



Butter Investigation

Grade Level: 3-5

Goal

Students predict how much butter will be made from different types of milk and test their hypothesis.

Curriculum Alignment

Find a list of which Common Core State Standards and NC Essential Standards this lesson plan aligns with on the lesson plan page at www.growing-minds.org.

Materials

Book to read

Clarabelle: Making Milk and So Much More by Cris Peterson

Activity supplies for each group

1 cup milk (heavy cream, half and half, whole milk, or 2% - a different type for each group)

1 liquid measuring cup

Quart jar with a lid

A stopwatch

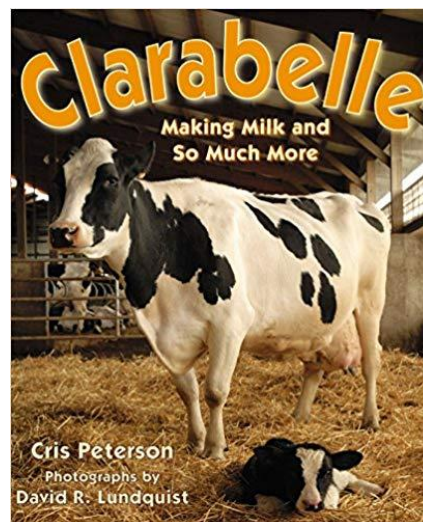
2 small bowls

A large bowl

A spatula

Cold water

Salt



Activities

Read a book

Provide the book Clarabelle: Making Milk and So Much More for students to read. This book will give them an overview of how the milk they will be using gets from the farm to the grocery store.

Make Butter!

1. As a food safety precaution make sure not to leave milk out for more than two hours.
2. Make sure students wash hands.
3. Read *Can you make butter from any kind of milk?*
4. Break up the class into 4 groups, each with a different type of milk (heavy cream, half and half, whole milk, and 2%), and explain the experiment.
5. Using the chart below, have students make predictions of how much butter each milk will make. You may want to recreate this table on a white board or overhead projector. As a class you may

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want to review the concept of butter fat in milk and compare the different types. You may also want to review ratios. Below is an example using cream.

Milk Type	Cups of Milk	Cups of Butter (predicted)	Ratio of Liquid to Solid (predicted)	Cups of Butter (Measured)	Ratio of Liquid to Solid (Measured)
Cream	1	.25	4:1	.5	2:1
Half and Half	1				
Whole	1				
2%	1				

6. Discuss with students how the type of milk may influence the “shake time”. Cream has the highest fat content. Does that mean that it will just have the smallest liquid to solid ratio or that it will also take less time to make? This is a good opportunity to discuss the different variables that may influence the outcome of the experiment, i.e. shake time, shake vigor, butterfat content, etc. **It may be that not all milk types will make butter in this experiment, make sure to discuss this possibility with students**
7. Students should predict how much “shake time” it will take for the butter to separate from the butter milk and explain why these times may differ depending on the milk type.
8. Students will pour the milk into the jar, screw on the lid, start the timer and begin shaking the jar. Note: The heavy whipping cream will turn into lighter whipped cream first. Encourage students to keep shaking vigorously.
9. It takes a lot of shaking to make butter, so students should take turns shaking and time tracking. Eventually the milk will become thicker (looking like whipped cream), but keep shaking.
10. If students get tired and need a break, make sure they stop the timer so that they have an accurate shake time. The thickened milk will start to separate into solid butterfat and liquid whey, but students should continue to shake. To keep it interesting encourage students to come up with a “butter dance” as they shake or turn on some music to keep them moving.
11. When a single lump of yellow butter and some liquid buttermilk has formed students can stop shaking and record their time. The “cream” group’s butter will separate before any of the other groups, have them continue to shake. You may want to set a cut off time, in which groups can



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- stop shaking. This may be the point in which groups will realize their milk type is not good for butter making. At this point these students might want to join another group that had a solid separate out.
12. Have students pour the liquid buttermilk out into one of their small bowls to save and continue shaking the solid until no more buttermilk is forming and all the buttermilk has been poured out.
 13. Students will dump the lump of butter into the large bowl, pouring cold water over the butter (just enough to cover it). You may need to demonstrate to students how to squeeze the butter against the side of the bowl with the spatula to press out any extra buttermilk. Have students pour the buttermilk/water out (into a sink or large basin if a sink is not available) and rinse the butter with more water, repeating until the water does not get clouded by the buttermilk.
 14. Assist students in measuring the volume of their finished butter by explaining or demonstrating that the butter must be packed into the measuring cup. Remind student to record data and facilitate sharing data between groups. As a class calculate the ratio of milk to butter for each type. How was the actual outcome different from predictions? Why?
 15. Have students answer questions about their predictions.
 16. Each group should place half the butter into a separate small bowl and mix a pinch of salt into the remaining butter.
 17. Perform a taste test between the salted and unsalted butter. Depending on the type of milk each group had they may need to share with other groups.
 18. Perform a taste test between the milk and buttermilk, again groups may need to share.