



Food-Science — Making Butter

Time required:

45 minutes

Lesson Objectives:

By participating in this lesson, youth will:

- Increase knowledge and improve skills and attitudes in science and technology.
- Develop skills in acquiring, analyzing, and using science and technological information.
- Practice teamwork skills to obtain a common goal.
- Develop awareness of dairy production.



Video Link:

<https://www.youtube.com/watch?v=e1LYWF8T8g0>

Introduction

Milk is one of the best foods for promoting and maintaining good health. Milk and milk products provide varying amounts of nutrients like protein, vitamins and minerals, especially calcium, which is needed by people of all ages to keep bones and teeth strong and healthy.

The milk that you drink, whether it's whole, low-fat, or skim, is sweet milk (unfermented milk). Sweet milk contains the sugar lactose. As milk ages or is not refrigerated, fermentation can occur. Bacteria responsible for fermentation multiply more quickly at warm temperatures. They convert the lactose to lactic acid. Because acids taste sour, fermented milk is also called sour milk. Sour milk isn't all bad. Sour milk is what gives us yogurt and cheese.

Yogurt is milk that has been soured by two special bacteria, *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. These bacteria curdle the milk and give it a particular flavor. The curds and whey do not separate but form a thick custardlike product.

Cheese is the curd of milk that has been specially prepared. There are over 2,000 varieties of cheese, some hard or soft, and some with strong or mild flavors. The different types of cheeses come from the same milk, whether from goat, sheep, or buffalo. But what makes them different is the types of microbes used to prepare them as well as the process by which the curds and whey are separated. The processes include aging, added ingredients, treatment of curd, temperature, whether enzymes are used, whether molds introduced, and other processes.

Butter is milk fat that has been separated from cream. Butter is a source of vitamin A and certain essential fatty acids. We keep butter in closed containers because butter will pick up flavors from other foods that may be found in the refrigerator. For instance, if you have a sliced onion in the refrigerator, the butter will pick up an onion flavor.

Engagement:

- Ask students how milk is measured at the dairy. (By pounds.)
- Ask students if they know how much milk is in a pound of butter. (Approximately 21.2 pounds.)
- Ask students what would make milk stay fresh longer. (A pinch of salt.)

Connection to Louisiana Agriculture

In 2018, the Louisiana dairy industry had 92 dairy farms located in nine parishes that produced a total of 151.4 million pounds. The parishes of Tangipahoa, Washington, and St. Helena, in the southeastern part of the state, account for 81% of the dairy cows and milk production in the state.

Materials Needed:

- Heavy whipping cream
- Container
- Paper towels
- Crackers (optional)
- Popsicle sticks to spread butter on crackers (optional)



Activity 1 - Making Butter

1. Allow the cream (make sure you use heavy whipping cream) to sit in its closed container for 30 minutes, but no longer, to reach room temperature.
2. Divide the students into smaller groups of four students per group.
3. Measure 2 tablespoons of room-temperature heavy whipping cream into each 2-ounce plastic condiment container.
4. Each group of four gets one container.
5. Each member of the group should shake the container for one minute and then pass it to the next member.
6. If liquid starts to separate from solids, open the container and pour out as much of the liquid as possible.
7. The solid matter remaining in the container is the butter!
8. Optional: Distribute crackers and popsicle sticks and allow members to spread butter on crackers and taste.

What Happened?

Heavy cream has a good deal of fat in it. That's why it can make such delicious items. By shaking the cream, the fat molecules begin to separate from the liquid. The more the cream is shaken, the more these fat molecules clump together, forming a solid, which is the butter.

As the heavy whipping cream is shaken, the fat molecules get out of position and clump together, eventually clumping so much that butter forms. At this point the fat molecules have clearly separated from the liquid in the cream. When molecules are heated, they move faster because they have more energy.

Share/Process/Apply

- What factors can affect the outcome of the experiment?
 - What happened?
 - How did it feel to make butter?
 - What was the most difficult part of making butter?
 - What problems were there?
 - What challenge did you or your group experience when making the butter?
 - How well did your group members work together?
 - How can you use something you learned today in the future?
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Resources:

The Butter Side of Moo, 4- H Lesson Kit
2018 Ag Summary, LSU AgCenter
<https://www.scientificamerican.com/article/bring-science-home-shaking-butter/>

Louisiana Standards Covered In This Lesson

5-PS1-1, 5-PS1-2, 5-PS1-4, 5-PS3-1
ELA ANCHOR STANDARD SL-1, SL-2, SL-3



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