

1. PUBLIC HEALTH STATEMENT

This public health statement tells you about aldrin and dieldrin and the effects of exposure to these chemicals.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites make up the National Priorities List (NPL) and are the sites targeted for long-term federal cleanup activities. Aldrin has been found in at least 207 of the 1,613 current or former NPL sites, and dieldrin has been found in at least 287 of the 1,613 current or former NPL sites. However, the total number of NPL sites evaluated for these substances is not known. As more sites are evaluated, the sites at which aldrin and dieldrin are found may increase. This information is important because exposure to these substances may harm you and because these sites may be sources of exposure.

When a substance is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. This release does not always lead to exposure. You are exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance, or by skin contact.

If you are exposed to aldrin or dieldrin, many factors determine whether you'll be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with them. You must also consider the other chemicals you're exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

1.1 WHAT ARE ALDRIN AND DIELDRIN?

Aldrin and dieldrin are the common names of two structurally similar compounds that were once used as insecticides. They are chemicals that are made in the laboratory and do not occur naturally in the environment. The scientific name for aldrin is 1,2,3,4,10,10-hexachloro-1,4,4 α ,5,8,8 α -hexahydro-1,4-endo,exo-5,8-dimethanonaphthalene. The abbreviation for the scientific name of aldrin is HHDN. Technical-grade aldrin contains not less than 85.5% aldrin.

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The trade names used for aldrin include Aldrec, Aldrex, Drinox, Octalene, Seedrin, and Compound 118. The scientific name for dieldrin is 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4 α ,5,6,7,8,8 α -octahydro-1,4-endo,exo-5,8-dimethanonaphthalene. The abbreviation for the scientific name for dieldrin is HEOD. Technical-grade dieldrin contains not less than 85% dieldrin. The trade names used for dieldrin include Alvit, Dieltrix, Octalox, Quintox, and Red Shield.

Pure aldrin and dieldrin are white powders, while technical-grade aldrin and dieldrin are tan powders. Aldrin and dieldrin slowly evaporate in the air. Aldrin evaporates more readily than dieldrin. Both aldrin and dieldrin have mild chemical odors. You might find aldrin and dieldrin in the soil, in water, or in homes where these compounds were used to kill termites. You might also find aldrin and dieldrin in plants and animals near hazardous waste sites.

Aldrin and dieldrin are no longer produced or used. From the 1950s until 1970, aldrin and dieldrin were used extensively as insecticides on crops such as corn and cotton. The U.S. Department of Agriculture canceled all uses of aldrin and dieldrin in 1970. In 1972, however, EPA approved aldrin and dieldrin for killing termites. Use of aldrin and dieldrin to control termites continued until 1987. In 1987, the manufacturer voluntarily canceled the registration for use in controlling termites.

In this profile, the two chemicals are discussed together because aldrin readily changes into dieldrin once it enters either the environment or your body. More information on the chemical and physical properties of aldrin and dieldrin is found in Chapter 4. More information on the production and use of aldrin and dieldrin is found in Chapter 5.

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1.2 WHAT HAPPENS TO ALDRIN AND DIELDRIN WHEN THEY ENTER THE ENVIRONMENT?

Aldrin and dieldrin can enter the environment from accidental spills or leaks from storage containers at waste sites. In the past, aldrin and dieldrin entered the environment when farmers used these compounds to kill pests on crops and when exterminators used them to kill termites. Aldrin and dieldrin are still present in the environment from these past uses. Sunlight and bacteria in the environment can change aldrin to dieldrin. Therefore, you can find dieldrin in places where aldrin was originally released. Dieldrin in soil or water breaks down (degrades) very slowly. Dieldrin sticks to soil and may stay there unchanged for many years. Water does not easily wash dieldrin off soil. Dieldrin does not dissolve in water very well and is therefore not found in water at high concentrations. Most dieldrin in the environment attaches to soil and to sediments at the bottoms of lakes, ponds, and streams. Dieldrin can travel large distances by attaching to dust particles, which can then be transported great distances by the wind. Dieldrin can evaporate slowly from surface water or soil. In the air, dieldrin changes to photodieldrin within a few days. Plants can take up dieldrin from the soil and store it in their leaves and roots. Fish or animals that eat dieldrin-contaminated materials store a large amount of the dieldrin in their fat. Animals or fish that eat other animals have levels of dieldrin in their fat many times higher than animals or fish that eat plants. For more information, see Chapters 5 and 6.

