ask students what they know about where milk comes from. Show the Dairy Farmers of Wisconsin video, *Cows Make Milk*, at <https://vimeo.com/389298321/825f2fe246>. Use the *Milk from Cow to You!* handout and the following information to help students track the process of producing milk, cheese, and yogurt.

Raw milk is trucked from dairy farms to different processing plants, depending on the final dairy product. At the milk processing plant, the dairy lab tests a milk sample to evaluate the farm's sanitation and dairy cow health.

The milk is then:

- separated into skim, low fat, and whole categories.
- homogenized to mix the cream evenly throughout the milk.
- pasteurized to kill any potentially harmful bacteria and also to prevent spoilage.
- packaged and delivered to your grocery shelf.

Answers: A. pasteurization, 3; B. homogenization, 2; C. packaging, 4; D. separator, 1.

Part B Answers: 1. D; 2. A; 3. C; 4. B. For more about Pasteur, see *Easy Science for Kids* (easyscienceforkids.com/all-about-louis-pasteur/) and *Encyclopedia of World Biography* (notablebiographies.com/Ni-Pe/Pasteur-Louis.html), plus library books.

Activity 2 Curds and What?

Prepare the items for the experiment ahead of time. **For younger students:** Work as a class, with individual students assigned to do specific set-up and procedural tasks. **For older students:** Rotate small groups through an experiment station where each group can independently conduct the experiment.

Part A: Review the cheese processing steps on *The Art of Cheesemaking* handout, pointing out how the addition of the acid-based enzyme, rennet, helps the “good” bacteria that is added to milk cause a chemical reaction that separates milk proteins into liquids (whey) and solids (curds).

Now conduct the experiment, using vinegar to “stand in” for rennet. Explain that milk contains molecules consisting of tiny droplets of fat and particles of protein mixed together. The acid in vinegar (and rennet) acts to lower



the natural balance of the acids in milk, forcing the protein particles to stick together while trapping the fat droplets which then coagulate to become a mass.

Student sketches should illustrate the separation of curds and whey, including: 1. mixture of milk and vinegar before pouring into filter; 2. curds on top of filter; and 3. whey inside jar.

Part B Answers: Colby, Cheddar, Swiss, Monterey Jack. Students should complete the cooking activity at home with parents. Suggest that they share their choice of favorite add-ins with classmates.

Activity 3 It's All Greek to Me!

Review the yogurt processing steps with students. Share the following information with students about why yogurt is a delicious and nutritious way to fuel your body for the day: <https://www.usdairy.com/news-articles/is-yogurt-good-for-you>. Have them share the Yogurt Quick Bites with parents.

Direct students to draw a picture of their favorite yogurt parfait on the back of the activity page using ingredients listed as examples.

Then have students write and describe why they will enjoy eating the parfait and why it will be good for their body.

Resources

- [ymiclassroom.com/WisconsinDairy](https://www.ymiclassroom.com/WisconsinDairy)
- Dairy Farmers of Wisconsin: [WisconsinDairy.org](https://www.WisconsinDairy.org)
- Wisconsin Cheese: [WisconsinCheese.com](https://www.WisconsinCheese.com)
- Downloadable Materials: <https://www.wisconsinmilk.com/Materials-Ordering>
- Milk Nutrition: [13 Nutrients in Milk Infographic](https://www.usdairy.com/news-articles/13-nutrients-in-milk-infographic)
- USDA MyPlate: [myplate.gov](https://www.myplate.gov)

Activity

1

It's in the Process



Did you ever wonder how that glass of milk got to you? Sure, you know it comes from cows, but *how*? A lot of hard-working dairy farmers were part of the process. Learn about what happens once the milk leaves their farms.

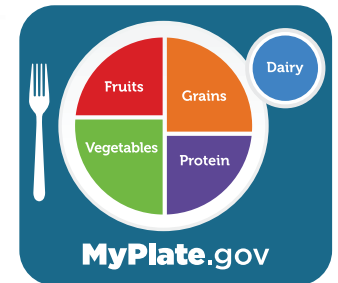
Part A: Write the milk processing term in the second column of the chart next to the step it describes. Then number each step in the correct order in the third column.

