



national science week

9-17 August 2025



Rainbow Milk

See some magic colour changing milk

Safety

Safety glasses/goggles and rubber/vinyl gloves are recommended with all chemical experiments and demonstrations.

What you need

- A shallow plate
- Full-cream milk
- Food colouring (4 different colours work best)
- Cotton bud or toothpick
- Dishwashing detergent

What to do

1. Pour milk into the plate so the bottom is just covered
2. Put a few drops of food colouring near the edge of the plate. Drop one colour on each quarter of the plate, so they are well spaced out from each other
3. Dip one end of the cotton bud or toothpick into the detergent
4. Touch the end with detergent into the centre of the milk and observe
5. Experiment again by placing the cotton bud with detergent at different places in the milk.

What's happening?

There are at least two different things happening that contribute to the swirling patterns you see in the milk. One relates to surface tension (the tendency of water to hold tightly to itself, creating a surface a bit like a bouncy skin), and the other relates to how detergent interacts with the water and fat in milk.

Milk is mostly water, but it also has tiny droplets of fat suspended in it. The high-water content of milk also gives it a high surface tension. When you drop food colouring into the milk, the surface tension of the milk and the fat droplets prevent the food colouring from spreading too far.

Detergent molecules have two ends; one end attracts water and the other repels water and attracts fats instead. When you add detergent to water, this disrupts how water molecules interact each other and lowers the surface tension.



national science week
9-17 August 2025



When you add detergent to milk, the surface tension reduces, and the water-repelling end of the detergent molecules attract and interact with the fat droplets in the milk. This creates lots of molecular movement. This invisible movement can only be seen when we add the food colouring as it gets swirled around. As the soap becomes evenly mixed with the milk, the action slows down and eventually stops.

Extension activity

Try the experiment again with different types of milk like skim milk, goats' milk or lactose-free milk or try placing the food colouring in different spots. You could also try different kinds of soap and detergents.