Seafood Borne Illnesses & Risks from Eating Seafood

ACTIVITY:

WHAT IS A PART PER MILLION? - SERIAL DILUTION

Objective: To develop an understanding of parts per million as a concept and to witness the difficulty of grasping the concept of a part per million.

Per group:

- One eye dropper
- Water
- Graduated cylinder with 10-milliliter graduations (check with a local science teacher or university lab to see if you can borrow one if you do not have one)
- Three 12-ounce clear plastic cups
- Masking tape
- Marking pen
- One bottle of dark food coloring
- Calculator
- Notebook paper

Procedure:

1. Put a piece of masking tape on each cup and label them "sample 1," "sample 2," and "sample 3."

2. **Sample 1:** Put 99 drops of water into the graduated cylinder. Record the volume of water on a piece of paper. Pour the water into the cup marked "sample one."

3. Add one drop of food coloring to sample 1. Stir the water. Record the color on the piece of paper.

4. **Sample 2:** Pour the recorded amount of water for 99 drops into the graduated cylinder. Pour this into the cup labeled "sample 2."

5. Add one drop from sample 1 to sample 2.

6. Stir and record the resulting color.

7. **Sample 3:** Pour the recorded amount of water for 99 drops into the graduated cylinder. Pour this into the cup labeled "sample 3."

8. Add one drop of sample 2 to sample 3.

9. Stir and record the color.

Instructor's note:

Sample 1: One drop of food coloring was added to 99 drops of water. The concentration is one part per hundred. One part per hundred can be expressed as 1/100 or 1 percent. Use a calculator to visualize the answer. Divide 1 by 100. The answer is 0.01. The color should be visible.

Sample 2: One drop from sample 1 (0.01 concentration) was added to 99 drops of new water. The now diluted 0.01 drop of food coloring is in a total of 100 drops of solution (water and food coloring). Divide 0.01 by 100 on the calculator. The answer is 0.0001. This means you have one part food coloring in 10,000, or 1/10,000. Depending on the food color used, the color should be faintly visible.

Sample 3: One drop from sample 2 (0.0001) was added to 99 drops of new water. The now diluted 0.0001 drop of food coloring is in a total of 100 drops of solution. Divide 0.0001 by 100. The answer is 0.000001, or one part per million (1/1,000,000). The food coloring should not be visible.

Adapted with permission from
http://www.engineeringplanet.rutgers.edu/lessons.php

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Some interesting comparisons for parts per million:

- 1 ppm is equal to one pinch of salt on 20 pounds of potato chips.
- 1 ppb (part per billion) is equal to a pinch of salt on 10 tons of potato chips.
- 1 ppm is approximately one bad apple in 2,000 barrels.
- 1 ppb is approximately one bad apple in 2,000,000 barrels.