Milk Processing Terms

Packaging Separator Homogenization Pasteurization

Milk Processing Step	Milk Processing Term	Correct Order
A. This process heats milk to a high temperature to kill any potentially harmful bacteria that might be present.		
B. This process breaks down fat so it stays suspended in the milk.		
C. Milk is packaged into bottles and cartons and delivered to your local grocery store.		
D. This machine helps remove the cream and then reblends the milk into skim, low fat, and whole milk.		

Part B: Milk is part of the **MyPlate** dairy group guidelines for healthy eating. Milk contains important nutrients your body needs to build strong bones and muscles and provide energy, like calcium, Vitamin D, and potassium. Other essential nutrients in milk are riboflavin, phosphorous, protein, Vitamin A, Vitamin B12, zinc, niacin, selenium, iodine, and pantothenic acid.



Milk Nutrition By the Numbers

Draw a line from the fact to the correct number:

Nutrition Facts

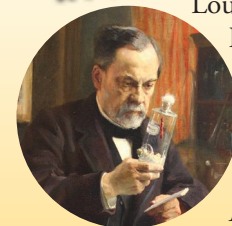
- Number of daily servings of milk or milk products recommended for kids ages 4-8
- Number of daily servings of milk or milk products recommended for kids ages 9 and older
- Amount of milk fat in whole milk
- Number of essential nutrients found in milk

Nutrition Numbers

- 3 cups
- 13
- 3.25%, about the same as when it comes straight from the Holstein (black and white) cow!
- 2½ cups

Parents! Remember, whether it's whole, reduced-fat, or flavored, milk is an equal opportunity source for great nutrition for your child. Wisconsin's dairy farmers are pleased to provide fresh quality milk and milk products to help you meet your family's dairy needs.

There's Science in My Milk!



The process of pasteurization is named for

Louis Pasteur, a French scientist who discovered that harmful bacteria can be killed with heat. *Pasteurization* heats milk to a minimum

of 145° F for 30 minutes to kill any potentially harmful bacteria present. Pasteurization does not affect the nutrition or taste of milk — and it also helps to keep milk from spoiling too quickly!

Activity

2

Curds and Whey?

Part A: Remember the nursery rhyme about Little Miss Muffet eating her curds and whey? You might be surprised to learn that curds and whey is a dish similar to cottage cheese! The separation of milk solids (curds) and liquids (whey) is the first step in making all kinds of cheese. And the process begins with milk.

Try this experiment to observe the separation of curds and whey (but don't eat the results!):

Materials Needed

- Whole milk
- Apple cider vinegar
- Small clear glass bowl
- Paper coffee filter
- Jar wide enough for filter to fit inside the top of it to make a small "basket," with the filter overlapping the edges of the jar
- Rubber band to secure the outside edges of the filter around the jar
- Small mixing spoon
- Measuring spoons

Directions

1. Measure $\frac{1}{4}$ cup milk into clear glass bowl.
2. Measure 2 tablespoons of vinegar and add to milk. Stir with spoon.
3. Place coffee filter inside top of jar and secure in place with rubber band.
4. Pour milk and vinegar mixture into the filter and allow liquid to fully strain.

On the back of this sheet, record your observations after steps #2 and #4 and include sketches of what you saw.

Part B: Cheese makes a tasty meal ingredient, and Wisconsin makes over 600 varieties, types, and styles from which you can choose. Try unscrambling the names of these favorites:

1. boCly _ _ _ b _

2. raeddhC _ h _ _ _ r

3. swSis _ _ _ s _

4. noMeyret kaJc M _ _ _ _ _ y _ _ _ k



Parents! Try this fun recipe to help boost your family's dairy nutrition! Use the chef-inspired add-ins below and/or your child's own ideas for other fresh, seasonal produce to personalize this favorite.

