EXPLORATION 2

A Milk Colour Explosion

Explore what soap does to mixtures.

Have you ever added some drops of food colouring to milk? If so, have you noticed that the drops stay intact and float on the surface of the milk instead of forming a solution?

Milk is a mixture. It is mainly made up of water, but it also contains proteins and fat molecules. These fat molecules are non-polar and hydrophobic, meaning they do not dissolve in water. Food colouring, on the other hand, consists of dye molecules that are non-hydrophobic, meaning they dissolve in water.

But when a drop of dish soap is added to milk with drops of food colouring in it, a burst of colour appears. Try the experiment to explore what soap does to mixtures.

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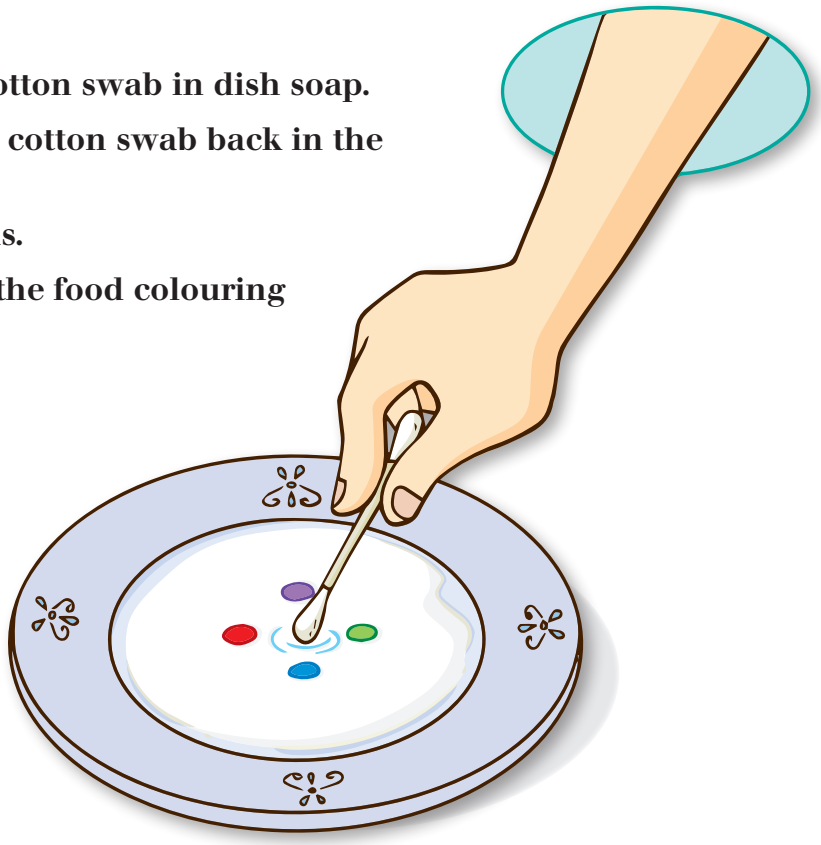
In this experiment, you will examine what happens when dish soap is added to a plate of milk and food colouring.

Materials:

- milk
- a plate
- cotton swab
- food colouring in different colours
- dish soap

Steps:

1. **Pour the milk onto the plate.**
2. **Add one drop of each food colouring to the centre of the plate of milk. Keep the drops close together.**
3. **Touch the surface of the milk in the centre lightly with the tip of the cotton swab. Do not stir.**
4. **Observe what happens.**
5. **Dip the other end of the cotton swab in dish soap.**
6. **Place the soapy end of the cotton swab back in the centre of the plate.**
7. **Hold it there for 15 seconds.**
8. **Observe what happens to the food colouring in the milk.**



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The burst of colours is caused by the unique chemistry of the dish soap. Dish soap has a bipolar characteristic – non-polar on one end and polar on the other.

Milk is made up of water as well as fat, which consists of non-polar molecules, meaning they do not dissolve in water. However, when soap is added, the non-polar end of the soap breaks up and bonds with the milk's non-polar fat molecules. The polar end of the soap molecule dissolves in water and its end bonds with the fat molecules in the milk. As the soap molecules move around to attach to the fat in the milk, the fat molecules are pushed and pulled in different directions. This displaces the dye molecules of food colouring, causing the swirling patterns.