



## Making Butter

### OVERVIEW

In this activity, students will learn about the unique properties of milk and cream. By vigorously shaking heavy table cream, students can make butter!

### TOPIC AREA(S)

Chemistry  
Food Science

### GRADE LEVEL

Grade 5/6  
Can be adapted for any grade

### QUESTIONS PRIOR TO THE LESSON/GETTING EXCITED

- What is a liquid? What is a solid?
- How might a liquid become a solid? (typically this would be freezing)
- Do you enjoy drinking milk? What kind of milk do you drink?
- What is the difference between milk and cream?

### BACKGROUND INFORMATION FOR INSTRUCTORS (INCLUDE QUESTIONS W/ ANSWERS)

A **liquid** is a substance that takes the shape of its container; its particles can move or slide past one another. Milk is a liquid!

A **solid** is a substance that retains a fixed volume and shape; there is very little space between its particles. Though melted butter is a liquid, butter is typically seen as a solid.

#### History of Butter

Butter has been around for thousands of years! A long time ago, before we used larger industrial factories, butter was produced in bags made from animal skins

There's an old rumour explaining the first time butter was ever made. It says that a man was travelling on his horse with a sheepskin's bag of milk tied to the horse. After his day of travelling, he went to get the milk only to find it had turned to butter! What happened to the milk?

The travelling horse would have been moving up and down, shaking the bag of milk all around!

#### More About Milk

Milk contains fat. Cream contains even more fat! When you look at a container of milk or cream, there will be a number written, followed by "m.f". This stands for **milk fat**. Different dairy products contain different amounts of milk fat. For example, there is 1% milk, 2% milk, light cream which is 5% milk fat, and what we will be using today 35% milk fat cream.

Milk and cream are unique because their fat molecules are uniformly suspended throughout the surrounding liquid. This is called a **colloid substance**.



### **Making Shaking Butter!**

By shaking the cream, we incorporate tiny air bubbles into the fatty cream, this makes it look whipped. It may take a long time for the cream to thicken, this will depend on the intensity of the shaking! After a while, the cream will become so thick that it will feel almost impossible to shake!

Take breaks as necessary, or ask a family member or friend to help out!

Although fat molecules are relatively stable, all this shaking causes them to become unstable. All of this smashing around damages the walls of the fat molecules and because these molecules don't like the water surrounding them, they clump to each other. The water and the fat don't mix... so the **water separates from the fat** and suddenly there will be liquid sloshing around your jar!

By the end of all the shaking, you will be able to see the **separated fat (the butter) and the thin buttermilk liquid.**

Making butter is quite a workout, but with patience and perseverance, you can achieve an impressive, and delicious result!

<b>RELEVANCE TO THE CURRICULUM</b>			
<b>Grade 1 and 2</b>	<b>Grade 3 and 4</b>	<b>Grade 5 and 6</b>	<b>Grade 7 and 8</b>
€ Needs & Characteristics of Living Things	€ Growth and Changes in Plants	€ Human Organ Systems	€ Interactions in the Environment
€ Growth and Changes in Animals	€ Habitats and Communities	€ Biodiversity	€ Cells
€ Materials, Objects and Everyday Structures	€ Strong and Stable Structures	€ Forces Acting on Structures and Mechanisms	€ Form and Function
€ Movement	€ Pulleys and Gears	€ Flight	€ Systems in Action
€ Energy in Our Lives	€ Forces Causing Movement	€ <b>Properties of and Changes in Matter</b>	€ <b>Pure Substances and Mixtures</b>
€ <b>Properties of Liquids and Solids</b>	€ Light and Sound	€ Electricity and Electrical Devices	€ Fluids
€ Daily and Seasonal Changes	€ Soils in the Environment	€ Conservation of Energy and Resources	€ Heat in the Environment
€ Air and Water in the Environment	€ Rocks and Minerals	€ Space	€ Water Systems



### **MATERIALS (SPECIFY WHETHER PER CAMPER, GROUP OR CLASS)**

#### **Per student/camper:**

- one jar or small container
- approximately one cup of 35% whipping cream (heavy table cream)

### **SAFETY CONSIDERATIONS**

As always, exercise caution when handling glass (if using a glass jar).

As well, be sure to have a firm hold on the jar or container, so it doesn't fly out of your hand and hit something or someone!

### **PROCEDURE**

Procedurally, this experiment is very straightforward!

1. Pour the heavy table cream into the jar (or other container)
2. Shake!
  - a. Cream will eventually develop a 'whipped' appearance and become very thick, difficult to shake.
  - b. Return to shaking the cream, until you can feel/see the separation of the liquid and solid portions
3. Using a strainer, filter the thin buttermilk from the solid butter.
4. Eat the butter! Enjoy it on your morning toast, or as part of a recipe!

Refer to background information for more details regarding the transformation.



## REFERENCES

<https://www.chem.purdue.edu/gchelp/liquids/character.html>

<https://littlebinsforlittlehands.com/make-homemade-butter-thanksgiving-edible-science/>

<https://www.scientificamerican.com/article/bring-science-home-shaking-butter/>

<https://www.serious-eats.com/2014/10/the-science-of-whipped-cream-butter-creme-fraiche.html>