



Make & Taste **DAIRY**



Butter (Grades 3-5)

Lesson Activity

LESSON OVERVIEW:

During this lesson, students will be introduced to both the history and science behind the process of turning heavy whipping cream (which comes from milk) into butter. Participants will make butter and discover how they can use their senses by adding different ingredients. They will also learn ways to use butter with other nutrient-rich foods.

LESSON MATERIALS NEEDED:

*Ingredients for each work station (3-5 students)**

- 2/3 cup of heavy whipping cream

Options for sensory testing:

- Herbs - rosemary, basil, thyme, garlic, etc.
- Seasonings - cinnamon, nutmeg, lemon zest, etc.
- Whole wheat crackers for tasting

Tools for each work station (3-5 students)

- Measuring cup
- Container with a tight fitting lid
- Fine mesh strainer
- Large bowl
- Spoons, plates or bowls for tasting

LESSON OBJECTIVES:

During this lesson, students will:

- Become familiar with the history of butter
- Explain the basic science of how heavy whipping cream can be made into butter
- Follow a recipe to make butter
- Follow a simple recipe to make mozzarella cheese
- Participate in a tasting activity to test their senses (sweet, spicy, savory, etc.)
- List nutrient-rich foods that can be paired with butter

ACADEMIC INTEGRATION

- Science
- History
- Language Arts



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Leader Background



WHAT IS BUTTER?

Quality butter begins with one key ingredient – quality milk. Dairy farmers make it a top priority to ensure milk is safe and nutritious by providing excellent care of their animals. Dairy farmers care for their cows and calves by providing a nutritious diet, good medical care and healthy living conditions.

Butter is a product made from the solid components in milk (fat and protein) by churning the fat from milk until it solidifies. Butter usually consists of approximately 80% fat, 15% water, and 5% protein. The unique mixture of fats allow it to stay solid in the refrigerator and at room temperature, while melting at approximately 90°F.

Butter has a rich flavor and is generally used as a spread on bread products, a condiment on cooked vegetables and pasta and is used as an ingredient in cooking, baking, sauce making, and pan frying.

HOW IS BUTTER MADE?

Traditional butter-making process begins with cream. The cream is the higher-butterfat layer skimmed from the top of milk before homogenization. In un-homogenized milk, the fat, which is less dense, will eventually rise to the top. The cream used to make the butter is pasteurized, by first being heated to kill any pathogens and to prevent spoilage (all butter in the U.S. is pasteurized).

To make butter, the cream is agitated (stirred up) so that the fat molecules get shaken out of position and clump together. After enough agitation, the fat molecules begin sticking together and separating from the liquid. When the fat molecules have clearly separated from the liquid this liquid can be removed and made into buttermilk.

Fun Fact: It takes 21.2 pounds (approximately 2.5 gallons) of milk to make one pound of butter.

HISTORY OF BUTTER

Early records indicate butter was first used anywhere from 2,000-4,000 BC. The word butter comes from bou-tyron, which means "cowcheese" in Greek. Many believe that ancient nomadic people first discovered the miracle of butter. It is thought that while traveling long distances, nomads would attach sacks containing milk to their pack animals and the cream was eventually churned into butter.



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Making & Tasting



MAKE YOUR OWN BUTTER

Number of participants per group: 3-5

Ingredients

2/3 cup of heavy whipping cream

Options for sensory testing:

Herbs - rosemary, basil, thyme, garlic, etc.

Seasonings - cinnamon, nutmeg, lemon zest, etc.

Whole wheat crackers for tasting

Equipment

Measuring cup

Container with a tight fitting lid

Fine mesh strainer

Large bowl

Spoons, plates or bowls for tasting

Serving Size

One serving of butter is equal to 1 Tablespoon.

Yield

One cup of heavy whipping cream yields 1/2 cup of butter and 1/2 cup of buttermilk.

Food Safety

- Thoroughly clean table or preparation area with soap and warm water before starting this project.
- Always wash hands with soap and warm water before beginning food preparation
- All ingredients should be kept chilled, both before and after preparation.
- Homemade butter's shelf life depends on how thoroughly the buttermilk is extracted. Buttermilk can keep for 2-3 weeks in the fridge, but if much buttermilk remains it will sour within a week. To remove excess buttermilk, place butter in a bowl with cold water and knead it. Repeat until the water is no longer cloudy.

