



Is Dilution the Solution to Pollution?

(Adapted from "How Well Is Your Water? NDSU Extension Service)

Goal: To show the effect of dilution on certain contaminants.

Indiana Proficiencies and Competencies:

Middle/Junior High School 1.1, 1.2, 3.2, and 7.2;

First year Earth and Space Science 1.1, 1.2, 6.2, and 7.2;

Environmental Science, Advanced 1.1, 1.4, 1.5, 2.1, and 6.1.

Materials needed:

- Six clear one ½ liter containers
- water
- two medicine droppers
- one milliliter of diesel fuel
- one milliliter of food coloring
- two stirring rods or straws to stir with

Background:

Sometimes there may be very small amounts of contaminants in our drinking water. Depending on what the contaminant is, this may be a serious problem. Because some contaminants are dangerous in very small amounts, it is important to know the amount of contaminant in a specified volume of (drinking) water. The federal government specifies maximum contaminant levels (MCL's) for certain chemicals that can be found in drinking water. If the MCL is exceeded, public water supply operators must take steps to ensure the health and safety of the public.

This activity demonstrates factors of dilution for two different substances, one that can be observed by sight and one by smell.

Procedures:

Part one - the food coloring

1. Fill three of the containers with 1/2 liter of water (about to the top of 16 oz cups).
2. To the first container, add 1/2 ml food coloring. (This will be ten drops from the medicine dropper.)
3. Stir the container, rinse and dry the stirrer.
Now that you have added 1/2 ml of coloring to 1/2 liter of water what is the dilution? (Remember one liter is the same as 1000 milliliters)
4. Take 1/2 milliliter (ten drops) of this solution and add it to the second container.
What is the dilution of the food coloring in the second container? Can you see any trace of color remaining?
5. Take 1/2 milliliter (ten drops) of this solution and add it to the third container.

Part two - the diesel fuel

6. Fill the three remaining containers with 1/2 liter of water.
7. Into the first container put 10 drops (1/2 milliliter) of diesel fuel using the second medicine dropper. Stir.
8. Then, put 10 drops (1/2 milliliter) of the diluted diesel fuel solution into the second container and stir.

What is the dilution of the diesel fuel in the second container?

Can you smell the fuel?

9. Now, put 10 drops (1/2 milliliter) of the diluted diesel fuel solution from the second container into the third container and stir.

What is the dilution of the diesel fuel in the second container?

Can you still smell the fuel?

For more discussion:

- *Is dilution the solution for contamination?*
- *At what dilution would you feel safe drinking the water diluted with diesel fuel?*
- *How would you determine the dilution level that would allow a contaminant to be safe to consume?*
- *Are the "safe" levels the same for children as they are for adults?*
- *How can you safely dispose of the water contaminated with diesel fuel?*
- *What would happen if you disposed of diesel fuel, or other petrochemicals or solvents in a septic system?*
- *How would you dispose of regular diesel fuel?*

To enhance this activity:

1. Do some research about how MCL's (maximum contaminant levels) are determined, and how safety standards are set. You could discuss

the ethics of using animals as test species.

2. Check you local water company's consumer confidence report. This report details the levels of certain contaminants found in your local drinking water and relates those levels to the federal MCL standards for drinking water.



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