

Color Changing Milk

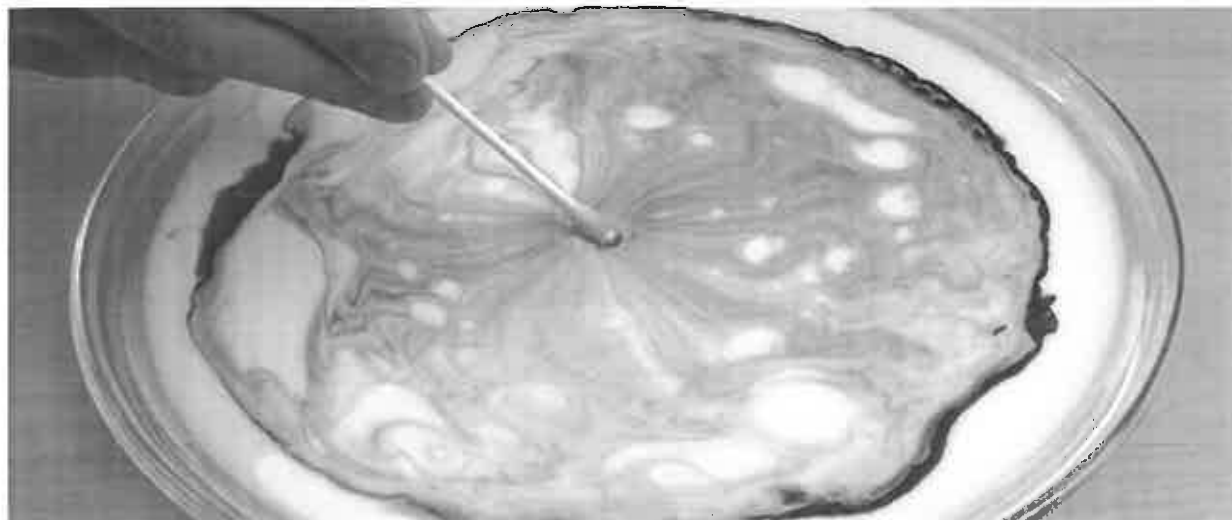
Mount Prospect was home to not one, but two creameries at different points in its history. This experiment from Steve Spangler Science is a great tie in.

Background:

Founded in 1910 by Edward Busse, the Mount Prospect Creamery quickly became a major distributor of milk, cheese and butter. This was not the first creamery in Mount Prospect. William Wille had run a much smaller creamery at the end of the nineteenth century, but he closed it in 1902. In the years after Wille closed his creamery, Mount Prospect became one of the largest producers of dairy products in northern Illinois. The farmers with dairy cows had to ship their milk into the city on the Chicago Northwestern trains each day and pay a charge on each can they shipped in. When a creamery opened in Mount Prospect it was cheaper to sell it locally. The Mount Prospect Creamery grew quickly and was soon shipping bottled milk, butter and cheese all around the Chicago area. They employed thirteen drivers who delivered the bottled milk around the northwestern communities and into Chicago, advertised as "Milk Bottled in the Country." (information courtesy of the Mount Prospect Historical Society)

Link to Experiment:

<http://www.stevespanglerscience.com/lab/experiments/milk-color-explcsion/>



Color Changing Milk

This is guaranteed to become one of your favorite kitchen chemistry experiments. Some very unusual interactions take place when you mix a little milk, food coloring, and a drop of liquid soap. Use this experiment to amaze your friends and uncover the scientific secrets of soap.

Using household materials like milk, food coloring, and dish soap, you'll create an awesome reaction and a beautiful explosion of colors.

This unforgettable hands-on learning experience is fun and easy—no wonder it's one of Steve Spangler's most popular experiments! Learn how to turn this activity into an awesome science fair project, and find more hands-on science fun in Steve's book, *Naked Eggs and Flying Potatoes*.

EXPERIMENT MATERIALS

- Milk (whole or 2%)
- Dinner plate
- Food coloring (red, yellow, green, blue)
- Dish-washing soap (Dawn brand works well)
- Cotton swabs

SCROLL DOWN TO:

Experiment Steps

Additional Information

↪ SHARE THE SCIENCE!

