HEADS IN, HEARTS IN Color-Changing Milk

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ Whole milk (enough to fill each small dish 1/3 full)
- ❑ 2 small dishes
- ❑ Food coloring (3 colors minimum)
- ❑ 1 dropper per food coloring
- ❑ Cotton swabs such as Q-tips (one per participant)
- ❑ Dish soap (enough to cover each cotton swab tip)
- ❑ Large bin for disposal of milk solution
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Set up the display table and arrange needed supplies.

HEADS IN, HEARTS IN

Color-Changing Milk

Guide for Families

Learning Objectives

What you need to know:

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).

What you will do and learn:

You will learn how fats and proteins change after the addition of a second substance. You will also learn about molecules of fat in the milk we drink.

Instructions

1. Pour a small amount of whole milk into the dish.
2. Choose 3 colors of food coloring and put one drop of each in the center of the milk. Keep the drops close together.
3. Grab one clean cotton swab. Predict: what do you think will happen if you touch the tip of the cotton swab to the center of the milk?
4. Place one end of the cotton swab in the center of the milk. What happens?
5. Using the other end of the cotton swab, dip it in dish soap. Predict: what do you think will happen when you touch the tip of the cotton to the center of the milk?
6. Place the soapy end of the cotton swab into the center of the milk. Hold it there for 10 to 15 seconds. What happens?

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 a 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.

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