

Science Fair Demonstrations

1. Tie-Dyed Milk Experiment

Pour some milk into a shallow plate. Add one drop for each color of food dye. (Space out the colors about 1 inch from the center of the bowl for the best effect.) Put some liquid soap on the tip of a Q-tip. Stick the Q-tip into the center of the plate. Watch the colors move!



How did it do that?!

Liquids like water and milk have a property known as **surface tension**, due to the cohesive forces of the liquid's molecules. Look closely (you can use a magnifying glass) at the edge of the surface of water in a clear glass. Do you notice how the very edge of the water appears to rise up the side of the glass? That's because the surface tension of the water is actually *pulling* the water away from the glass inward toward the center of the surface. Soap will reduce this surface tension.

You probably first noticed that the drops of food coloring just sat on the surface where you placed them. That's because food coloring is less dense than milk, so it floats on the surface, and the colors do not mix because you didn't stir the milk.

Then the action began with a drop of soap! The soap reduces the surface tension of the milk by dissolving the fat molecules, which is why fattier milk works better. The surface of the milk outside the soap drop has a higher surface tension, so it pulls the surface away from that spot. The food coloring moves with the surface, streaming away from the soap drop. Due to the convection that results from the moving surface, the food coloring may be drawn down into the liquid, only to appear rising again somewhere else. That's why it's best to use a clear bowl so you can see what's happening.

As the soap becomes evenly mixed with the milk, the action slows down and eventually stops. Addition of another drop of soap will start the process again.

<http://www.coolspace.org/CoolScience/KidScientists/tiedymilk.htm>