1.3 HOW MIGHT I BE EXPOSED TO ALDRIN AND DIELDRIN?

For most people, exposure to aldrin and dieldrin occurs when they eat foods contaminated with either chemical. Contaminated foods might include fish or shellfish from contaminated lakes or streams, root crops, dairy products, and meats. Exposure to aldrin and dieldrin also occurs when you drink water, breathe air, or come into contact with contaminated soil at hazardous waste sites. Skin contact and breathing of aldrin and dieldrin by workers who used these chemicals to kill insects were at one time common. However, aldrin and dieldrin are no longer produced and no longer used. People with the greatest potential for exposure include those who live in homes that were once treated for termites using aldrin or dieldrin. Studies indicate that people can be exposed to aldrin and dieldrin years after they were applied in a home.

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Exposure to aldrin is generally limited because aldrin is changed quickly to dieldrin in the environment. Dieldrin remains in the environment for a long time and is usually detected in soil, sediment, and animal fat. Levels of both aldrin and dieldrin have decreased over the years since they are no longer produced or used. The levels of aldrin and dieldrin in air and water are typically very low. For more information on human exposure to aldrin and dieldrin, see Chapter 6.

1.4 HOW CAN ALDRIN/DIELDRIN ENTER AND LEAVE MY BODY?

Aldrin can enter your bloodstream through your lungs when you breathe air, through your stomach after eating food or drinking water containing it, or through your skin. Exposure to aldrin or dieldrin around hazardous waste sites can mainly occur by breathing contaminated air or touching contaminated soil. Exposure near hazardous waste sites can also occur by eating contaminated food or drinking contaminated water. Exposure of the general population most likely occurs through eating food contaminated with aldrin or dieldrin. Exposure of some infants occurs by drinking mother's milk containing aldrin or dieldrin. Studies in animals show that both aldrin and dieldrin enter the body quickly after exposure. Once aldrin is inside your body, it quickly changes to dieldrin. Dieldrin then stays in your fat for a long time. Dieldrin can change to other products. Most dieldrin and its breakdown products leave your body in the feces. Some breakdown products can also leave in the urine. It can take many weeks or years for all of the compound to leave your body. Chapter 3 contains more information on how aldrin and dieldrin enter and leave the body.

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1.5 HOW CAN ALDRIN/DIELDRIN AFFECT MY HEALTH?

Aldrin and dieldrin affect your health in similar ways. Symptoms of aldrin and dieldrin poisoning have been seen in people who were exposed to very large amounts of these pesticides during their manufacture. Symptoms of poisoning have also been seen in people who intentionally or accidentally ate or drank large amounts of aldrin or dieldrin. Most of these people experienced convulsions or other nervous system effects, and some had kidney damage. Some people who intentionally ate or drank large amounts of aldrin or dieldrin died. Health effects in people exposed to smaller amounts of aldrin or dieldrin occur because levels of the chemicals build up in the body over time. Exposure to moderate levels of aldrin or dieldrin for a long time causes headaches, dizziness, irritability, vomiting, or uncontrollable muscle movements. Some sensitive people seem to develop a condition in which aldrin or dieldrin causes the body to destroy its own blood cells. We do not know whether aldrin or dieldrin affects the ability of people to fight diseases. We also do not know whether aldrin or dieldrin affects the ability of men to father children, or causes birth defects or cancer in people. The International Agency for Research on Cancer has determined that aldrin and dieldrin are not classifiable as to their carcinogenicity to humans. Based on studies in animals, the EPA has determined that aldrin and dieldrin are probable human carcinogens.

