

**Purpose:** Students will explore the processing involved in taking a raw agricultural product – milk and converting it into ice cream.

**Time:** 45 minutes

**Level:** 2 – easily adapted to other grades

**Materials:**

- Large Sheets of poster board or bulletin board paper
- Markers or crayons
- MyPlate Diagram  
[www.choosemyplate.gov](http://www.choosemyplate.gov)
- Dairy foods samples (or empty containers that once held dairy foods, or pictures)
- Ice Cream in a Bag recipe (one for each student)
- Milk or cream
- ½ cup measuring cup
- Sugar
- 1 Tbsp. measuring spoon
- Vanilla
- 1 tsp. measuring spoon
- Salt
- 1/3 cup measuring cup
- Ice
- Large (gallon size) zip-lock bags
- Small (sandwich size) zip lock bags
- Spoons
- Newspaper or paper towels
- Wet wipes for clean-up

OPTIONAL: Extra Cheese Please: Mozzarella's Journey from Cow to Pizza by Cris Peterson  
*This book is available through the Minnesota Agriculture in the Classroom Book Bundle*  
<http://www.mda.state.mn.us/en/kids/childrens-lit-bundle.aspx>



## Ice Cream in a Bag

### Minnesota/Common Core Language Arts Standards and Benchmarks

2.2.3.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.

### Minnesota Science Standards and Benchmarks

2.2.1.2.1 The physical properties of materials can be changed, but not all materials respond the same way to what is done to them.

### Minnesota Health Education Standards and Benchmarks

2.1 Students will comprehend concepts related to health promotion and disease prevention to enhance health

## Background

After a dairy cow gives birth to a calf, the cow begins producing milk. This is called “freshening.” Cows are milked by machine usually twice a day, every 12 hours. Cows are milked for 305 days or about 10 months. Then the cow’s body needs to rest and store nutrients before she has her next calf. After the calf is born the cow will resume giving milk.

The average dairy cow in Minnesota produces 19,400 pounds of milk in 305 days. That’s nearly 2,255 gallons of milk. The milk is stored in refrigerated tanks at the dairy farm until it is picked up by a refrigerated tank truck and taken to a dairy processing plant. There the milk is homogenized and pasteurized. If the milk will be sold as fluid milk it is put into gallon jugs or smaller cartons. If the milk will be used in making the wide variety of other dairy products it will be further processed. Refrigerated trucks deliver the packaged milk and dairy products to grocery stores around the United States.

Dairy Product Facts: 99% of all households in the United States purchase milk. The average American consumes almost 25 gallons of milk a year. Milk and other dairy products provide 72% of the calcium in the United States’ food supply plus energy, protein and vitamins. Chocolate milk is made by adding sweetener and chocolate or cocoa to white milk. Cheese, butter, ice cream, yogurt and sour cream are also made from milk. One cow’s daily production of milk produces 8 gallons of fluid milk, or 3.3 pounds of butter or 7 pounds of cheese.

## Procedure

1. Display the book *Extra Cheese Please: Mozzarella’s Journey from Cow to Pizza*. Tell your students to pay very close attention to how milk gets from a cow to the food we eat. Read the book to the students. If the book is not available, use the **Background** information to explain the process milk follows from cow to dairy product.
2. Divide students into groups of 3-4. Give each group some markers or crayons and tell them to write and/or draw the steps that milk passes through from the cow to a food that we eat on the large sheet of paper.
3. When groups are complete (allow about 10 minutes) have each group show and describe the steps. Hang the posters somewhere so all students can see them and you can refer back to them. After all groups have shared with the class, ask the students:
  - a. What steps did all groups include?

