

RAFT IDEAS

Topics: Biochemistry,
Mixtures, Chemical
Changes

Materials List

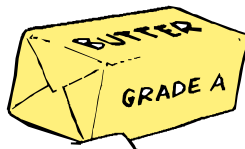
- ✓ Portion cup (1 oz. with lid)
- ✓ Heavy whipping cream (room temperature)
- ✓ Salt (optional)
- ✓ Cracker, bread, or equivalent
- ✓ Knife or craft stick

This activity can be used to teach:

- Physical & chemical properties (CA Science Standards: Grade 5, 1.f; Grade 8, 3.b & 5.d)
- Molecules of organisms (CA Science Standards: Grade 8, 6.c)
- Economy & food production of peoples, past & present (Various CA History-Social Science Standards applications)

Shake Your Butter

Observing Cream Turn into Butter



No need for a huge churn to observe wonderful and tasty changes.

To Do and Notice

1. Fill the portion cup halfway with cream. Notice that the cream is the same throughout, an example of a homogenous mixture.
2. Add a small pinch of salt to the cream. (Note: Salt is added to butter for taste. This step can be omitted, if desired.)
3. Place the lid onto the portion cup and shake it vigorously for 20 seconds.
4. Open the lid and note any changes in the cream (e.g. – foamy, “air bubbles”, greater volume, thicker). Notice that continued shaking causes property changes in the cream: volume and viscosity of the cream both increase. After enough shaking, the mixture usually becomes so thick that it no longer “sloshes” around in the portion cup. The sample is now “whipped cream”; it’s almost there! Continued shaking will soon turn the sample to butter.
5. Repeat steps 3 & 4 until the mixture has separated into a clump of butter and some watery liquid (buttermilk). When this happens, a “thunking” noise is usually heard when shaking the cup. Notice that the mixture is now unevenly distributed throughout, an example of a heterogeneous mixture.
6. Drain out the buttermilk and spread the butter onto a cracker or bread.

The Science Behind the Activity

Milk contains water, protein, sugar, fat, and some dissolved vitamins and minerals. Milk fat molecules form droplets encased in protein membranes that help them dissolve in the milk and also prevent the droplets from sticking and clumping together. In raw milk (non-homogenized), this “milk fat cream” eventually separates and floats to the top (fats are less dense than water). By agitating the cream-filled container, the repeated bumping action breaks and removes the membranes so the fat globules clump together to form butter. The liquid substance left over is the watery portion of the cream called buttermilk (store-bought buttermilk have cultures added).

Fast Facts:

- Butter contains about 100 calories per tablespoon
- Up to 3 gallons of milk are needed to produce 1 pound of butter
- People have used milk from many different animals for millennia, including: water buffalo, goats, sheep, reindeer, horses, camels, yak, and cows.

Taking it Further

Dairy products offer a wide variety of possible biochemistry explorations. See the RAFT Idea Sheet *Cheese, Please* for instructions to make a simple and tasty cheese.

Web Resources (Visit www.raft.net/more for how-to videos and more ideas!)

History of butter: <http://webexhibits.org/butter/index.html>

Milk content comparison of various animals:

<http://www.havemilk.com/article.asp?id=1485#contentbyspecies>