



The **Hazard Evaluation and Emergency Response (HEER) Office** is part of the Hawai'i Department of Health Environmental Health Administration whose mission is to protect human health and the environment. The HEER Office provides leadership, support, and partnership in preventing, planning for, responding to, and enforcing environmental laws relating to releases or threats of releases of hazardous substances.

Arsenic in Soil - Former Pesticide Mixing Area, Aalona Place, Kilauea, Kauai

Questions and Answers on Health Concerns

A neighborhood in Kilauea is located on the site of a former sugar mill. Based on a review of historical information, HDOH has determined that a pesticide mixing and storage area was located in the vicinity of the drainage ditch on Aalona Place. Our staff have tested the soils in yards and commercial properties on Aalona Place for pesticides. This fact sheet discusses how arsenic was used in sugar cane operations, what our investigation has found, how you can reduce exposure to contaminated soils and provides resources for further information.

HDOH recently found high levels of arsenic in soils on two properties on Aalona Place. The highest concentration was found in a small drainage ditch behind a commercial building, about 80 times HDOH's acceptable level for residential yards. One residential property was found to have arsenic levels about 30X our action level. Adjacent residential and commercial properties were also tested, and found to have surface soils that meet state residential action levels. Testing of additional properties located further from the ditch area, and in downstream drainage areas is planned as a precautionary measure.

A lesser amount of dioxins was also identified in the impacted soils. The dioxins are believed to be associated with impurities in other types of pesticides (e.g., pentachlorophenol) used in the mixing area. Although the levels of dioxins exceeded HDOH action levels, they are not high enough to pose potential, near-term health risks. Addressing short-term risks posed by possible exposure to arsenic in the soil will also address potential long-term risks posed by exposure to dioxins.

The affected property owners have been notified to limit contact with exposed soils. The impacted ditch area is securely fenced and Keep Out signs have been posted. **The current risk is low because the soils in the affected residential yard are covered with grass or clean soil, and the ditch area is fenced and clearly marked to restrict access.** The HEER Office is currently evaluating cleanup options, and will come back to the community and the affected landowners to discuss alternatives and proposed state actions.

What is arsenic and where is it found in Hawai'i?

Arsenic is a naturally occurring element in the earth's crust. In Hawai'i, low levels of arsenic are found naturally in native soils. However, significantly elevated levels of arsenic have been identified in former pesticide storage or mixing areas. The presence of elevated levels of soil arsenic is believed to be related to the widespread use of sodium arsenite (an inorganic arsenic compound) and other arsenic-based herbicides/pesticides in and around sugar cane fields in the 1920s through 1940s. Because inorganic arsenic is stable in the environment, it remains in the soil after use. Fortunately, naturally occurring iron in the soil tightly binds with most of the arsenic and makes it less toxic to people who may come in contact with the soil.

How are people exposed to arsenic?

For most people the diet, including foods such as fish, rice and seaweed, is the most significant source of arsenic. However, unintentional ingestion of soil with high levels of arsenic can be an important source of exposure. This is especially a concern in young children. Most preschoolers put their hands, toys, or other objects in their mouths, and these often have small amounts of soil and dust on them that the child swallows. While a typical child might eat 1/8 teaspoon of soil daily, some young children may eat more than that on occasion. Eating unusually large amounts (teaspoons or more) of contaminated soil can greatly increase a child's exposure to arsenic.

What are the human health concerns of arsenic exposure?

The health effects of arsenic depend on its chemical form, how much enters the body, how it enters the body, how long it stays in the body and the unique health situation of the person. Exposure to very high amounts of arsenic can cause both short-term (acute) symptoms and long-term health effects. Symptoms of exposure to very high levels of arsenic may include stomach pain, vomiting, diarrhea and impaired nerve function that may result in "pins and needles" sensation in hands and feet. People who have been exposed to lower levels of arsenic in drinking water over long periods of time have had health symptoms that include changes in skin pigmentation (dark spots), thickening or warts on the palms of the hands and soles of the feet, damage to heart and blood vessels, and inflammation of the liver. In addition, long-term exposure to high levels of arsenic has been associated with an increased risk of cancer.

