

# Moving Colors Milk Experiment



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Surfactant Science: The Interaction of Hydrophilic and Hydrophobic Molecules

# Hydrophilic vs Hydrophobic

**Hydrophilic** = water loving; affinity for water

For example mixing salt and water.



**Hydrophobic** = water fearing; repulsion for water

For example mixing olive oil and water.



**“Like dissolves like”**

Water ( $\text{H}_2\text{O}$ ) and Salt ( $\text{NaCl}$ ) are both polar while olive oil ( $\text{C}_{88}\text{H}_{164}\text{O}_{10}$ ) is non-polar.

# Ingredients

- Goggles
- Liquid dish detergent
- Shallow plate or bowl
- Food coloring
- Cotton swabs
- Whole milk



# Instructions



1. Pour some milk in a plate or bowl so that it just covers the bottom.

2. Add 1-2 drops of various food colorings to the center of the milk.

3. Dip a cotton swab in your detergent, then (without stirring) gently touch the center of the food coloring.

4. Push the cotton swab down all the way to the bottom of the plate or bowl and hold it there.

5. Dip a clean cotton swab in the detergent, then touch different areas of food coloring around the plate or bowl to see if the color will move again.

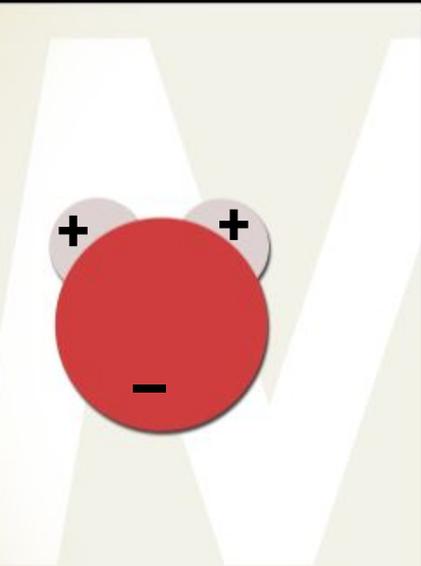
# Testing it out....