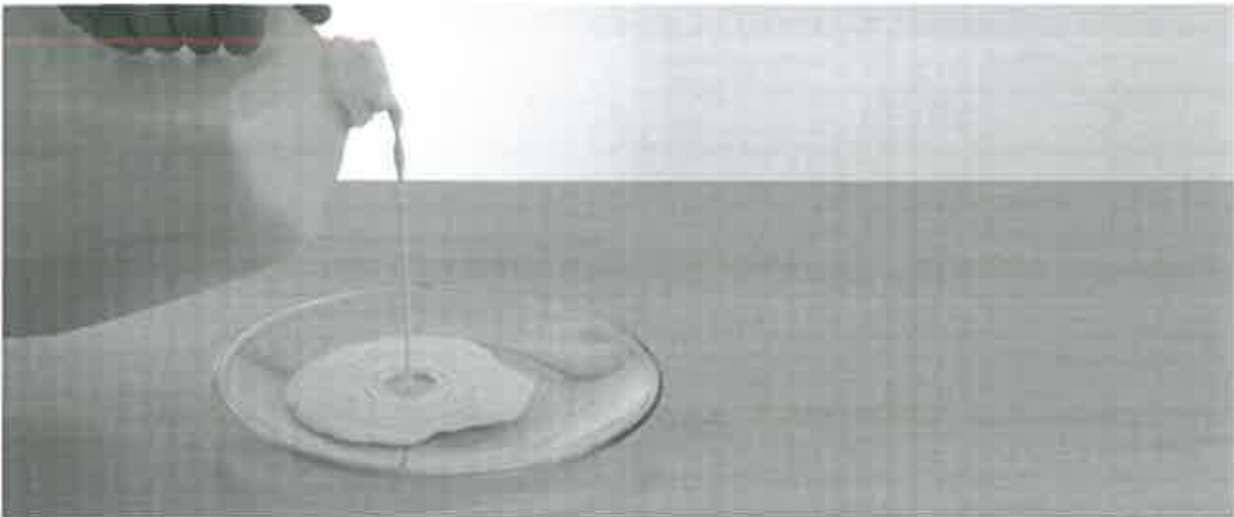


EXPERIMENT VIDEOS

Color Changing Milk - Sick Science! #018



EXPERIMENT



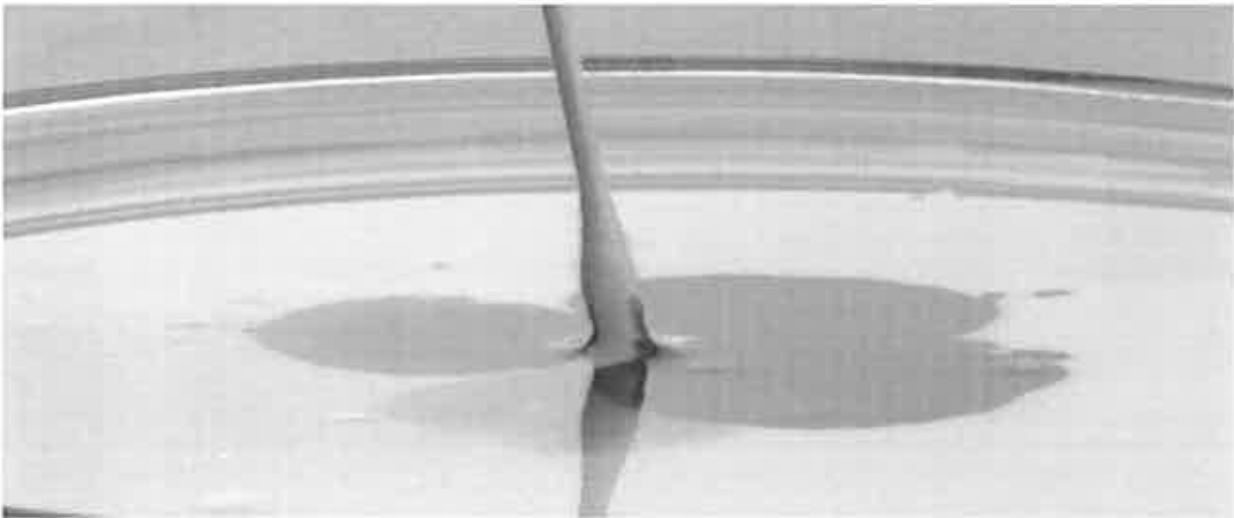
1

Pour enough milk in the dinner plate to completely cover the bottom to the depth of about $\frac{1}{4}$ inch. Allow the milk to settle before moving on to the next step.