These types of health effects have been identified in poisonings or in some countries where drinking water is contaminated with high amounts of arsenic. **These health effects have not been documented from soil arsenic exposure in Hawai'i.** Many years of continuous exposure to soil with high levels of arsenic could, however, lead to a small increase in the risk of cancer and other health effects. These effects would be extremely hard to associate with past chemical exposures and to examine in relatively small population sizes that occur in many regions of the Hawaiian Islands. Consequently, limiting exposure to any arsenic sources above typical dietary exposure wherever possible is generally recommended. Parents should make every effort to ensure that their young child does not inadvertently eat large amounts of soil. Arsenic does not accumulate in the body (bioaccumulate). Stopping exposure will reduce arsenic levels in the body.

How can I test to see if I have been exposed to arsenic?

Any arsenic exposure testing should be recommended and conducted by a doctor or trained medical professional. Tests are available to measure arsenic in your urine, blood, or hair and fingernails. HDOH has not generally recommended human exposure testing in former sugar cane plantation areas. The urine arsenic test is considered the most reliable, but is expensive, and determines exposure only within the last few days. The testing can determine if the level of arsenic in the body is higher or lower than the average person. Because the diet is an important source of arsenic exposure, the average person will have measurable amounts of arsenic in their body. The testing cannot determine the origin of the arsenic (e.g. soil or food) or whether the arsenic levels in the body will affect the individual's health. Limited urine arsenic testing (by HDOH and the federal Agency for Toxic Substances Disease Registry [ATSDR]) of people living by two Hawai'i Island garden areas with elevated soil arsenic found normal arsenic levels in most individuals tested. The tests could not determine if higher inorganic arsenic exposures measured in some older individuals was from soil ingestion or the rice and seafood diets they ate.



What can I do to prevent exposure to contaminated soil?

Soil testing near Aalona Place has revealed high soil arsenic in a small area that is currently fenced. Lower, but still elevated levels of arsenic were found in one other yard. Initial sampling of the adjacent houses show that surface soils are below action levels, and are not believed to pose a health risk. HDOH will be doing additional testing to confirm these results. However, until we complete the investigation and are comfortable that all source areas have been identified, we recommend the following common sense practices to reduce exposure.

General Precautions to Reduce Arsenic or Dioxin Exposure for Bare Soil

- If you have bare soil on your property, maintain grass, other vegetative cover, or some kind of surface material over the soil. This acts as a barrier to prevent soil exposure. Cover animal pens with old rugs or other materials to eliminate bare dirt areas that pets could be exposed to.
- Keep children from playing in bare dirt and keep toys, pacifiers, and other items that go into children's mouths clean.
- Wash hands and face thoroughly after working or playing in the soil, especially before meals and snacks.
- Wash fruits and vegetables from the garden with water before bringing them in the house, then wash again inside with a brush to remove any remaining soil particles. Pare root and tuber vegetables before eating.
- Bring in clean sand for sandboxes and add soil known to be free of contamination to food garden areas. You could also make raised garden beds with clean soils.
- Avoid tracking soil into the home and clean up right away if soil is tracked in. Remove work and play shoes before entering the house. Keep pets from tracking soil into your home.

If you have concerns about your or your child's exposure to the contaminated soil in the area adjacent to Aalona Place, please talk to your physician or call Dr. Barbara Brooks, HDOH, 808-586-4249.

Further Information

For questions about this fact sheet or further information about the investigation in Kilauea or about HEER Office guidance related to soil arsenic, contact:

Hawai'i Department of Health,
Hazard Evaluation and Emergency Response Office
919 Ala Moana Boulevard, Room 206
Honolulu, Hawai'i 96814, Telephone: (808) 586-4249

To access more detailed information regarding soil arsenic, including detailed reports of studies conducted in Hawai'i and elsewhere, please visit the HEER Office website: <http://hawaii.gov/health/environmental/hazard/index.html>

Additional references located on HEER Office website:

HDOH, 2008. *Homeowner's Guide to Soil Testing for Arsenic*

HDOH, 2010. *Arsenic in Canec Ceilings and Wallboard in Hawai'i* (Fact Sheet)

Federal Government

To learn about recommendations from the Federal Government regarding arsenic, you can also contact the Agency for Toxic Substances and Disease Registry, ToxFaq's internet address <http://www.atsdr.cdc.gov/toxfaq.html>



Former Kilauea Sugar Mill Area Preliminary Pesticide Investigation March, 2011

