MOSH CONNECT

EDUCATIONAL ACTIVITY

BUTTER IN A JAR

Learning Goal

Investigate and observe how substances can undergo physical change, and that many physical changes are affected by temperature, by making butter and testing the butter in different temperature environments.

Did you know?

Butter was first thought to have been made over 4000 years ago. Through the ages, there have been many creative ways used to transform milk that comes from animals into butter, starting with using the hide of an animal like a bag and shaking until the fat inside the milk separated and clumped together. In fact, there are still people who make butter this way! The term used to describe the process of making butter from milk by mixing, shaking or stirring is 'churning'. You may even have seen photos of old-style butter churns, big wooden barrels with sticks in them that were plunged up and down to mix up the milk. In order to make butter, you have to use the part of milk called cream which is filled with fat. Today, butter is usually made by machines in factories. But you can still create butter at your own house using a shaking technique!

BUTTER IN A JAR, PART I: MAKING HOMEMADE BUTTER

Materials:

Heavy Cream, A Jar with a Lid (or 2 Ziplock Bags, one for the cream and another for the first bag to go into, to prevent accidental spilling while you shake the bags), A Pinch of Salt (or more to taste), Measuring Cup, Stopwatch

Don't have these materials available? No problem! MOSH activities are designed to be versatile. Think of it as a challenge and change it up to suit yourself. Be sure to take a pic and show us your customization. *Note - This experiment requires heavy cream.

1. Take the heavy cream from the fridge and pour 1/2 cup into the jar. Tilt the jar side to side and observe how the liquid moves inside of your jar, filling the container and taking its shape.

2. Tightly seal the jar with the lid, start your stop watch and begin shaking. *Be careful to hold the jar with both hands as you shake!*

3. After about 5 minutes, you will notice that it seems like nothing inside the jar is moving anymore. This is when your cream has become whipped cream! Pause your timer for a moment and observe the cream in its current state. Is it still a liquid? Start the stopwatch again and resume shaking.

4. After a bit more shaking, your cream will change and you can feel it moving again, just a bit. After a few more shakes, it will suddenly begin to plop around in your jar, almost a wet dough consistency. Pause your stopwatch again briefly and observe. What state of matter does your jar hold now? Continue timing and shaking.

5. Suddenly, your cream will separate and you'll have a ball of soft yellow butter and white liquid (this is still milk) in your jar. Pause your stopwatch. Observe the two substances inside of your jar. The liquid, which still fills the container and takes its shape, and a solid, which does not. You just made butter! How long did the process take according to your stopwatch? Would shaking the jar faster or slower have affected the time it took for the cream to turn to butter? If you have more cream, give the experiment another try later and change the speed of your jar shaking for comparison.

6. Open the jar. Get a bowl and slowly drain off the white milk from the butter. You can still drink this (it might be a little salty) or use it for cooking.
7. Take a butter knife or fork and mix the butter around. Little pockets of milk will be exposed during mixing, so hold the jar at an angle that allows the extra milk to drip into your bowl.

8. Time to enjoy a taste test! Make observations about how it feels when you touch it, what it tastes like, or even feels like on your tongue. A great way to expand on your taste test is to grab butter that was purchased from a store and compare and contrast the two butters. Try making a chart and recording your observations about each kind of butter- handmade and store bought. You could note their appearance, color, texture, how well they spread on a piece of bread and taste. Which do you prefer?
9. After your taste test, keep your butter refrigerated!

The Science Behind Making Butter

Cow's milk is a liquid that is mostly made up of tiny bits of water, fat, and protein that are called molecules. The fat floats around inside the milk like little water balloons that bump into each other, but don't stick. As you shake, or 'churn' the heavy cream, the fat balloons pop, and the fat starts sticking to other fat, forming bigger bunches inside the liquid. Once all of the open fat balloons have stuck together, you get a big glob of milk fat, or butter! The left-over white liquid is still milk, it just has very little fat left in it. The extra cool thing is that you start this experiment with a liquid, and end it with liquid and a solid. You observe a change in the state of the matter inside your jar!

BUTTER IN A JAR, PART II: EXPERIMENTING WITH YOUR BUTTER IN DIFFERENT TEMPERATURE SETTINGS

Materials:

Handmade Butter (made in previous activity), Spoon, 3 Containers With Lids

Don't have these materials available? No problem! MOSH activities are designed to be versatile. Think of it as a challenge and change it up to suit yourself. Be sure to take a pic and show us your customization.

1. Using a spoon, scoop some of your homemade butter and place equal amounts in 3 different containers.

2. Place one container in the freezer, one container in the refrigerator, and one container in an area with direct sunlight.

3. Leave each container in place for 6 hours.

4. Record your observations as you experiment with each butter container using your spoon. How did the butter change in each setting? What might temperature have to do with the observed changes?

5. Now try taking each container and rotating them – sunlight moving to the freezer, freezer to refrigerator, and refrigerator to sunlight. Leave them in place for 6 more hours. How did each change?

6. Finally, try this temperature experiment test using different substances, such as chocolate or ice cubes. How do these substances compare to how the homemade butter reacted to different temperatures? Record your observations and share them with us at MOSH!

Change it up!

Try making butter again, but change something about the recipe. Observe what happens when you add ¼ tsp of garlic powder to your cream before shaking. Does it change anything about the process? ***Bonus:*** *You can use the garlic butter on toasted bread for a savory snack!*

What would happen if you added some cinnamon and sugar to create a sweet butter? Try adding 1 tsp of white sugar and ¼ tsp of cinnamon to your cream before churning. Observe what happens now during the butter making process. Are there any changes? ***Bonus:*** *You can also use this cinnamon butter on toast for a sweet treat!*

You made some awesome butter creations and discoveries so don't just keep it to yourself, share your findings on social media! Make sure to use #MOSHConnect so that we can see the awesomeness too!