

LESSON #6: UNDERSTANDING LEAD TOXICITY

OVERVIEW:

In this lesson, students will develop a basic understanding of lead toxicity to humans by observing and discussing a demonstration which models the masking of calcium by the presence of lead. A PowerPoint focusing on lead's properties as well as its sources of entry into the body will be used to lead a class discussion. Students will consider not only what has been done to limit the sources of lead in the environment, but also how diet may also play a role in preventing the effects of lead poisoning from being manifested in the individual. A focus on the specific consequences of lead poisoning in young children will also be addressed.

SUB-QUESTION:

How and why is lead toxic to humans?

Ways of Knowing Urban Ecology:



Students will...

Understand

- Recognize the physical and chemical properties of lead (*ecosystem state and structure*).
- Understand the ways in which lead interferes with human body functioning (*ecosystem change, ecosystem services*).
- Acknowledge the ways in which lead poisoning is prevented and treated.

Talk

No specific goals connected with talking about urban ecology in this lesson.

Do

- Complete and analyze a simulation of lead entering the human body.

Act

No specific goals connected with acting on urban ecology in this lesson.

SAFETY GUIDELINES:

No specific safety issues are associated with this lesson.

PREPARATION:

Time:

1 class period

Materials:**Activity 6.1**

Yellow food coloring
Green food coloring
600-1000 ml beaker or clear container
Water

Activity 6.2

LCD projector
Lead Toxicity Power Point

INSTRUCTIONAL SEQUENCE**Activity 6.1: Lead gets in the Way**

1. Begin the class by reminding students of the previous lesson which described the effects of mercury on organisms. Remind them of the concepts that were discussed related to what it means for a substance to be toxic. Then tell them that in this lesson, you will be focusing on why lead, not just mercury, is also toxic to humans.
2. For the demonstration, place a water filled beaker in the front of the room. Add 20 drops of yellow food coloring to the water and tell students that this represents the calcium that is present in their bodies.

Teacher Background Knowledge

Calcium plays many roles in a healthy human body. It is a building block for bones and bone development, and plays a large role in muscle and nerve functioning. Calcium also plays a role in heart functioning and blood clotting.

3. Ask them what they think will happen when you add one drop of green food coloring to the water.
4. Add the green food coloring. The water will become green. Explain to students that the yellow coloring is still present in the water, but that the green coloring masks the effect of the yellow coloring, inhibiting our vision from detecting the yellow.
5. The green represents lead when it enters the body. Scientists suggest that lead mimics and inhibits calcium from performing its natural functions in various organs. Because of this, the body functions differently and symptoms of lead poisoning emerge.
6. Keep the beaker and its contents in the front of the room. It will be referred to after the next activity.

Activity 6.2: Why and how is Lead Toxic?

1. Present the PowerPoint to the students. Questions and suggestions can be found in the notes section of the slides.
2. The last slide asks students to explain why a diet high in calcium can prevent the effects of lead poisoning. At this point, you can refer back to the beaker. Could the effect of the green coloring be decreased if more yellow coloring were added?

You may add more yellow food coloring to test this hypothesis. This is also a good time to talk about what the limitations of the model are as well as how the model helps to understand processes by which lead is harming the body.

Concluding the lesson

1. Ask students to comment on the following question.
 - In 1997, the blood lead level of concern for children was decreased from 25 micrograms per deciliter to 10 micrograms per deciliter by the Center for Disease Control and Prevention. What does this mean to the average person? Do you think this was necessary? Do you think this was strong enough?