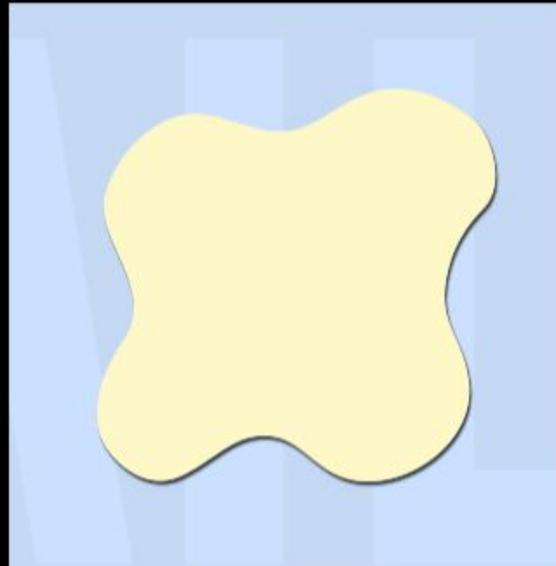
Whole milk and dish detergent

**How it works:** “Opposites attract” The negative and positive charges on molecules are attracted to each other.

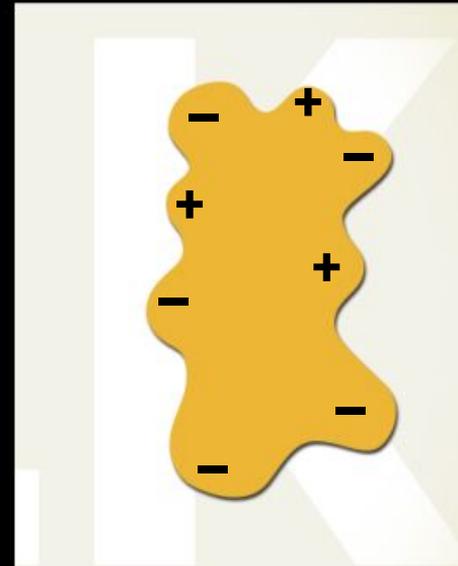
# MILK MOLECULES



**WATER**

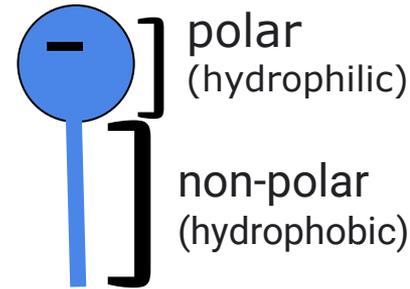


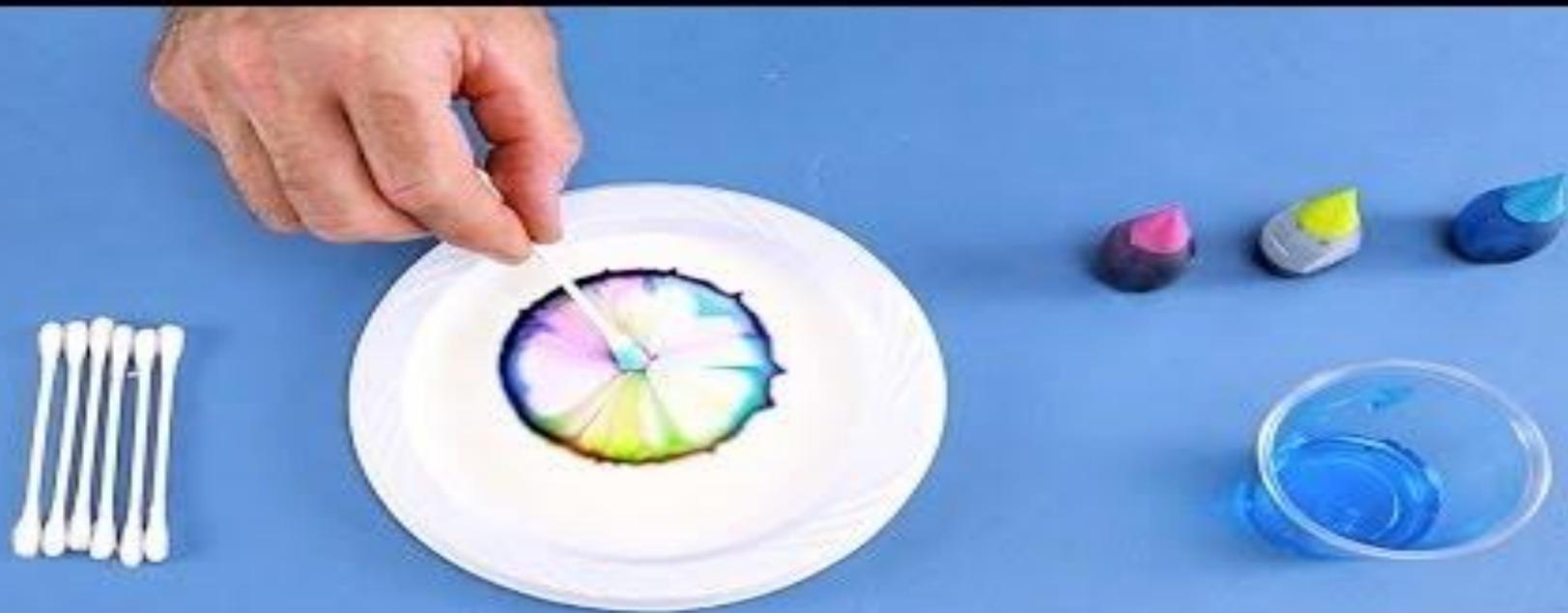
**FAT**



**PROTEIN**

**DETERGENT  
MOLECULE**





# Try changing the ingredients (variables), techniques (methods) and/or conditions and see what happens!

- Powder laundry detergent, shampoo, etc.
- Gel food coloring, beet juice, etc.
- 1%, 2% milk etc.
- Food coloring or Cotton swab placement
- Warm, cold or room temperature milk

Testing it out....



2% reduced milk and dish detergent

# Testing it out....

Soy milk and dish detergent

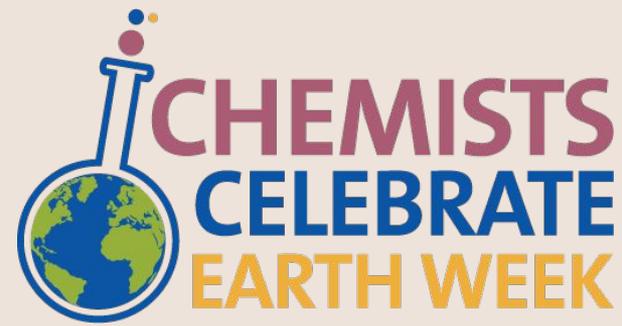


Testing it out....



2% reduced milk and body wash

# Sources



ACS's Colors on the Moooooove

<https://www.acs.org/content/acs/en/education/whatischemistry/adventures-in-chemistry/experiments/colors-move.html>

Steve Spangler's Color Changing Milk

<https://www.stevespanglerscience.com/lab/experiments/milk-color-explosion/>

Science World's SWIRLING MILK

<https://www.scienceworld.ca/resource/swirling-milk/>