

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.

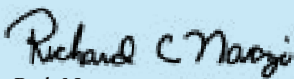
Milk and milk products like cheese and yogurt are important components of a balanced, healthy diet for children. American Dairy Association North East (ADANE) and the curriculum specialists at Young Minds Inspired (YMI) are pleased to bring you this free educational program that will help students discover 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.

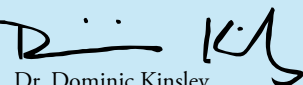
We hope you will share this program with other teachers in your school. Although the materials are copyrighted, you may make as many copies as needed for educational purposes.

Please use the enclosed reply card or comment at ymiclassroom.com/feedback-adane-dairy-science to provide feedback. We look forward to hearing from you.


Sincerely,



Rick Naczi
CEO
American Dairy Association
North East



Dr. Dominic Kinsley
Editor in Chief
Young Minds Inspired



For questions, contact us 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 colorful classroom wall poster.
- A reply card for your comments, or comment online at ymiclassroom.com/feedback-adane-dairy-science.

How to Use This Program

Photocopy the teacher's guide and distribute the activity sheets for class and take-home use. Refer to the poster for each activity, having students read the processing steps aloud if you wish. Visit ymiclassroom.com/adane-dairy-science 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 (visit ymiclassroom.com/adane-farm-to-table for background on ADANE farmers and dairy production). Then use the poster 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-Pel/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 poster, 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: American, 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 on the poster, directing students to order the images on the activity sheet and write sentences about them. Have them share the Yogurt Quick Bites with parents.

- Answers:** Clockwise from top center photo, with possible student sentences:
6. Greek yogurt is packaged and delivered to grocery stores.
 3. The whey is separated from the cultured milk and used for livestock feed.
 2. Live bacteria cultures are added to skim milk to make yogurt.
 4. Fruit is put into cups before the yogurt is added.
 5. Yogurt is sent to a refrigerated warehouse.

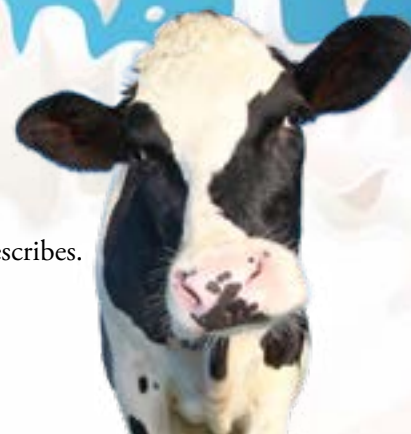
Resources

- ymiclassroom.com/adane-dairy-science
- American Dairy Association North East: www.americandairy.com
- Upstate Farms: upstatefarms.com
- Cabot Cheese: cabotcheese.coop/cheese-making-process
- Cabot pre-K to grade 5 lessons: cabotcheese.coop/education-center
- Chobani Yogurt: chobani.com
- USDA MyPlate: choosemyplate.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, and zinc.



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
- 9
- 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. The farmers of American Dairy Association North East (ADANE) 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 there are several varieties from which you can choose. Try unscrambling the names of these favorites:

1. meranciA _ _ e _ _ _ _ _ n

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 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 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. ADANE 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.

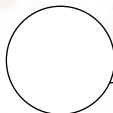
Activity

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? Yes, it starts with milk from local farmers, but then it goes through quite a process. Can you put the steps of that process in the correct order?

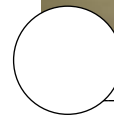
Use the poster to number these pictures that show how Greek yogurt is made. Then write a sentence to describe each step.











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.

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.