My Style Grilled Cheese Sandwich



Ingredients

- Two slices of bread, each buttered lightly on one side
- 1 tablespoon butter
- Your favorite Wisconsin cheese (choose one or more from the scrambles list above)
- Your favorite savory or sweet add-ins from list below (or use your own ideas)

Directions

1. Place butter in skillet, and melt at medium high setting.
2. Place one slice of bread in skillet, buttered side down.
3. Place cheese on bread. Don't forget — you can combine different Wisconsin cheeses if you like!
4. Place your add-ins on top of cheese after it starts to melt. (If using jam or marmalade, spread onto the unbuttered side of the second piece of bread.)
5. Top the cheese with the other bread slice, buttered side up.
6. Flip the sandwich in the skillet and cook until it is toasted on both sides.
7. Serve and enjoy!

Savory Add-Ins

Finely chopped kale or spinach
Turkey or ham
Tomato
Chopped herbs (rosemary, dill, or tarragon)
Sliced pickles

Sweet Add-Ins

Thinly sliced pears or apples
Strawberry jam
Orange marmalade
Chopped pineapple
Chopped herbs (mint or basil)

Milk and milk products like cheese are important (and delicious!) sources of calcium and protein for your growing child. Wisconsin farmers provide the milk used to produce many cheese varieties found in your supermarket. **MyPlate** guidelines recommend $2\frac{1}{2}$ cups of dairy for children ages 4-8 each day and 3 cups for ages 9 and up.

Activity

3

It's All Greek to Me!

Do you speak Greek? Greek yogurt, that is. Creamy, smooth Greek yogurt is a favorite with kids everywhere, but where does it come from? It starts with milk from local Wisconsin farmers.

Farms that ship milk to Wisconsin yogurt plants practice sustainability and stewardship of the environment in producing milk that will become yummy Greek yogurt.

Review the Greek yogurt making steps at right and think about how you might enjoy this delicious dairy product in a yogurt parfait.



1 At the plant, after the milk is separated, the milk is pasteurized. Live bacteria cultures are added to the milk to ferment the natural milk sugars and turn the milk into yogurt.



2 The whey is then separated from the cultured milk through a whey separator to remove excess moisture. This gives Greek yogurt its rich, creamy texture and high protein content. The nutrient-rich excess whey is then used for livestock feed.



3 For fruit-on-the-bottom flavors, fruit is dispensed into the cups before the yogurt is added. The cups are sealed with foils and coded before being packed into cases and cooled.



4 The chilled cases of Greek yogurt are transported to a refrigerated warehouse.



5 From there, it is shipped to grocery stores and schools in Wisconsin for you to enjoy!

Yogurt+ Quick Bites

Choose from among these many different ways to enjoy Greek yogurt throughout the day:

- Layer it with granola and fresh fruit for a breakfast, lunch, or snack parfait.
- Substitute it for cream or sour cream in soups, salad dressings, dips, quesadillas, and sandwich wraps.
- Add fresh, juiced fruits to whip up a tasty breakfast smoothie.
- Use it instead of mayo for tuna, chicken, and egg salads.
- Serve it with your favorite fresh fruits and a drizzle of chocolate sauce for a healthier dessert.
- Mix it with skim milk in place of buttermilk to make perfectly nutritious pancakes.
- Mix it with your favorite seasonings for a tangy marinade for meats and poultry.

Make your own yogurt+ parfait!



Yogurt parfaits are a delicious way to enjoy yogurt. On the back of this page, draw your favorite yogurt parfait with your favorite yogurt flavor, fruits, and toppings from the list below. Describe how this yogurt parfait can be good for your body and also why you will enjoy eating it!

