

Bioaccumulation Basics

The term bioaccumulation describes the process that leads to increasing concentrations of a chemical in an organism over time. It's a complicated concept, and it can be hard to visualize. The following activity provides a hands-on means to help people understand how bioaccumulation happens. The graphic on the following page depicts mercury bioaccumulation in fish.

Materials Needed

- 10-12 very small clear containers (1-2 ounces each)
- 5-6 small clear containers (4-5 ounces each)
- 2 or 3 medium clear containers (8-10 ounces each)
- 1 large clear container (32-48 ounces)
- Glitter or small beads of 4 distinctly different colors

Procedures

Prior to your program:

1. Fill each container 1/3 to 1/2 full with water.
2. Add a pinch of glitter or a few beads of one specific color to the very small containers. Use a second color for the small containers, a third color for the medium containers, and the final color for the large container.

During your program:

1. Distribute the containers among your participants until all are in use.
2. Ask the people with the very small containers to stand. Explain that they represent tiny organisms (plankton) living near the bottom of a local stream or lake. The glitter in the water is the mercury they have ingested eating the microorganisms in the stream or lake bottom.*
3. Ask the participants with the small containers to stand. These participants represent small fish or insects that feed on the plankton. The glitter or beads represent the mercury they have accumulated. Instruct these volunteers to each find two plankton and “feed” by pouring water from these very small containers into their water. Point out that the mixed colors of glitter represent the beginning accumulation of mercury. The volunteers with the smallest containers (now empty) can return to their seats.
4. Move on to the participants with the medium containers. Ask them to stand. They represent the small or medium-sized fish who feed on the smallest fish and insects. Each of these volunteers will find 2-3 of the small fish or insects to eat. Again, they will add the water from the small containers into the medium containers. You'll now have 3 colors of glitter or beads in each container representing the continued accumulation.
5. As a final step, ask the volunteer with the largest container to stand. This person represents a predator fish who feeds on small and medium sized fish over their lifetime. Ask the volunteer to add the water from all of the medium containers to their initial water and glitter or beads. This predator will now have 4 colors of beads or glitter visible representing the stages of accumulation.

* Note: As the water is poured from one container to the next, a small amount of the glitter or beads may be left behind. This represents the mercury that is not accumulated but is excreted.

Adapted from “Mercury in Schools and the Community: A National Issue,” Steve Brachman, et.al. University of Wisconsin-Extension. Adapted by Kim Henken, Extension Associate for Environmental Issues. March 2005

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Bioaccumulation of Mercury in Fish: Stepping Up the Chain

Step 5 - At the top of the chain:

A 150-pound man or woman may consume 100 pounds of fish in a year. If the fish contain mercury, that person could accumulate mercury in his or her body over time, much like larger fish accumulate mercury from the smaller fish they eat.

Step 4 – Large fish consume thousands of small and medium-sized fish in their lifetime. Toxins such as mercury become more concentrated in the larger fish.

Step 3 – Medium-sized fish feed on the smaller fish and accumulate even more mercury as they grow and age.

Step 2 – Small cold-water fish feed on the plankton and become contaminated with mercury.

Step 1 – As plant and animal plankton sift water for food, they can take in toxins such as mercury.

