

Lab 1

Lead Detection

Purpose

To learn one method for the detection of lead in soil.

Overview

This investigation is one method used in the detection of lead in soil. The detection of the presence of lead in soil can be determined sensitively using inexpensive swabs.

Time

2 class periods – the actual lab takes about 30 minutes each day, but the dirt samples need to settle overnight

Key Concepts

The major cause of soil contamination by lead in populated areas is the weathering, chipping, scraping, or sandblasting of structures bearing lead-based paints. There are proven and inexpensive means for the detection of lead in soil. It is not unusual to find lead in the soil and paint in our surroundings.

Skills

Making observations
Measuring
Tabulating data
Forming hypotheses
Testing hypotheses
Understanding and describing interrelationships in nature
Communicating observations and interpretations orally and in writing

Materials

Lead Check[®] Soil Swabs
Soil Samples
Beakers
Eye Droppers

Plastic Bags
Wax Paper
Clear Plastic Wrap
Lemon Juice

Facilitator Preparation

Some soils may contain more clay than others and may completely absorb the two teaspoons of lemon juice. If your soil sample does not settle, leaving a layer of clear lemon juice above it, repeat the test and either add 3-4 teaspoons of lemon juice to one

teaspoon of soil OR reduce the amount of soil tested to ½ teaspoon and add two teaspoons of lemon juice as required to effect a separation of soil and lemon juice layers.

ETHICS NOTE: Facilitators may choose to bring prepared soil samples for testing for the students rather than having students bring soil from their homes. Because it is not unusual to find detectable levels of lead in soil taken from urban areas, students may be distressed to find positive results. Ethically, the facilitator must be prepared to deal with feelings of anxiety or panic when students identify soil or paint that contains lead. If the facilitator does choose to use students' soil samples, a discussion should prepare them for fact that is it likely that they will have some positive tests.

Background

Soil is often contaminated with lead-paint chips flaking from exterior house paint, from sand blasting near-by metal structures such as bridges or highway overpasses, and from automobile exhaust fumes on a busy street. Lead Check[®] Swabs are designed to be used as a presumptive test for lead. As such, they cannot be used to determine *how much* lead is present.

Procedure

The following protocol can be used to determine if your soil contains a HIGH level of lead:

- 1) Have students collect several spoonfuls of soil from various parts of their yards at home. Students should place the samples in flexible plastic bags. Break up large lumps of dirt by squeezing the plastic bags. Within each plastic bag, mix the dirt together thoroughly.
- 2) In a glass or plastic beaker, place one teaspoon of soil and add two teaspoons of reconstituted lemon juice, such as *Real Lemon*.
- 3) Thoroughly mix the dirt and lemon juice together.
- 4) Allow the dirt to settle overnight at room temperature.
- 5) The next class period, remove *ONE SMALL DROP of the clear liquid above the dirt and place it on a piece of plastic wrap, such as *Saran Wrap* or wax paper.
- 6) Activate the Lead Check[®] Swab according to the instructions provided. Be sure there is yellow at the tip of the swab.
- 7) Rub the Lead Check Swab in the drop of liquid for about 15 seconds.
- 8) If pink is observed, on the swab, on the plastic wrap or on both, high levels of extractable lead are present in the soil tested.

* Be sure to use a small drop of liquid. A large drop dilutes the lead reactive material in the swab and causes an inaccurate result.

Student Assessment

Before the testing of the soil samples, students should hypothesize whether the soil sample may have lead contamination and why. Was the sample taken from a “high risk” area? Have students describe what they see happening with the soil samples and the corresponding swabs. Students should write a brief description of what they observe as the various soil samples interact with the swabs. They should describe what the next step might be in lead detection within soil. Students are encouraged to include their opinions and educated guesses. Students can also map the sources of their samples positive and negative and compare them with the high-risk map provided by the Miami- Dade County Health Department in the mapping segment.