Color Changing Milk Experiment

It's an explosion of color! Some very unusual things happen 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.

MATERIALS

- Milk (whole, or half and half)
- Dinner plate, pie tin, or similar bowl
- Food coloring (red, yellow, green, blue)
- Dish-washing soap (Dawn brand works well)
- Cotton swabs
- T Chart for documenting results

EXPERIMENT

1. Pour ½ cup of milk into bowl, to completely cover the bottom to the depth of about 1/4 inch.
2. 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.
3. Touch a cotton swab gently into the center of the milk. (Do not stir!) What happens? Note this in the chart. Put all used q-tips in the empty cup.
4. Now, dip the other end of the cotton swab into the cup of dish soap. Then gently touch the cotton swab into the center of the milk. What happens? Note this on the chart.
5. Everyone on the team gets a turn to dip a cotton swab into the soap and then into the milk. Try dipping the swab into different places in the milk. What happens? Do not stir!
6. When everyone has had a turn, collect the used q-tips in the cup, and place it carefully in the garbage can. Follow instructions for clean up.

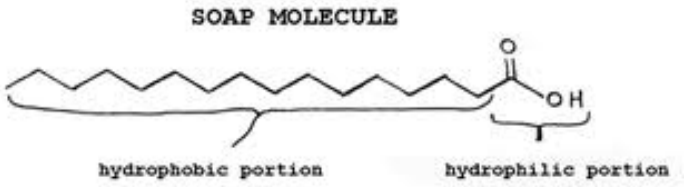
Questions for discussion:
Let's review this experiment! Who can tell me what the Director's did? The Materials Managers? (etc. for each job)
What results did you notice, and write down in your chart?
Draw a sketch of what the milk looked like after the qtip with soap was dipped in
Why did the colors move with the soap, but not with plain q tip?

Source: **Steve Spangler Science**
www.stevespanglerscience.com/lab/experiments/milk-color-explosion

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 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 polar, 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.

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.

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