DIRECTIONS

1. Pour 2/3 cup of heavy whipping cream into a jar or container.
2. OPTIONAL: Add a pinch of spices or seasonings to add variation to your butter.
3. Make sure the lid is securely fastened.
4. Shake the jar until butter forms a soft lump, approximately 15 minutes. Students can take turns shaking.
5. Continue to shake approximately 5 more minutes until the buttermilk separates. The jar should contain a lump of butter and liquid buttermilk.
6. Pour contents into a mesh strainer and let the buttermilk drain into a bowl.
7. Remove the butter to prepare for tasting.



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Lesson Activity



THE SCIENCE CONNECTION

During the activity, ask students these questions.

During Butter Making:

- What do you see happening to the cream as you shake the jar?
- Is the volume in the jar growing bigger or smaller? Why do you think this is happening?
- After 10 minutes of shaking, stop and open the container to look inside. What do you see? What do you think this is? It is whipped cream!
- What do you hear and feel in your jar as you continue shaking? Do you feel a lump of butter forming?
- As the fat (molecules) warm up they move faster because they have more energy so the “lump/butter” will form quickly.
- Do you have anything else in the jar besides the lump of butter? What do you think the liquid is? Buttermilk!
- When draining off the buttermilk, ask students if this liquid can be used for anything?
- OPTIONAL - Compare the weight of the heavy whipping cream you began with to the weight of the remaining butter. What do you observe?

During Butter Tasting:

- Can you name three nutrient-rich foods you can put butter on? Whole grains, vegetables, etc.
- Explain why you chose to add this optional ingredient. How did it change the taste of the butter?
- OPTIONAL - Compare the taste of the student’s homemade butter to the taste of store butter. What are the similarities? Differences? Do they taste the same, spread the same, etc.



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Resources & References



- **What is Butter?**

<https://dairygood.org/content/2017/what-is-butter?>

- **How to Make Butter**

<https://dairygood.org/content/2013/how-to-make-homemade-butter>

- **9 Reasons We Think Butter is Better**

<https://dairygood.org/content/2015/9-reasons-why-butter-is-better?>

- **Herb Infused Butter Recipes**

<https://www.drink-milk.com/herb-infused-butter-recipes/>

- **Difference Between Regular, Cultured & European Butter?**

<https://www.bonappetit.com/story/whats-the-difference-between-regular-cultured-and-european-butter>



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Teaching the Lesson



FOOD SCIENCE

Butter is chemically known as an emulsion, which is a suspension of two liquids that under normal circumstance do not mix together (e.g. water and oil). In the case of butter, the two liquids in the emulsion include milkfat and water. Butter solids are formed when heavy cream is vigorously mixed or shaken. The mechanical force breaks down the fat particles (known as globules) and eventually, the globules stick together while also trapping smaller amounts of water. This forms what is known as a water-in-oil emulsion, or the solid mass we commonly recognize as butter.

CLASS DISCUSSION

1. Begin the lesson by finding out what students know about butter. Do they use butter at home? What foods do they put butter on?
2. Ask students if they can describe the process of how milk (a liquid) becomes butter (a solid). Explain the basic science behind the formation of butter. (See food science section above)
3. Ask students if they can name the primary nutrient found in butter (fat). Explain why fat is an important nutrient. (See glossary below).
4. Describe how the class will break into small groups to make and taste butter. Discuss what other items (herbs and spices) could be added, and how that will change the taste of the butter.

Glossary

Buttermilk: The liquid remaining after butter is produced from heavy cream. Commercial buttermilk sold in stores is generally not true buttermilk, but milk with added lactic acid cultures.

Fat: Fat in food belongs to a group of substances called lipids and includes both animal and plant sources. The fat found in milk is known as cream and can be used to make butter. Fat is an essential nutrient that we need to help our brains develop, keep our cells healthy and provide a source of stored energy in our body.

Heavy Cream: A liquid dairy product commonly made up of approximately 36% fat with the remaining volume coming primarily from water. Heavy cream is used to produce both whipped cream and butter.

Homogenization: A mechanical process that breaks fat globules into smaller droplets so that they stay suspended evenly in milk rather than separating out and floating to the top.

Pasteurization: A process that kills harmful bacteria by heating milk or food to a specific temperature for a set period of time. Pasteurization does not harm the flavor or quality of the food.