Yogurt+

- Strawberry
- Vanilla
- Plain
- Other flavors

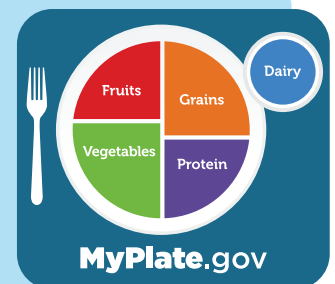
Fruit+

- Strawberries
- Blueberries
- Peaches
- Other favorite fruits

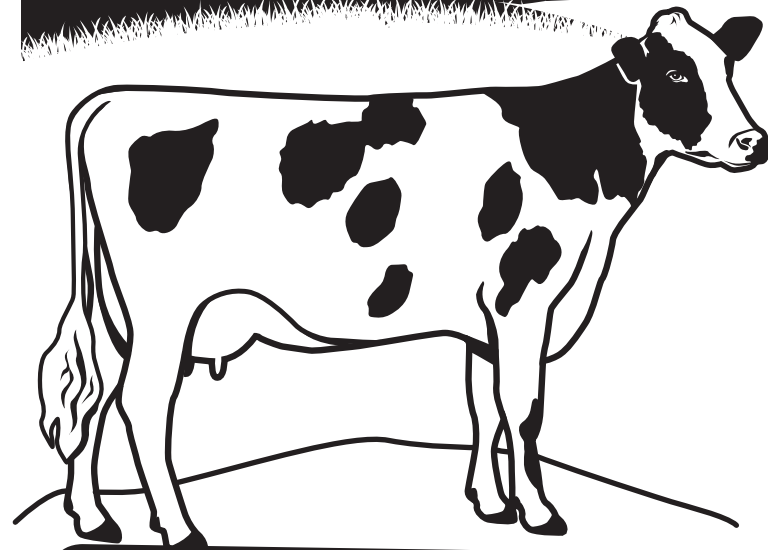
TOPPINGS

- Granola
- Your favorite cereal

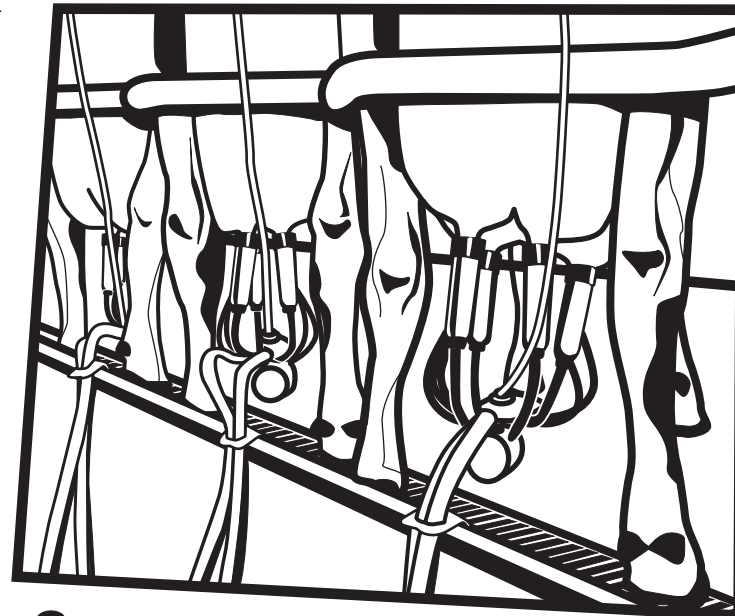
Parents! The creamy goodness and quality nutrition of Greek yogurt starts with the freshest milk. Packed with calcium and other nutrients for strong bones and teeth, Greek yogurt's creamy, tangy goodness generally contains at least twice the protein of regular yogurt thanks to the straining process that is part of the production process. Young children especially need protein to help them stay focused at school.



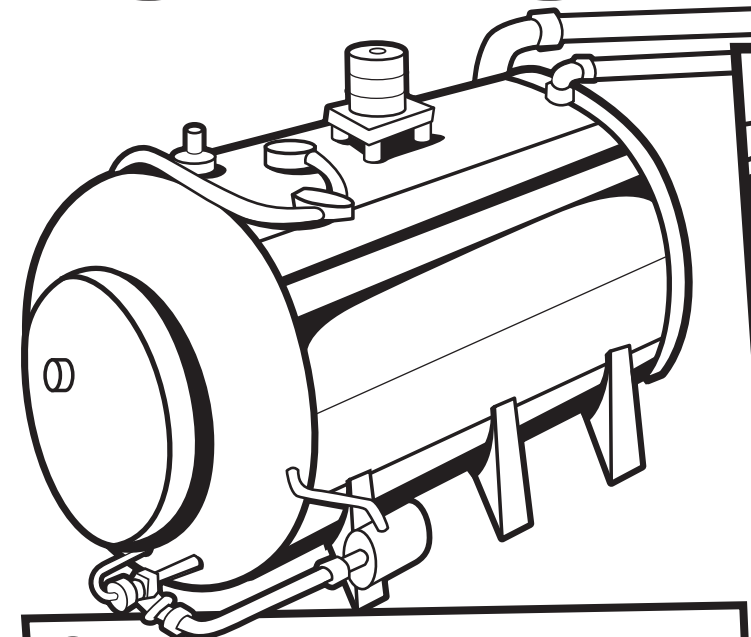
Milk from Cow to You!