- b. What step do you think is most important?
  - c. What machines and technology are important in milk and dairy product production?
  - d. What people are important in milk and dairy food production?
  - e. Besides cheese for pizza, what other foods can be made from milk? (As students start to name dairy foods bring out sample products/examples that you have collected)
4. Show the students a variety of dairy foods (or empty containers or pictures) – add any that they did not mention in the previous step of the procedure. Ask students:
    - a. Why are these products important to eat? (*Intake of dairy products is linked to improved bone health, and may reduce the risk of osteoporosis. Dairy products are especially important to bone health during childhood and adolescence, when bone mass is being built.*)
    - b. How many dairy foods should you eat each day? (*2-3 cups each day. Use the MyPlate diagram and website as a reference for nutritional information.*)
  5. Tell students that today you are going to make a dairy product that is healthy because it contains milk, but it should be eaten in small amounts because it also has more sugar than most dairy foods. You are going to make ICE CREAM!
  6. Tell the students to look back at the posters they made earlier. Which steps do they think will be the same for making cheese and ice cream? Which steps do they think will be different?
  7. Hand out an Ice Cream in a Bag recipe ½ sheet to each student.
  8. Set up 5 stations around your room. The stations are:
    - a. Milk with a ½ cup measuring cup
    - b. Sugar with a 1 tablespoon measuring spoon
    - c. Vanilla with a 1 teaspoon measuring spoon
    - d. Salt with 1/3 cup measuring cup
    - e. Ice with gallon zip lock bags
 Include a recipe at each station so students can see how much of each ingredient is needed.
  9. Model to the students how to add all of the ingredients and follow the recipe:
    - a. Add the milk, sugar and vanilla to the sandwich bag and then seal it tight.
    - b. Fill the gallon zip lock bag 2/3 full of ice and then add the salt.
    - c. Place the sealed sandwich bag in the large bag.
    - d. Close the large bag and then shake, shake, shake!

*Teaching Tip: Be sure to make it clear to your students that the order of adding the ingredients does not matter.*

*Also, tell the students to try not to open and close their sandwich bag too many times because then it won't stay closed when they want it to!*

10. Divide your students into five different groups and assign each group a station to start at. Give each student a sandwich bag. *Again, remind students that milk, sugar, and vanilla go in the small bag. Ice and salt go in the large bag. Also remind students that the order that they get their ingredients does not matter!*

Tell students that each of them needs to be responsible and add the ingredient at each station. You will tell them when they can rotate to the next station.

11. Monitor the groups and help where needed. Be sure that all group members have the correct ingredient before you tell them to rotate. If all is well, each rotation should take around 5 min – for a total of 25 minutes to get all ingredients.
12. Students must now shake. The bag can be wrapped in newspaper or paper towels if their fingers get cold.

*Teaching Tip: Use heavy duty (possibly freezer bags) bags to prevent leaks! It is recommended to shake the ice cream outside or in an uncarpeted area so if leaks do happen, they will be easy to clean.*

13. After ten minutes have the students check their sandwich bag by squeezing gently. If the milk, sugar and vanilla mixture has turned from a liquid to a soft solid, the ice cream is ready to eat –if it is still a liquid, shake some more.
14. If the ice cream is ready, provide each student with a spoon to eat and enjoy!

### ***Additional Activities***

- Create a mathematical problem for students to solve or graph. Some ideas:
  - Have students estimate the amount of milk needed for the experiment. Then calculate the actual amount used.
  - Calculate the cost for the milk used by the class and also per student.
  - Have each student record how much time was needed to change the milk, sugar and vanilla mixture to ice cream. Calculate the class average for this time.
- Have students research the history of ice cream and present their findings to the class.
- Have students work in teams to research different companies that produce and sell ice cream (Kemps, Blue Bunny, Schwan's, Ben and Jerry's, etc). Assist students in finding information about the company's location, ingredients used, flavors, marketing, and career opportunities within the company

*In accordance with the Americans with Disabilities Act, this information is available in alternative forms of communication upon request by calling 651/201-6000. TTY users can call the Minnesota Relay Service at 711 or 1-800-627-3529. The MDA is an equal opportunity employer and provider.*

## Ice cream in a Bag

### Ingredients

$\frac{1}{2}$  cup milk or cream  
2 tablespoons sugar  
1 teaspoon vanilla  
 $\frac{1}{3}$  cup salt  
Ice

1 gallon size zip-lock bag  
1 sandwich size zip-lock bag

### Procedure

1. Add milk, sugar, and vanilla to the sandwich bag and seal.
2. Fill the large zip-lock bag about  $\frac{2}{3}$  full of ice.
3. Add approximately  $\frac{1}{3}$  cup of salt to the ice in the large bag.
4. Place the sealed sandwich bag containing the milk, sugar and vanilla in the large bag containing ice and salt.
5. Close the large bag and shake!

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