

Why doesn't spilt milk go everywhere?

Students put drops of food coloring into milk and then set the system in motion with a drop of dish detergent. You can discuss the fat content of milk and the fact that soap disperses fat molecules.

Objectives:

To practice being careful and making observations.

To learn that experiments can be fun!

To learn that there are forces that hold liquids together.

Definitions/Background:

- Milk has fat molecules in it.
- Forces push the fat molecules in the milk together.
- Soap, which we know can help break up things like fat (grease, butter, oil), separates the fat molecules in the milk and then they can move around – so you see the dyes start to move around.

Materials:

Enough of everything for the number of students in class:

- Milk (must be at least whole milk; soy milk works best b/c of the type of fat in it)
- Food coloring (must be liquid drops, not gel stuff)
- Q-tips
- Joy detergent and some small cups to put samples of joy in (for dipping)
- Shallow trays (like empty Lean Cuisine dishes)

Pre-class setup:

Make a few stations with some of each supply at each.

Method: (consider using parent volunteers to do in small groups)

1. Introduction: We will all be scientists today! All scientists observe carefully. What does it mean to “observe carefully”? Why is it important? How do you do it? We are going to work together in our groups to make careful observations.
2. Ask:
 - a. Why do we use soap?
 - i. Answers will be things about dirt or germs.
 - ii. Push them to think about getting oil, grease, or fat off hands.
 - iii. Want to think about soap breaking up fat molecules.
 - b. What is milk made of?
 - i. Answer might be water, etc.

Why doesn't spilt milk go everywhere?

- ii. Push towards FAT in milk
 1. Ask them what the difference between whole, 2%, and skim milk is.
 - c. CONNECT: If soap can separate fat, maybe soap can separate the fat in milk.
3. Demo the “Milk and Food Coloring” experiment.
- a. *see experiment below*
 - b. As a group make as many observations about the experiment as you can. Watch for at least 2 minutes. Possible observations:
 - The food color sits on top of the milk (its less dense than milk).
 - Nothing happens when clean swab touches the milk.
 - The action happens when you add the soap.
 - Colors shoot out toward the edge of the dish and swirl.
 - Colors don't mix together.
4. Kids will get a chance to do their own experiment one at a time, but first they will do a little planning.
- a. Hand out the worksheet titled “My Experiment”.
 - b. Students draw what they want to do when it is their turn.
 - c. Focus the kids:
 - i. Where do they want to put the food coloring drops and soap?
 - ii. How much of each (don't be wasteful)?
 - iii. How long will they hold the soapy swab in the milk?
5. Students do their experiment one at a time with the teacher's help.
- a. Everyone else in the group watches their fellow student's experiment and makes observations.
 - b. What happens to the food coloring when you first put it on the milk?
 - c. What happens when you touch the Q-tip to the milk?
 - d. What happens when you add the drop of soap?
 - e. What direction does the food coloring move when you first add the drop of soap?
 - f. What direction does the food coloring move after the experiment has been running for a while?
 - g. Does the movement go on forever? What happens?
 - h. What happens if you add more soap after the colors have stopped moving?
6. Clean up.
7. Next day follow-up: “What did I learn?” worksheet

Experiment: Milk and Food Coloring

1. Materials: plate, whole milk, food coloring, swab, Joy dish soap.
2. Pour enough milk in the dinner plate to completely cover the bottom and allow it to settle.

Why doesn't spilt milk go everywhere?

3. Add one drop of each of the four colors of food coloring – red, yellow, blue, and green – to the milk. Keep the drops close together in the center of the plate of milk. Be careful with the food coloring because it can stain!
4. Get a clean cotton swab for the next part of the experiment. Predict what will happen when you touch the tip of the cotton swab to the center of the milk. It's important not to stir the mix, just touch it with the tip of the clean cotton swab (our control= shows the Q-tip alone does not do anything!).
5. Now dip the swab into Dawn soap. Place the soapy swab in the middle of the milk and hold it there for 10 to 15 seconds. Look at the burst of color! Make observations. Talk about other things you could try but don't do them – kids will be designing their own experiment.

What happened and why? The milk you are working with is more complicated it looks. It is made up mostly of water and then equal parts of protein, fats, and sugar. The fat has been broken up and spread throughout the milk (by the process called HOMOGENIZATION) into tiny pieces of fat called globules. When the milk was first placed into the carton, it was still and did not move. Even when the food coloring was added to the milk, things were still quiet. This is because the fat globules were steady and undisturbed. When the soap hits the milk, things begin to move.

The soap breaks up the fat globules and lets them spread across the surface of the milk. As the globules break and expand, they create movement in the milk. Normally you would never notice this, but the food coloring shows how the surface of the milk moves and changes in response to the soap breaking up the fat in the whole milk.

This flowing shows how soap works. It is the same kind of thing that happens when you wash dishes or hair with soap. The soap breaks up the fat or grease and lets it to flow in the water and down the drain.