



The **Hazard Evaluation and Emergency Response Office (HEER Office)** is part of the Hawai'i Department of Health (HDOH) 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.

Past Use of Chlordane, Dieldrin, and other Organochlorine Pesticides for Termite Control in Hawai'i: Safe Management Practices around Treated Foundations or during Building Demolition

This fact sheet provides building owners, demolition and construction contractors, developers, realtors, and others with an overview of the potential environmental concerns associated with the past use of organochlorine termiticides (pesticides used to control termites) in Hawai'i. In addition, this fact sheet discusses methods for reducing exposure to organochlorine termiticides during building demolition or around the foundations of treated buildings and identifies resources for further information.

What are organochlorine termiticides?

Organochlorine termiticides are a group of pesticides that were used for termite control in and around wooden buildings and homes from the mid-1940s to the late 1980s. These organochlorine pesticides included chlordane, aldrin, dieldrin, heptachlor, and dichlorodiphenyltrichloroethane (DDT). They were used primarily by pest control operators in Hawaii's urban areas, but also by homeowners, the military, the state, and counties to protect buildings against termite damage. In the 1970s and 1980s, the U.S. Environmental Protection Agency (EPA) banned all uses of these organochlorine pesticides except for heptachlor, which can be used today only for control of fire ants in underground power transformers. Chlordane was the most widely used organochlorine pesticide against termites in Hawai'i. Termiticides were commonly applied directly to soil beneath buildings or beneath slab foundations and around the foundation perimeter for new construction. They may also have been periodically applied underneath the building (if accessible) at occupied structures, around the perimeter of the foundation, or in trenches excavated around the foundation, or by injection through holes drilled next to the foundation or in the flooring at the periphery of walls. These pesticides break down slowly in the environment, application rates were relatively high, and applications may have been repeated over time. As a result, these organochlorine termiticides may sometimes still be found in treated soils at concentrations detrimental to human health.



At least seven species of termites are found in Hawai'i. The most destructive are the Formosan subterranean termite (shown here) and the West Indian drywood termite, both of which arrived during the past 100 years and are now common throughout the state.



How do I identify if organochlorine termiticides are present at levels that may be a concern?

Some organochlorine termiticide contamination may be found below wooden structures, building slabs, or adjacent to foundations built in Hawai'i before 1989. The highest concentration of termiticides in soil is typically found beneath the house or around the perimeter of the building foundation (extending away from the building a distance of up to 1 to 3 feet). Highest concentrations are believed to be contained in the top 1 to 2 feet of soil because termiticides are persistent chemicals that stick to soil particles. Most, however, are likely within the top 6 inches or top 12 inches of treated soil depending on soil type and if the termiticides had been applied on the surface, in shallow trenches, or injected a little deeper underground during application. If soils in the areas treated were subsequently covered or scraped off, that could also affect the depth where any residues may be found. Termiticides applied more than two decades ago are not detectable by smell or sight, so generally they are assumed to be present at levels that may be a concern, or soil testing is recommended to confirm the presence and level of these toxic substances. The Department of Health (HDOH) HEER Office has established specific soil action levels for each of the organochlorine termiticides that, if exceeded, represents a potential hazard that would warrant further evaluation or cleanup.

When organochlorine termiticides are assumed to be present underneath or around the foundation perimeter (or both) of wooden structures built before 1989, the HEER Office recommends following practices that will help avoid or greatly reduce the potential for exposure in the (presumed) treated areas. See the section below on *What can I do to limit or avoid exposure to soil or foods contaminated with organochlorine termiticides?*

The HEER Office recommends testing soils (at wooden structures built before 1989) when: (1) the homeowner plans to grow produce within 5 feet of the building foundation, (2) the soils adjacent to the foundation cannot be covered or landscaped with non-edible plants and children or others playing or working in this area may periodically come in contact with bare soil, (3) the home or other structures are going to be demolished and the soil underneath the structure and from around the foundation will be reused either on or off site, and (4) there is reason to believe soil in areas of the yard away from the foundation were treated with organochlorine termiticides in the past, or that treated soil from underneath the structure or from the foundation perimeter may have been spread out in the yard.

In the case where structures will be demolished, the demolition and redevelopment process could spread termiticide-contaminated soil about the property in the process of grading or site preparation. Spreading the soil could put the demolition and construction contractors at risk of exposure as well as future site inhabitants. Consequently, testing before grading is conducted is important to evaluate the potential for soil contamination. Alternatively, the soil from under the structure and around the foundation perimeter (to a depth of at least 1 foot) can be assumed to be contaminated, excavated, and disposed of in an approved landfill. If soil is disposed of at a landfill, any specific landfill testing or disposal requirements would apply.

A knowledgeable contractor can collect soil samples, arrange for laboratory testing, and help interpret testing data. A guide to assist contractors in soil testing for organochlorine termiticides is available on the HEER Office website (see [Further Information](#) below). Once the soil has been tested, the HEER Office also offers guidance to assess the termiticide levels (if present) and help decide what actions may be appropriate to reduce or eliminate exposures.



What can I do to limit or avoid exposure to soil or foods contaminated with organochlorine termiticides?

Residents or owners of homes or buildings treated with organochlorine termiticides have a higher potential risk of exposure, primarily through direct contact with contaminated soil or eating foods grown in contaminated soil. If you have or suspect organochlorine termiticide-contaminated soil on your property, the Department of Health HEER Office recommends these actions to limit or avoid exposure:

Limiting Exposures

- Plant grass or other non-edible vegetation, or cover contaminated soil with some kind of surface material such as gravel (within several feet of the foundation) to act as a barrier to prevent soil exposure.
- Keep children from playing in dirt near the foundation and keep toys, pacifiers, and other items that go into children's mouths clean.
- Locate pet enclosures away from the perimeter of the building foundation.
- Do not grow edible produce such as fruits and vegetables in potentially contaminated soils next to the building foundation. Cover the soil next to the foundation, or add clean soil and landscape with non-edible plants.
- Do not relocate soils from underneath the building or from the foundation perimeter to other areas of the property.
- To reduce exposure to soil, cover bare soil underneath the house with a barrier material such as gravel or plastic before you work or store materials underneath the house.