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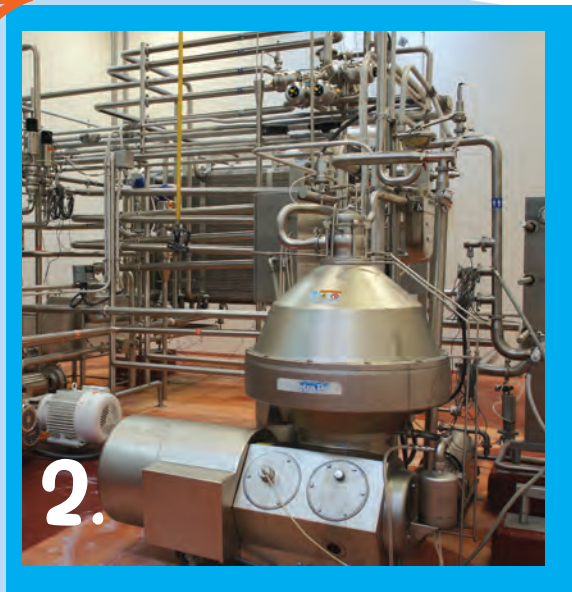
Learn how the nutrition from milk is converted into delicious cheese and yummy yogurt!

Milk Production Process



1.

Upstate Farms in Buffalo, NY, makes proper care of its cows a top priority so the milk for your school lunch and meals at home is the freshest it can be.



2.

When milk arrives at the processing plant, a separator removes the cream from the milk and then the milk is rebled into skim, low fat, and whole categories.



3.

Next, the milk is homogenized by breaking down fat globules so they stay suspended evenly throughout the milk.



4.

The milk is pasteurized by heating it to a high temperature for a short time to kill any potentially harmful bacteria and to help keep it from spoiling. The milk is then packaged for delivery.



5.

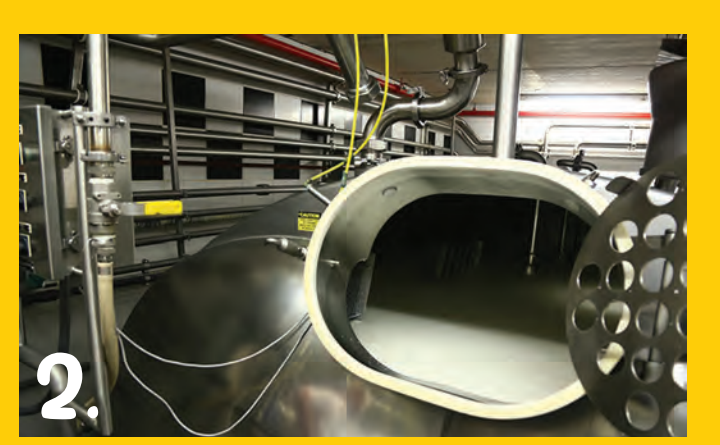
Milk is delivered to your local grocery store, fresh from the cow to you, all within 2-3 days!

Cheese Production Process



1.

Farms providing milk for Cabot cheese follow strict safety and quality standards before their milk is sent on to be processed into cheese.



2.

After the milk is trucked to the cheese processing plant, it is pasteurized, then poured into a cooking vat, where "good" bacteria are added as the milk is heated, allowing the bacteria to grow.



3.

A special enzyme called rennet is added to the milk, which helps the "good" bacteria cause a chemical reaction that separates the milk proteins into liquids (whey) and solids (curds).



4.

The whey is drained off and used to make protein powder for athletes.



5.

Salt and other ingredients for specialty cheese are added to the curds. Machines pack the curds into large blocks of cheese, which are then aged in a temperature-controlled warehouse.



6.

Cheese is packaged and delivered to your local grocery store, ready for you to enjoy in its many delicious varieties!

Yogurt Production Process



1.

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



2.

At the plant, after the milk is separated, the skim milk is pasteurized. Then five live bacteria cultures are added to the skim milk. These cultures ferment the sugars naturally found in milk and turn the milk into yogurt.



3.

The cultured milk is then put through a whey separator, which removes excess liquid, giving Greek yogurt its rich, creamy texture and high protein count. The nutrient-rich whey is returned to area farmers for livestock feed and crops, bringing the process full circle.



4.

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.



5.

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



6.

From there, it is shipped all over the United States!