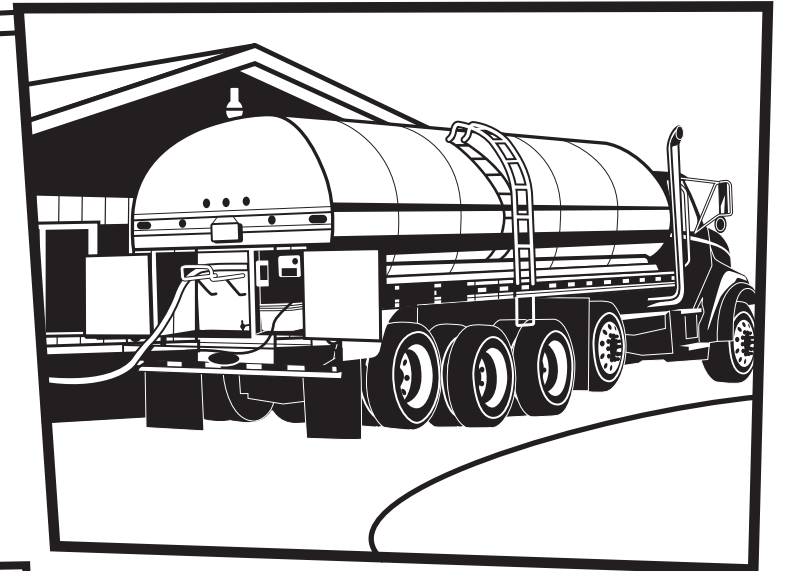
1. Milk comes from healthy, well-fed cows that are raised on dairy farms.



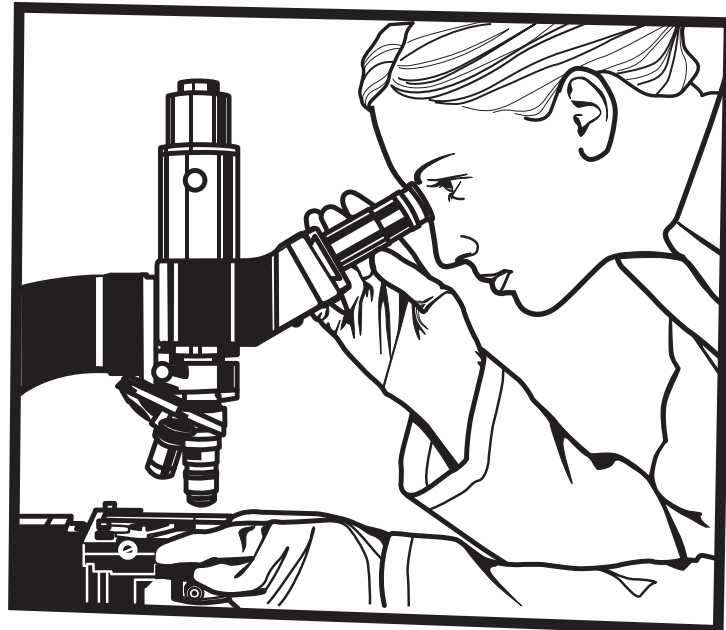
2. To begin milking, a cow's udder is washed before the milking machine is attached. This happens at least two times a day.



