Better Butter

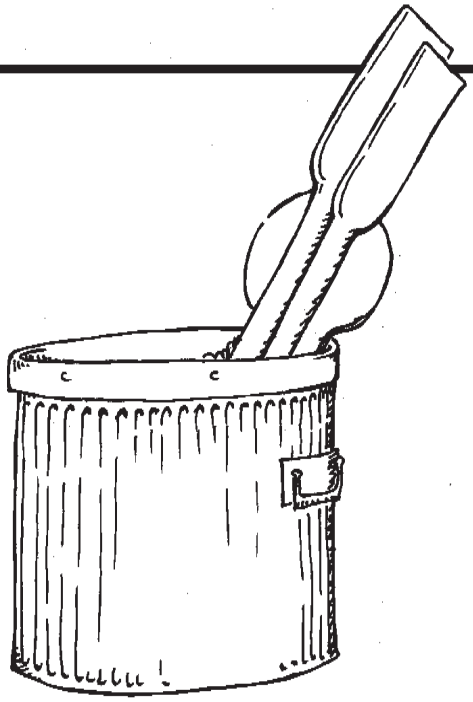
Objective: Students will learn how to make butter, observe the difference in shelf life of butter vs. cream and milk, and relate the information to local agricultural history.

Summary: Students will make butter from cream, then compare which spoils most quickly under non-refrigerated conditions, milk, cream or butter.

Time: 45 minutes to make the butter, 15 minutes daily to make observations over several (three to 14) days as milk spoils.

Student Grouping: Four to six students per group

Materials: One set of worksheets per group, 1 pint cream per group, ½ pint whole milk per group, ½ cup of salt, three one-pint jars with lids per group, large bowl of COLD water, dish soap, sponges, towels and water to clean up with. Optional: 1 package of crackers for tasting the butter.



Background Information: If fresh, non-homogenized milk is allowed to sit for several hours, the fat portion of the milk, what we call "cream," will float to the top. The fat is less dense than the more watery part of the milk; thus, it floats, like oil floats on water. Today, in creameries, a centrifuge is used to separate cream from milk. This yields cream and milk with the fat removed, nonfat milk. Butter is made by further concentrating the cream by a vigorous agitation called "churning." As cream is churned, the fat globules stick to each other more and the watery milk parts are squeezed out. The whole and low-fat milk we buy in the store is homogenized. This means that the fat globules are broken into very tiny bits and mixed evenly throughout by forcing milk through a fine screen under high pressure. This breaks the fat particles into such tiny pieces that they no longer stick to each other and separate out.

In this activity students will churn cream by vigorously shaking it in jars. As they shake the jars, the cream will first incorporate air, becoming whipped cream. As they continue to shake their jars the fat globules continue to bump and stick together into a larger glob, becoming "sweet butter" (unsalted butter). Then they will set aside butter, cream and milk to observe over time. The spoiling time will vary (two to 14 days) with room temperature, age of milk and cleanliness.

Have you seen lumps in sour milk? These are curds, and the thin, runny liquid is whey. Under controlled situations, milk is treated with rennet, which causes the curds to congeal, leaving whey. Random bacteria causes milk to sour with an unpalatable result.

Marin Ag. Facts: The gold rush of 1849 helped start the dairy industry in Marin County. Tenant ranches, ranches usually owned by rich persons or corporations in San Francisco, were set up in Sausalito and on the Point Reyes peninsula. Most of the ranches had only as many cows as they could milk twice a day by hand, usually 10-15 cows. There was no refrigeration to keep the milk fresh on the long boat ride to market in San Francisco. Shipping was primarily by way of Corte Madera Creek, Bolinas Wharf and the Petaluma River. Almost all the milk produced was separated and churned into butter and salted to preserve it. In 1862 Marin provided a quarter of California's butter and was the state's largest producer of dairy products into the 1880s. Buttermilk left over from the churning was generally fed to hogs and also sold in the city. Since cheese

also keeps better than milk, some families made cheese or had a cheese maker come to their ranch and make cheese for them. Point Reyes butter was so prized that some tried to "counterfeit" it. They would mark their butter with the Point Reyes stamp to bring a higher price. Established train connections between Marin and San Francisco in the 1870s and the invention of the milk bottle in 1884 made milk handling much easier. By the 1930s and '40s, fresh milk was a popular market item.