Practices for Exposure Prevention

- Wash hands and face thoroughly after you work or play in soil near the building foundation, especially before meals and snacks.
- Avoid tracking soil from near the foundation perimeter into the home and clean it up right away if soil is tracked in. Remove work and play shoes before you enter the house. Keep pets from tracking contaminated soil into your home.
- If you work with contaminated soil or soil that may be contaminated, you should wear gloves and protective clothing (long-sleeve shirt and pants) to reduce exposure. A protective paper mask (N-95 type with two elastic straps) should be worn if airborne dust is present (such as when you are operating a weed-eater in contaminated or potentially contaminated areas). Working with contaminated soil may leave residues on your clothing, so change clothes and shower after you work with the soil and avoid spreading dirt from clothes or shoes into your vehicle or house.

What are the hazards of organochlorine termiticides?

The organochlorine termiticides used in Hawai'i before 1989 are persistent synthetic chemicals that stick to soil particles, do not dissolve easily in water, remain in the environment for many years, and may bioaccumulate up food chains. Exposure to the organochlorine termiticides can occur through ingestion, absorption through the skin, or inhalation; however, the primary exposure to these chemicals long after application is from unintentional ingestion of contaminated soil or through contaminated foods. (Plants can take up residues from the soil.) The greatest exposure to these chemicals is expected in areas where they were applied at homes or building sites for termite control, but the potential for exposure would depend on how and where they were applied in the past, the frequency residents may come into contact with contaminated soil or foods grown in contaminated soil, and any actions after applications that may have disturbed or spread contaminated soil. Following is general information for each of these pesticides, as published by the U.S. Department of Health and Human Services and EPA.



CHLORDANE (Technical Chlordane)

Chlordane was the most common organochlorine termiticide used in Hawai'i. The amount of chlordane used was more than twice that of the termiticides aldrin, dieldrin, or heptachlor. Exposure to high levels of chlordane can harm the human endocrine system, nervous system, digestive system, and liver. EPA has also concluded that chlordane is a probable human carcinogen and may cause liver cancer. Chlordane can persist in the soil for more than 20 years. Technical chlordane does not occur naturally in the environment. It is not a single chemical, but a mixture of pure chlordane (50 to 75 percent) and more than 100 related compounds, including heptachlor and heptachlor epoxide. Chlordane was used widely throughout the U.S. from 1948 to 1983 for control of termites as well as pests in some agricultural crops and in lawns. EPA banned all uses of chlordane in 1983 except to control termites, and banned all uses in 1988, because of concern about damage to the environment and harm to human health.

ALDRIN and DIELDRIN

Aldrin and dieldrin are often considered together because they are chemically similar compounds. These chemicals were used as insecticides in agriculture and as termiticides to protect buildings after they were commercially available in the early 1950s. EPA banned all uses of aldrin and dieldrin in 1987. Exposures of animals to high levels of aldrin or dieldrin have caused nervous system effects. Based on animal studies, EPA has also concluded that aldrin and dieldrin are probable human carcinogens. Aldrin breaks down to dieldrin in the body and in the environment. Dieldrin breaks down very slowly in soil.

DDT, DDD, and DDE

Since the mid-1940s, dichlorodiphenyltrichloroethane (DDT) had been used widely as an insecticide in agriculture, for control of mosquitoes that may carry disease, and as a termiticide. EPA banned DDT in 1972. Dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethylene (DDE) are chemicals similar to DDT that occur as manufacturing byproducts and breakdown products or metabolites of commercial DDT. DDD also had been produced and sold as an insecticide, but its use was banned along with DDT. Exposure to high levels of DDT affects the nervous system. EPA has concluded that DDT, DDD, and DDE are probable human carcinogens. DDT, DDD, and DDE are long-lived in the environment, though current levels found in soils of agricultural fields are typically quite low. However, higher DDT levels may occur around or beneath wooden building foundations where it was used as a termiticide because the application rates for termite control were higher than the application rates for agricultural insect control.

HEPTACHLOR and HEPTACHLOR EPOXIDE

Heptachlor is a manufactured chemical that was commercially available from 1953 through 1987, when EPA banned virtually all uses. Little is known about the health effects of heptachlor in humans, but high levels may damage the liver and nervous system. EPA considers heptachlor epoxide a possible human carcinogen. Heptachlor was used as an insecticide in agriculture, as well as a termiticide for homes. Currently, it can be used only for fire ant control in underground power transformers. Bacteria and animals break down heptachlor to form heptachlor epoxide; therefore, heptachlor epoxide is more likely to be found in the environment over time than is heptachlor.

For questions about this fact sheet of further information, contact:

- Hawai'i Department of Health, Hazard Evaluation and Emergency Response Office, Telephone: (808) 586 – 4249, Website: <http://eha-web.doh.hawaii.gov/eha-cma/Org/HEER/>

Additional references located on the HEER Office website:

- HDOH, 2011. *A Guide to Soil Testing for Organochlorine Termiticides at Residential Sites in Hawai'i*

Access information from the federal government on termiticides:

- (U.S.) Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine
ToxFAQs Website: <https://www.atsdr.cdc.gov/substances/index.asp>
- U. S. Environmental Protection Agency
Website: <https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks>

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