

How Much Mercury Is In Your Soil

By Aubrey Lewis

Introduction: Mercury is one of many heavy metals on Earth. It stays liquid at room temperature. “Mercury is found everywhere including the earth's crust and released naturally by volcanoes. It is even used in thermometers, flu vaccines, dental fillings, fluorescent bulbs and get this, children's light-up sneakers. All of which end up in our oceans, lakes, streams and landfills. In fact, mercury ends up polluting our water supply”. Mercury was once use in make up and dental work. Mercury was also used in the hat making because of the high concentrations of mercury in the felt the makers often went mad. This is how the term mad hatter was started. People having long-term contact with this element show signs of mercury poisoning. Mercury poisoning causes personality changes, nervousness, and other mental problems.

Abstract: We want to find what places in the New York area contain more mercury a landfill, an auto junkyard, or a home garden. These tests will show is if mercury is harmful or if it is contained in one area more than the others. If there are one place with a higher mercury level then the others we want to see what is causing it. These tests are important because if could show why one town has a higher rate of mercury related illnesses then others. It could also prevent building being placed in a risky area. The mercury could reach ground water in that area causing people to get sick.

Materials:

FIMS 100 Mercury Analyzer
Goggles and Gloves
BOD Bottles

Soil Samples
Reagents and Standards

Reagents and Standards:

Stannous Chloride
Potassium Permanganate
Sulfuric Acid
Sodium chloride-hydroxylamine sulfate
Mercury Stock Standard
Mercury Working Standards

Procedure: Standard Methods extraction procedure was used for the soil samples collected.

The procedure is as follows:

- 1) Place 0.6 grams of sample into a BOD bottle
- 2) Add 5 mL of RGW (reagent grade water)
- 3) Add 5 mL of 3 parts HCl and 1 part HNO₃
- 4) Heat for 2 minutes @ 95 C
- 5) Cool, then add 50 ml RGW
- 6) Add 15 ml 5% Potassium Permanganate and heat for 30 minutes @ 95 C
- 7) Cool, add 6 mL of Sodium Chloride-hydroxylamine sulfate, and analyze within 28 days

Standard Preparation: The standards were prepared as follows:

Hg Stock: 1 ppm

Working Standards:

- 1.0 ppb: 100 uL of stock to 100 mL RGW
- 5.0 ppb: 0.5 mL of stock to 100 mL RGW
- 15.0 ppb: 1.5 mL of stock to 100 mL RGW
- 20.0 ppb: 2.0 mL of stock to 100 mL RGW

Samples and standards were analyzed on the Perkin Elmer FIMS 100 that utilizes a flow injection system. The absorbance is read 257.5 nm. The units read the absorbance of the standards to create a calibration curve. The soils samples are then read against the curve to determine the mercury levels in each sample.

The preliminary results were as follows:
Soil sample 1: Landfill KP: 0.23 ppb
Soil sample 2: Location S : 0.35 ppb

The preliminary results show that landfill KP has lower mercury levels than Location S. As to why Location S has lower levels is unknown at this time. It will be necessary to obtain additional samples from Location S but also from Location KP. It is possible that the area from which the original sample was taken was a clean area and there are “hot” spots located within landfill. Since landfills contain waste from homes it is not unreasonable to think that at one point or another someone inadvertently discarded a thermometer containing mercury. Likewise Location S could exhibit the same type of incidence. Another fact that will have to be tested in the future is collected samples from various depths. This will help strengthen our findings and support what we have learned from this first test.

Future Work: Soil samples will be collected from various other locations to see if they show the similar results to our initial findings. If so, we want to check hospital records for cases of developmental disabilities in areas exhibiting larger concentrations of mercury levels. This correlation will help with future clean up efforts in these areas to try lower the incidences of developmental disabilities. This will also determine a safe distance for residential development from a landfill. My ultimate question for this research is to find out if Long Island has harmful levels of mercury in its topsoil. Future analysis will let me know “If my organic backyard garden is really safe?”

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