Preparation:

1. Decide how many groups you will have. Make copies of worksheets.
2. Collect materials according to your group numbers. Let cream set out of fridge before activity. It will churn faster if it is not chilled; however, if it is too warm, the butter is slick and too soft. Best temperature is 65°–70°. You may want a half pint to make into butter yourself as the tasting batch.

   If you can find "cream top milk" (non-homogenized), students can actually observe the cream floating on top of the milk and skim this cream off for churning into butter.
3. If you do not have warm water, you may want to have students mix in salt with a spoon. Hands will get very greasy kneading the butter.

Procedure:

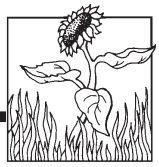
1. Ask the class: If their refrigerators broke, which would spoil first, butter, cream or milk? Ask the class if they know how to make butter, and discuss answers.
2. Break the class into groups.
3. Tell the class they are going to make butter today. Have students help distribute the worksheets, pint jars with lids and the cream.
4. Instruct each group to shake their jar vigorously, stopping every 200 shakes to record observations on the worksheets. Each group member should have a turn shaking. Continue until they have a good glob of butter and some thin buttermilk in the jar.
5. At this point one person should scrub his or her hands very well and remove the glob from the jar with their hands. Submerge it in the COLD water and knead it. This rinses out more of the buttermilk. After kneading and rinsing for five minutes, pat the glob dry with paper towels.
6. Another student with freshly scrubbed hands should then poke a hole in the glob of sweet butter and add a pinch of salt. Knead the salt into the butter.
7. Another group member should scrub next and shape the butter into a desired form, returning it to a well-washed jar, replacing the lid.
8. Place the butter in its jar next to the jars of cream and milk in a shaded place. Using the worksheets, students will return to the jars and make notes on changes.
9. Have students present their experiment results to the rest of the class.
10. Discuss the "Marin Agriculture" information with students. Relate the results of the experiments to ranching in the 1800s.

Questions for Discussion:

- Did anyone taste the buttermilk? Why? How was it?
- Was there more buttermilk or butter?
- What do you expect to see, smell, observe as the jars' contents age?
- If you were a Marin County dairy owner in the 1800s, would you sell butter, cream or milk to your customers in San Francisco? Why?

Extensions:

- Take a field trip to a dairy and/or creamery (see Resources Directory).
- Observe some cheese and the buttermilk alongside the milk and butter.
- Don't add salt to some of the butter and see if it ages differently.
- Have students interview their parents and grandparents to see if any of them used to make their own butter.
- Bring in a butter churn and demonstrate its use.



Better Butter

Names _____

Date _____

Write observations of plain cream. _____

_____

_____

_____

Write observations as you shake your jar. _____

_____

_____

_____

_____

Date _____ Note changes:

Milk	Cream	Butter
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Date _____ Note changes:

Milk	Cream	Butter
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Date _____ Note changes:

Milk	Cream	Butter
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

¡ Una Mantequilla Mejor!

Nombres (del grupo) ______________________________

Fecha ______________________________

Escriban sus observaciones de la crema sencilla. ______________________________

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Escriban sus observaciones mientras que agitan su frasco. ______________________________

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Fecha ______________ Anoten los cambios observados:

La leche	La crema	La mantequilla
______	______	______
______	______	______
______	______	______
______	______	______

Fecha ______________ Anoten los cambios observados:

La leche	La crema	La mantequilla
______	______	______
______	______	______
______	______	______
______	______	______

Fecha ______________ Anoten los cambios observados:

La leche	La crema	La mantequilla
______	______	______
______	______	______
______	______	______
______	______	______