

OIL SPILL! Disperse it or not?

There is much discussion about whether or not to use dispersants on the current Gulf of Mexico oil spill. Oil, being less dense than sea water, naturally rises to the surface. It's clearly visible as large cohesive mats that may be skimmed, burned, and boomed. When it's at the surface, however, it has several negative impacts. The most obvious to all are oiled wildlife and blackened shorelines. Less conspicuous are problems related to oxygen levels. The dark oily surface absorbs more heat and blocks sunshine to underlying water. The warmer water that results holds less oxygen and photosynthesizing phytoplankton are starved of light.



Some people argue that it's best to disperse the oil. Dispersants have advantages and disadvantages. Added chemicals break it up into lots of smaller droplets. This increases the surface area, allowing bacteria greater access for consuming the oil. This is a good thing except that the bacteria consume oxygen instead of making it. When a food source (like oil) is available in large quantities, the bacteria rapidly reproduce and consume a lot of oxygen. Another disadvantage of dispersed oil is that it can't be as easily boomed, burned, or skimmed. Some oil droplets may sink below the surface. Some people question the toxicity of the dispersants themselves. The questions are many and the answers aren't easy.

Objective

This activity shows what dispersants do to the oil in the water column.

Materials

- Quart jar
- Tap water
- Vegetable oil
- Cocoa
- Spoon
- Small beaker or cup
- Eye dropper or pipette
- Dawn[®] Dishwashing Detergent
- Formula 409[®]



Directions

(Are you wearing your safety goggles? Do not eat or drink anything during the lab. Wash your hands when you finish.)

1. Fill quart jar about 2/3 full with tap water.
2. Add about 20 ml of vegetable oil to beaker/cup.
3. Add about ½ teaspoon cocoa to oil and mix.
4. Fill dropper with oil/cocoa mixture. Insert dropper into jar of water until the tip nearly reaches the bottom. Squeeze dropper “spilling” oil into the water.
5. Does the oil rise, sink, stay in the middle of the water column?
6. Does the oil stay together or spread throughout the water?
7. Are the oil droplets large or small?
8. Put the lid on the jar and shake to simulate waves. Observe the oil for a few minutes. Describe what happens.



9. Let's disperse the oil. Gently tilt a bottle of Dawn[®] detergent and add about 25 drops to the jar. Squirt 6 "sprays" of Formula 409[®] into the jar. Gently stir the upper layer of the mixture with the spoon.
10. Look at the surface of the water from above the jar opening. Are the drops of oil larger or smaller than they were before adding the dispersant?
11. Put the lid on the jar and shake to simulate waves. Where is the oil now? Be thorough.
12. Are the drops of oil larger or smaller than before adding dispersants?

National Science Education Standards

Physical Science Content Standard, Levels K-4:
Properties of objects and materials

Life Science Content Standard, Levels K-4:
Organisms and environments

Earth & Space Science Content Standard, Levels K-4:
Properties of earth materials

Science in Personal & Social Perspectives
Content Standard, Levels K-4:
Types of resources

Science in Personal & Social Perspectives
Content Standard, Levels K-4:
Changes in environments

Science in Personal & Social Perspectives
Content Standard, Levels K-4:
Science and technology in local challenges



Science in Personal & Social Perspectives
Content Standard, Levels 5-8:
Populations, resources, & environments

Science in Personal & Social Perspectives
Content Standard, Levels 5-8:
Science and technology in society

Science in Personal & Social Perspectives
Content Standard, Levels 9-12:
Natural resources

Science in Personal & Social Perspectives
Content Standard, Levels 9-12:
Environmental Quality

Science in Personal & Social Perspectives
Content Standard, Levels 9-12:
Natural and human-induced hazards

Science in Personal & Social Perspectives
Content Standard, Levels 9-12:
Science and technology in local, national, and global challenges

Ocean Literacy Essential Principle

The ocean and humans are inextricably interconnected.

