Say Cheese!

Objective

Students make soft cheese from milk and rennet or from milk and lemon juice.

Background

Cheese has been a popular food for centuries. According to legend it was discovered several thousand years ago by an Arabian traveler who placed milk into a pouch made of a sheep's stomach. During the day's journey, the combined action of the sun's heat and the enzymes in the lining of the stomach changed the milk into a snowy white curd of cheese and the thin liquid called whey.

Today some cheeses are made by taking rennin from the stomach of a calf and adding it to milk. Rennin is a natural complex of enzyme found in mammalian stomachs that is used to digest mother's milk. When added to milk, it causes a semisolid mass (curd) to form and separate from the liquid (whey). The whey left over from the cheese-making process is used in animal feed or to make ice cream.

When you make cottage cheese, you are making a culture. The warm milk provides the warm and wet environment the bacteria need to grow.

Different strains of microbes are used to produce different kinds of cheese. Factories produce cheese in 500-pound blocks. When it is first made, cheese has little flavor. It takes three months to make mild cheese and at least a year to make sharp cheese. Manufacturers keep the cheese in the refrigerator until it is ready. Then they cut off the mold that grows on the surface. All cheese is naturally white. Yellow cheeses are yellow because color is added to them.

Science Activity

1. Write the following on the chalk board: "Little Miss Muffet sat on a tuffet, eating her curds and whey." Students will explain what Miss Muffet was eating in the nursery rhyme.
2. Read and discuss background and vocabulary.
3. Use one or both of the recipes included with this lesson to demonstrate cheesemaking for students. Older students may work in groups to make the cheese themselves.
4. While students wait for the results of the cheesemaking activity, hand out vocabulary worksheets. Students will work in groups to find definitions for the vocabulary words.
5. Students will use the worksheet to record their observations as they conduct the experiment or watch the demonstration.

Oklahoma Academic Standards

KINDERGARTEN
Science Process—1.2,3
Physical Science—1.1

GRADE 1
Science Process—1.2; 2.1; 3.1,2,3,4; 4.3
Physical Science—1.1

GRADE 2
Science Process—1.1,2; 2.1; 3.1,2,3,4; 4.3

GRADE 3
Science Process—1.1,2; 2.1; 3.1,2,3,4; 4.3

GRADE 4
Science Process—1.1,2; 2.1; 3.1,2,3,4; 4.3,4

GRADE 5
Science Process—1.1,2; 2.1; 3.1,2,3,4; 4.3,4

GRADE 6
Science Process—1.1,2,3; 2.1; 3.1,2,3,4,5,6; 4.1,3,4,5; 5.1,3,4
Physical Science—1.1

6. Students will describe the finished product. How is it similar to the dairy products with which they are familiar? Students will record their observations on the student worksheets.

Extra Reading

Alphin, Elaine Marie, and Elaine Verstraete, *Germ Hunter: A Story About Louis Pasteur (Creative Minds Biography),* Carolrhoda, 2003.

Basel, Roberta, *From Milk to Cheese*, Capstone, 2005.

Birmingham, Christian, *The Fight Against Microbes: Pasteur's Story (Science Stories),* Matthew Price, 2006.

Fandel, Jennifer, *Louis Pasteur and Pasteurization*, Capstone, 2007.

Llewellyn, Claire, *Milk: What's for Lunch,* Franklin Watts, 2003.

Peterson, Cris, *Clarabelle: Making Milk and So Much More*, Boyds Mills, 2007.

Reilly, Kathleen, and Samuel Carbaugh, *Food: 25 Amazing Projects: Investigate the History and Science of What We Eat (Build It Yourself Series)*, Nomad, 2010.

Solheim, James, and Eric Brace, *It's Disgusting and We Ate It! True Food Facts from Around the World and Throughout History*, Aladdin, 2001.

Taus-Bolstad, Stacy, *From Grass to Milk,* Lerner, 2004.

Zemlicka, Shannon, *From Milk to Cheese*, Lerner, 2003.