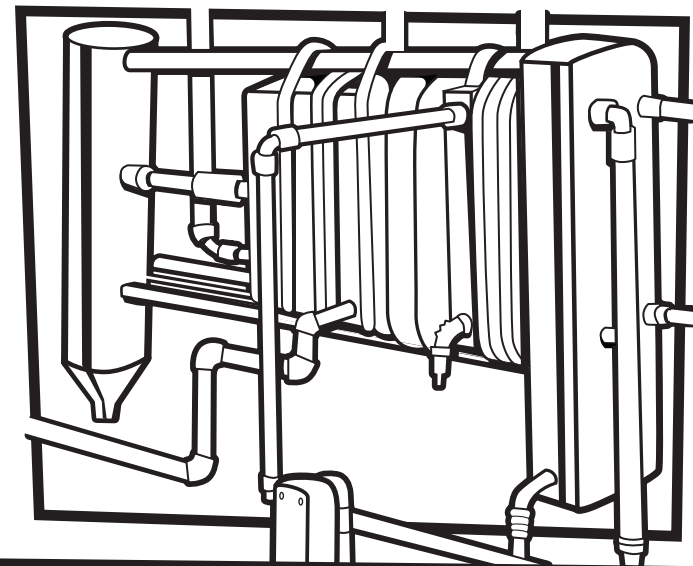
3. Fresh milk from the cow is pumped through a pipe and into an insulated tank, where it is cooled and kept fresh and safe.



4. Each day, a special insulated tanker truck comes to the farm to pick up the cold milk and deliver it to the dairy plant.



5. At the dairy plant, the milk is kept cold and tested many times for quality.



6. Next, the milk is quickly heated, or pasteurized. This is an important step to ensure the milk is safe and wholesome.



7. The milk is then cooled again, put into containers and stored in a refrigerated room until it can be picked up.

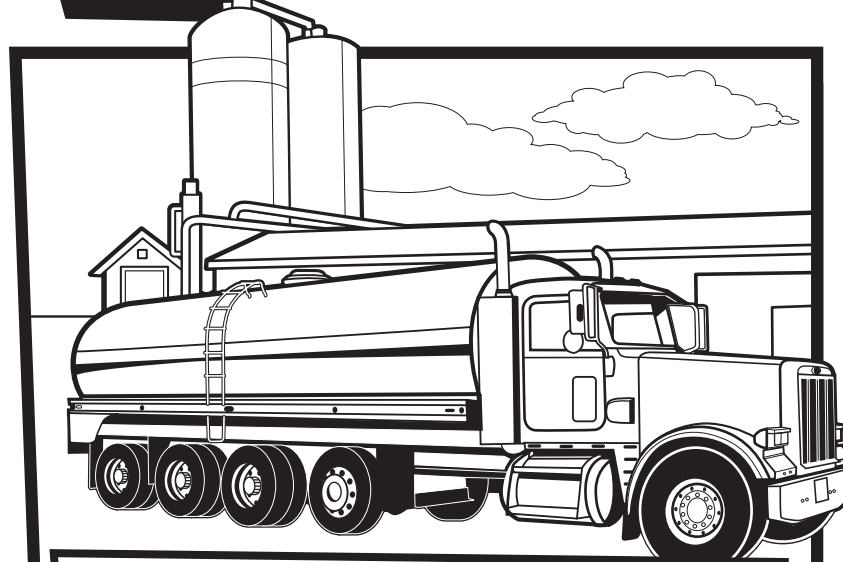


8. Within two days after milking, the milk is loaded onto refrigerated trucks and delivered to schools, restaurants and supermarkets.



How Milk Becomes CHEESE

The Art of Cheesemaking in Wisconsin



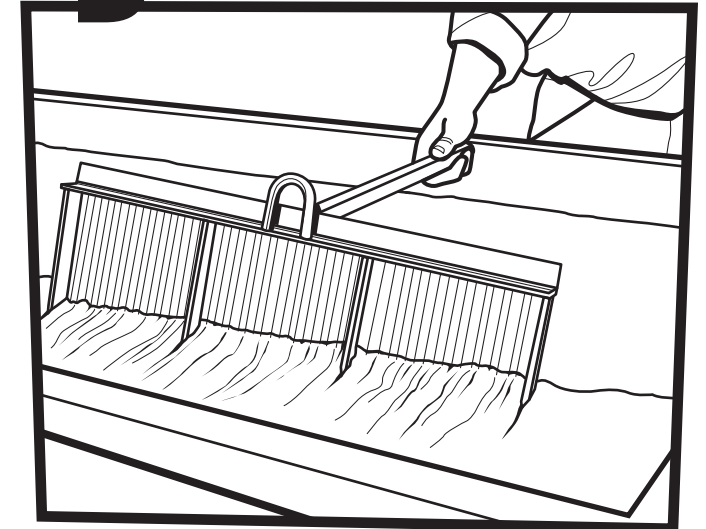
1. Each day insulated tanker trucks pick up top-quality milk from Wisconsin dairy farms and deliver it to cheese plants.



