Merging Mercury

About This Lesson

Timeframe: Typically, one class period.

Grade level: 6-12

Academic Question: How does mercury accumulate in gamefish?

Objective: To show how mercury travels and accumulates through food chains.

Background:

Mercury, introduced or naturally occurring, can be introduced into various food chains/webs. Because mercury is stored in tissue, it is transferred between trophic levels. At lower levels, mercury concentrations do not seem to have an effect on animal function; however, as levels rise over time, animals may begin to show adverse effects of mercury poisoning (neurological/reproductive issues). Humans are a high-level consumer and therefore, potentially at risk of mercury poisoning. Mercury poisoning in humans and occurs through a process known as **bioaccumulation.**

Bioaccumulation- refers to the accumulation of substances, such as pesticides, mercury, or other chemicals in an organism. Bioaccumulation occurs when an organism absorbs a toxic substance at a rate greater than at which the substance is lost.

Getting Started

Process:

This activity will use a classroom of students representing a food chain to show the bioaccumulation of mercury through several trophic levels. Develop an interrupted case study scenario appropriate to your region, and present this to the students before beginning the exercise.

Materials:

- 3-5 lbs. bag of pinto beans
- 1 ½-2 lbs. bag of red beans (try to find a similar size to the pinto beans)
- Small plastic container or small shoebox to hold combined beans
- 1 ½ ounce plastic cups

Procedure:

First level

Thoroughly mix together all beans in plastic container. Have each student collect a full 1 ½ ounce cup of the combined beans. At this level, the students represent a lower

organism on the food chain and the beans represent their diet. (In marine systems, this level is typically made up of polychaete worms and/or zooplankton). Have the students record the number of "red" beans in their diet for the first level and return the red beans to their sample. The red beans represent mercury that the organism has eaten or absorbed from their environment.

Second level

Have the students group together in groups of 3-4 students and combine their beans. At this level the students have moved up the food chain and now represent gastropods and bivalves that consume polychaete worms and zooplankton. Have the students record the number of "red" beans for the second level.

Third level

Have the groups of 3-4 students join with another group of 3-4 and combine their beans. At this level the students have moved to the third level of the food chain and represent small fish (pinfish/croaker) and squid. Have the students record the number of "red" beans for the third level.

Fourth level

Have the groups of 6-7 students join with another group of 6-7 and combine their beans. At this level the students have moved to the fourth level of the food chain and represent local sportfish (Redfish, Speckled Trout, Black Drum). Have the students record the number of "red' beans for the fourth level.

Fifth level

Have the teacher "go fishing" and collect the beans representing the two or three "redfish" he/she caught that day. Have the students record the number of "red" beans consumed by the teacher and determine/discuss if they are susceptible to mercury poisoning.

Evaluation/Extension:

- This lab can be evaluated as per district procedures.
- Have students research other elements/chemicals that bioaccumulate in organisms.
- Have students research local sources of mercury within their region.

This module was originally developed as part of the "Hurricane Recovery Workshops for Students", held in Corpus Christi in 2017.