Vocabulary

bacteria—tiny organisms

coagulate—to cause a liquid to change into a soft, semisolid, or solid mass

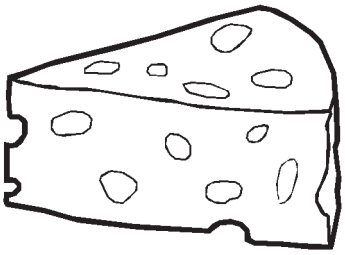
culture—A colony of bacteria or other living matter grown in a specially-prepared nutrient medium

curd—The thick substance that forms when milk ferments

enzyme—a protein produced by a living organism that speeds up a chemical process

rennin—a liquid extracted from enzymes found in a calf's stomach

Cheese Recipes



With Rennet

1 gallon homogenized milk, at room temperature
saucepan
room thermometer
liquid thermometer
1 rennet tablet (Available in most grocery stores. Ask your grocer.)
1⁄4 cup lukewarm water
large colander
cheesecloth
large bowl
long knife

1. Pour milk into a saucepan and allow it to reach room temperature
2. Crush the rennet tablet, and dissolve it in the 1⁄4 cup water, then stir it into the milk.
3. Check the mixture about every 30 minutes and record your observations on your worksheet. After 1-2 hours the mixture should begin to separate. (If you want to speed up the process, add 1/2 cup vinegar.)
4. Pour off the whey, and cut the curd into 1⁄2 inch cubes with a long knife.
5. Place the colander in the bowl, and line the colander with cheesecloth. Pour the mixture through. Drain thoroughly and squeeze out the moisture.

With Lemon

1gallon whole milk
Juice of 4-6 Lemons, about 1/2 cup
1 tsp. salt

1. In a large pot over medium-low heat, gently bring the milk to 175 degrees Fahrenheit. Be sure to stir frequently to keep from scalding the milk.
2. Turn off the heat. Add about 1/4 cup of lemon juice and stir well. Let sit for 15 minutes.
3. After 15 minutes, the milk should be curdled, and the whey (the liquid) should be clear. If it's still milky/cloudy, add more lemon juice, stir gently, and give it a few more minutes. Depending on the acidity of the lemon juice, it may take quite a bit more. It won't hurt to use more, but if you use more than necessary, the final result will have a stronger lemon flavor.
4. Line a colander butter muslin, and gently pour the curds into it. Allow it to drain for a few minutes, and then tie the corners of the muslin together to form a bag.
5. Hang the curds to drain.
6. Allow to drain for 1-2 hours, until it stops dripping and has firmed up a bit. (If you're in a hurry you can speed the process somewhat by squeezing the bag gently from the top down).
7. Remove the cheese and mix in the salt and fresh, chopped herbs, if desired. The cheese will keep in the refrigerator for 1-2 weeks.

Oklahoma Ag in the Classroom is a program of the Oklahoma Cooperative Extension Service, the Oklahoma Department of Agriculture, Food and Forestry and the Oklahoma State Department of Education.

Name_____

Say Cheese

Find the definition of these words. Draw a line from the word to the correct definition.

coagulate	a liquid extracted from enzymes found in a calf's stomach
enzyme	a colony of Bacteria or other living matter grown in a specially-prepared nutrient medium
curd	to cause a liquid to change into a soft, semisolid or solid mass
bacteria	the thick substance that forms when milk ferments
culture	the watery substance that separates from milk as cheese is made
rennin	a protein produced by a living organism that sppeds up a chemical process
whey	tiny organisms

Write what you observe

Room temperature_____ Temperature of the milk_____

Write three words that describe how the milk looked at the beginning of the experiment.

1._____ 2._____ 3._____

How long did it take for the milk to reach room temperature?_____

Rennet is the solid form of rennin. Read your definition of rennin above and predict what will happen after you add rennin to the milk.

Describe the appearance of the milk

At the beginning

After 30 minutes

After two hours

Write three words that describe how the milk looked at the end of the experiment.

1._____ 2._____ 3._____

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