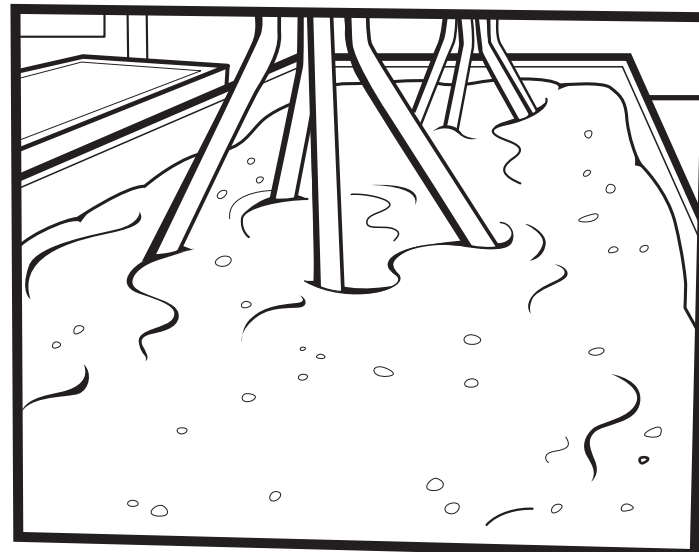
2. Before cheesemaking begins, the milk is carefully tested, weighed and heated, or pasteurized.



3. Milk is pumped into a large vat. Special ingredients, called starter cultures and enzymes, are added. They thicken the milk and give it the desired cheese flavor. Another enzyme, called rennet, is added to make the milk thicker – like custard.



4. Next, cheesemakers begin cutting the custard-like milk into tiny pieces. This separates the liquid, called whey, from the milk solids, called curd.



5. The curd and whey are stirred and cooked until the curd reaches just the right amount of firmness for the type of cheese to be made. The whey is drained and saved for other uses.



6. Depending upon the type of cheese to be made, the curd is salted and then specially handled by the cheesemaker.



7. The curds are pressed into forms and shapes. The cheese is then moved to a curing room where the temperature and humidity are just right to allow the cheese to age properly.

I ♥ WISCONSIN CHEESE



8. When the cheese has been cured for the desired length of time, it is ready to be wrapped and shipped to cheese lovers everywhere!



Discover Dairy Science!

Curricular Standards

GRADE 2 STANDARDS ALIGNMENT

	Activity 1	Activity 2	Activity 3	Poster
Common Core State Standards English/Language Arts: Reading Informational Text				
<u>Key Ideas and Details:</u>				
RI.2.1 Ask and answer questions such as who, what, where, when, why, and how to demonstrate understanding of key details in a text.	x	x	x	x
RI.2.2 Identify the main topic of a multi-paragraph text as well as the focus of specific paragraphs within the text.	x	x	x	x
RI.2.3 Describe the connection between a series of historical events, scientific ideas, or concepts, or steps in technical procedures in a text.	x	x	x	x
<u>Craft and Structure:</u>				
RI.2.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.	x	x	x	x
RI.2.5 Know and use various text features to locate key facts or information in a text efficiently.	x	x	x	x
RI.2.6 Identify the main purpose of a text, including what the authors wants to answer, explain, or describe.	x	x	x	x
<u>Integration of Knowledge and Ideas:</u>				
RI.2.7 Explain how specific images contribute to and clarify a text.	x	x	x	x
National Health Education Standards				
<u>Standard 1</u> Students will comprehend concepts related to health promotion and disease prevention to enhance health.	x	x	x	x
<u>Standard 3</u> Students will demonstrate the ability to access valid information, products, and services to enhance health.	x	x	x	x
<u>Standard 5</u> Students will demonstrate the ability to use decision-making skills to enhance health.	x	x	x	x
National Science Education Standards				
<u>Science as Inquiry</u>				
• Abilities necessary to do scientific inquiry	x	x		
• Understanding about scientific inquiry				
<u>Physical Science</u>				
• Properties of objects and materials	x	x	x	x
<u>Science and Technology</u>				
• Understanding about science and technology	x	x	x	x
<u>Science in Social and Personal Perspectives</u>				
• Personal health	x	x	x	x
• Types of resources	x	x	x	x
• Science and technology in local challenges	x	x	x	x
<u>History and Nature of Science</u>				
• Science as a human endeavor	x	x	x	x

