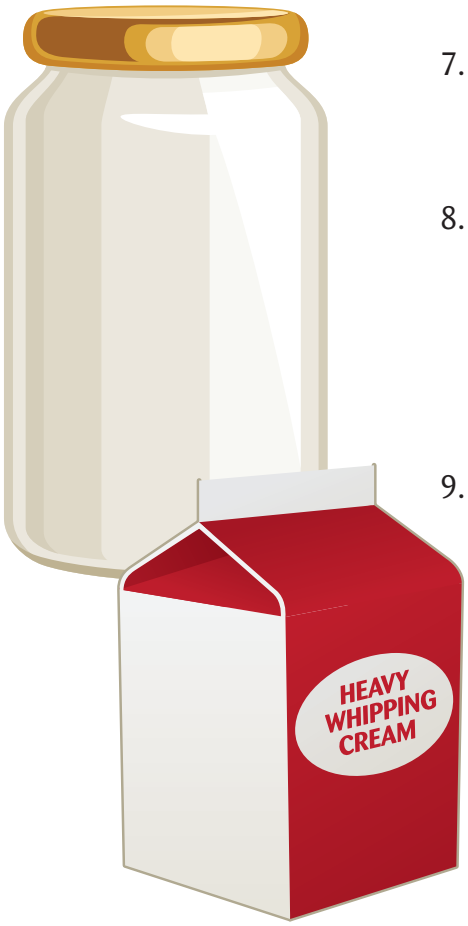
Butter and Cheese Please!

Butter is a delicious treat that we enjoy on a variety of different foods, from biscuits to popcorn. But where does butter come from? How is it made? Create butter in a jar to see how a few simple ingredients transform to produce the tasty substance we know as butter.

What You'll Need

- Jar with a tight fitting lid
- Heavy whipping cream
- 2 marbles (optional)
- Small bowl
- Medium sized bowl
- 4 cups of ice cold water
- Strainer
- Timer



What You'll Do

1. Remove the heavy whipping cream from the refrigerator about 25 minutes before starting the activity. Trust us on this!
2. Fill the jar about halfway with heavy whipping cream. (Optional: add two clean marbles - it can help make the process faster)
3. Make sure the lid to the jar is closed tightly and securely.
4. Start the timer and shake, shake, shake!
5. What's going on in the jar? Any changes happening to the cream? Stop every five minutes and record your observations in the chart.
6. Shake, shake, shake!
7. Keep shaking the jar until you see solid parts sticking together. That's your butter! Pour off the excess liquid into the cup. This is buttermilk. Use it for cooking! Store it in a sealed container in the fridge for two or three days.
8. Rinse off the butter to remove excess buttermilk. Put your butter in the medium sized bowl and add about one cup of ice water. Use your hands to knead the butter in the water until it becomes cloudy with excess buttermilk. Drain off the water into the sink with the strainer (don't keep this liquid) and repeat one or two more times until the water no longer turns cloudy.
9. Now your butter is ready to taste!

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What's Going On?

Heavy whipping cream contains the fat skimmed off the top of the milk. It has a lot of fat, at least 36 percent milkfat. Normally, the fat is mixed in with the water of the milk in a type of mixture called an emulsion. The fat is suspended in the water in small spheres called globules and it won't easily separate. You encounter emulsions all the time. Mayonnaise, vinaigrettes, hollandaise and ice cream are all examples of emulsions. By shaking the cream, the fat globules start to stick together and form a solid lump - butter!

Halfway between the liquid cream and solid butter phase of shaking did you notice that the cream got thicker? You made whipped cream, which is perfect on top of some fresh strawberries (just needs a bit of sugar added). The fat globules were starting to form butter at this time, but there was still a large amount of air in the mixture creating the stiff cream. By continuing to shake you're removing the excess air and other liquids from the fat to make butter!

Time spent shaking	My butter observations
5 minutes	
10 minutes	
15 minutes	
20 minutes	
25 minutes	

More Fun with Milk! Make a Simple Cheese

What You'll Need

- 8 cups or 1/2 gallon whole milk
- 6 tbsp white vinegar (can substitute lemon juice)
- Cheesecloth
- Strainer
- Medium bowl

What You'll Do

1. Heat the milk in a saucepan over medium-high heat until it is simmering but not boiling. Stir constantly to keep from scorching.
2. Once simmering, reduce heat to medium and slowly add in the vinegar (or lemon juice) while constantly stirring. What do you observe happening to the milk? It's separated into the solid curds and the liquid whey.
3. Once all the vinegar (or lemon juice) has been added and the curds separated, remove from heat.
4. Place the strainer over the bowl and line it with a double layer of cheesecloth.
5. Carefully strain the milk through the cheesecloth to separate the curds from the whey. The curds will stay in the cheesecloth and the whey will drain through.
6. Wrap the curds with the cheesecloth and squeeze to remove any excess whey.
7. With the curds wrapped in the cheesecloth, squeeze it into a ball and let it sit in the strainer for about an hour.
8. Your cheese is ready to eat! What does it taste like? You can flavor it with various herbs, salt or olive oil. It will keep for a few days if stored covered in the refrigerator.

What's Going On?

Milk is a mixture of water, fat, protein and sugar. There are two types of protein in milk: casein and whey. By adding the vinegar - an acid - you caused the casein proteins to start to clump together and separate from the whey (or become curdled). If you've ever had milk go bad in the fridge you've seen curdled milk. Don't eat THOSE curds! Spoiled milk curdles from bacteria growing in the milk producing lactic acid which then causes the casein proteins to clump together. Many cheeses are made this way with only simple ingredients, such as cottage cheese or paneer!