2

Add one drop of each of the four colors of food coloring—red, yellow, green, and blue—to the milk. Keep the drops close together in the center of the plate of milk.



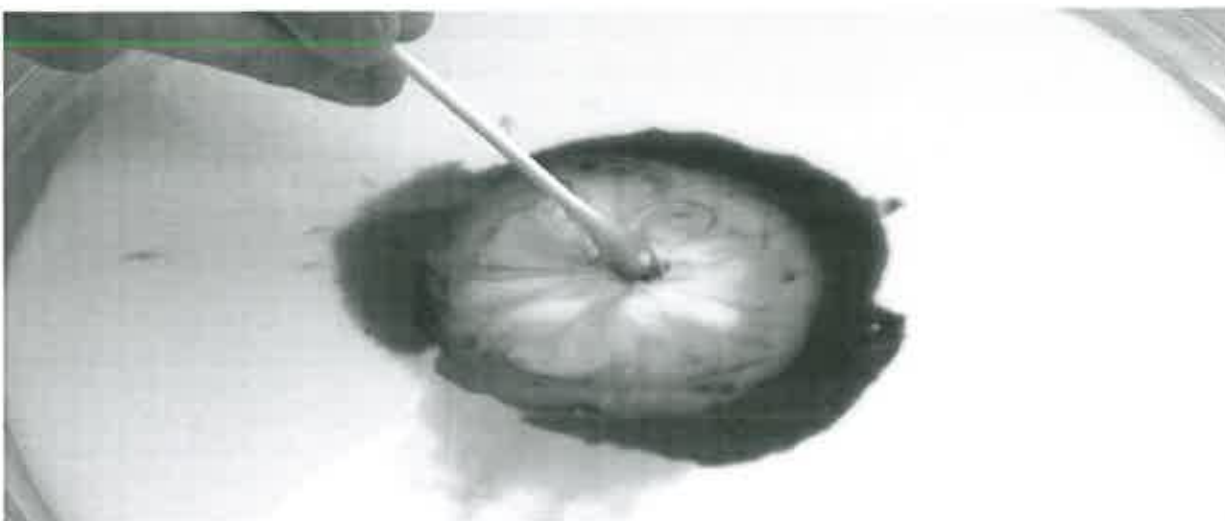
3

Find 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 cotton swab. Go ahead and try it.



4

Now place a drop of liquid dish soap on the other end of the cotton swab. Place the soapy end of the cotton swab back in the middle of the milk and hold it there for 10 to 15 seconds. Look at that burst of color! It's like the Fourth of July in a plate of milk.



5

Add another drop of soap to the tip of the cotton swab and try it again. Experiment with placing the cotton swab at different places in the milk. Notice that the colors in the milk continue to move even when the cotton swab is removed. What makes the food coloring in the milk move?

HOW DOES IT WORK

Milk is mostly water, but it also contains vitamins, minerals, proteins, and tiny droplets of fat suspended in solution. Fats and proteins are sensitive to changes in the surrounding solution (the milk).

The secret of the bursting colors is in the chemistry of that tiny drop of soap. Dish soap, because of its bipolar characteristics (nonpolar on one end and polar on the other), weakens the chemical bonds that hold the proteins and fats in solution. The soap's nonpolar, or **hydrophilic** (water-loving), end dissolves in water, and its **hydrophobic** (water-fearing) end attaches to a fat globule in the milk. This is when the fun begins.

The molecules of fat bend, roll, twist, and contort in all directions as the soap molecules race around to join up with the fat molecules. During all of this fat molecule gymnastics, the food coloring molecules are bumped and shoved everywhere, providing an easy way to observe all the invisible activity. As the soap becomes evenly mixed with the milk, the action slows down and eventually stops. This is why milk with a higher fat content produces a better explosion of color—there's just more fat to combine with all of those soap molecules.

Try adding another drop of soap to see if there's any more movement. If so, you discovered there are still more fat molecules that haven't found a partner at the big color dance. Add another drop of soap to start the process again.

TAKE IT FURTHER

Repeat the experiment using water in place of milk. Will you get the same eruption of color? What kind of milk produces the best swirling of color, skim, 1%, 2%, or whole milk? Why? This is the basis of a great science fair project as you compare the effect that the dishwashing soap has on a number of different liquids. Do you see any pattern in your observations?

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