GRADE 3 STANDARDS ALIGNMENT

	Activity 1	Activity 2	Activity 3	Poster
Common Core State Standards English/Language Arts: Reading Informational Text				
<u>Key Ideas and Details:</u>				
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.	x	x	x	x
RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.	x	x	x	x
RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.	x	x	x	x
<u>Craft and Structure:</u>				
RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.	x	x	x	x
RI.3.5 Use text features and search tools to locate information relevant to a given topic efficiently.	x	x	x	x
<u>Integration of Knowledge and Ideas:</u>				
RI.3.7 Use information gained from illustrations and the words in a text to demonstrate understanding of the text.	x	x	x	x
National Health Education Standards				
<u>Standard 1</u> Students will comprehend concepts related to health promotion and disease prevention to enhance health.	x	x	x	x
<u>Standard 3</u> Students will demonstrate the ability to access valid information, products, and services to enhance health.	x	x	x	x
<u>Standard 5</u> Students will demonstrate the ability to use decision-making skills to enhance health.	x	x	x	x
National Science Education Standards				
<u>Science as Inquiry</u>				
• Abilities necessary to do scientific inquiry		x		
• Understanding about scientific inquiry	x	x	x	x
<u>Physical Science</u>				
• Properties of objects and materials	x	x	x	x
<u>Science and Technology</u>				
• Understanding about science and technology	x	x	x	x
<u>Science in Social and Personal Perspectives</u>				
• Personal health	x	x	x	x
• Types of resources	x	x	x	x
• Science and technology in local challenges	x	x	x	x
<u>History and Nature of Science</u>				
• Science as a human endeavor	x			

GRADE 4 STANDARDS ALIGNMENT

	Activity 1	Activity 2	Activity 3	Poster
Common Core State Standards English/Language Arts: Reading Informational Text				
<u>Key Ideas and Details:</u>				
RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.	x	x	x	x
RI.4.2 Determine the main idea of a text and explain how it is supported by key details; summarize the text.	x	x	x	x
RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.	x	x	x	x
<u>Craft and Structure:</u>				
RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.	x	x	x	x
RI.4.5 Describe the overall structure of events, ideas, concepts, or information in a text or part of a text.	x	x	x	x
<u>Integration of Knowledge and Ideas:</u>				
RI.4.7 Interpret information presented visually, orally, or quantitatively and explain how the information contributes to an understanding of the text in which it appears.	x	x	x	x
National Health Education Standards				
<u>Standard 1</u> Students will comprehend concepts related to health promotion and disease prevention to enhance health.	x	x	x	x
<u>Standard 3</u> Students will demonstrate the ability to access valid information, products, and services to enhance health.	x	x	x	x
<u>Standard 5</u> Students will demonstrate the ability to use decision-making skills to enhance health.	x	x	x	x
National Science Education Standards				
<u>Science as Inquiry</u>				
• Abilities necessary to do scientific inquiry		x		
• Understanding about scientific inquiry	x	x	x	x
<u>Physical Science</u>				
• Properties of objects and materials	x	x	x	x
<u>Science and Technology</u>				
• Understanding about science and technology	x	x	x	x
<u>Science in Social and Personal Perspectives</u>				
• Personal health	x	x	x	x
• Types of resources	x	x	x	x
• Science and technology in local challenges	x	x	x	x
<u>History and Nature of Science</u>				
• Science as a human endeavor	x			