To protect the public from the harmful effects of toxic chemicals and to find ways to treat people who have been harmed, scientists use many tests. One way to see if a chemical will hurt people is to learn how the chemical is absorbed, used, and released by the body; for some chemicals, animal testing may be necessary. Animal testing may also be used to identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method to get information needed to make wise decisions to protect public health. Scientists have the responsibility to treat research animals with care and compassion. Laws today protect the welfare of research animals, and scientists must comply with strict animal care guidelines.

Results from animal studies show that high levels of aldrin and dieldrin cause effects on the nervous system and on the kidneys similar to those seen in people. Results from animal studies also show additional effects of aldrin and dieldrin after exposure to lower levels for longer

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periods. We do not know whether these effects also occur in people. These other health effects of aldrin and dieldrin in animals include changes in the liver and reduced ability to fight infections. In addition, animals born to mothers who have eaten large amounts of aldrin or dieldrin do not live very long. This results, in part, from the newly born animals being poisoned by aldrin or dieldrin in the mother's milk. Studies in animals give conflicting information about whether aldrin and dieldrin cause birth defects. Studies in animals also give conflicting information about whether aldrin and dieldrin make it more difficult for male animals to reproduce. Some studies show that aldrin and dieldrin may damage sperm. Aldrin and dieldrin have been shown to cause liver cancer in mice, but not in other species of animals.

Additional information regarding the health effects of aldrin and dieldrin can be found in Chapter 3.

1.6 HOW CAN ALDRIN/DIELDRIN AFFECT CHILDREN?

This section discusses potential health effects from exposures during the period from conception to maturity at 18 years of age in humans. Potential effects on children resulting from exposures of the parents are also considered.

Children can be exposed to aldrin or dieldrin in the same ways as adults, mainly by eating food contaminated with aldrin or dieldrin, or by exposure in homes treated for termites using aldrin or dieldrin. Children can also be exposed by coming into contact with aldrin- or dieldrin-contaminated water, air, or soil near hazardous waste sites. There are no known unique exposure pathways for children. We do not know if children's intake of aldrin or dieldrin per kilogram of body weight is different than that of adults.

Adults and children who swallowed (either by accident or on purpose) amounts of aldrin or dieldrin that were much greater than those found in the environment suffered convulsions, and some died. We do not know whether children differ from adults in their susceptibility to health effects from aldrin or dieldrin exposure.

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We do not know whether aldrin or dieldrin affect the ability of people to have children or whether they cause birth defects in children. Some studies in animals show that females given aldrin or dieldrin by mouth have smaller numbers of babies. Some other studies show that large amounts of aldrin damage the testes, but it is unknown whether such large amounts affect the ability of animals to reproduce. Pregnant animals given aldrin or dieldrin by mouth had some babies with low birth weights and some with skeletal variations. Because these effects occurred in animals, they might also occur in humans. Aldrin and dieldrin can cross the placenta. Dieldrin has been found in human breast milk. More information on this topic can be found in Sections 3.7 and 6.6.

1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO ALDRIN OR DIELDRIN?

If your doctor finds that you have been exposed to significant amounts of aldrin or dieldrin, ask whether your children might also be exposed. Your doctor might need to ask your state health department to investigate.

Since aldrin and dieldrin are no longer produced or used, exposure to these compounds will occur from past usage. Families with the greatest risk of exposure to aldrin and dieldrin are those living in homes that were once treated with either chemical for termite protection. Aldrin and dieldrin were usually applied to the basement level of homes to protect the foundation from termites. Studies indicate that detectable levels of both chemicals can exist in a home for up to 10 years after the first application. Before buying a home, families should investigate what, if any, pesticides have been used within the home.

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1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO ALDRIN/DIELDRIN?

Aldrin is quickly changed to dieldrin in the body, and dieldrin can be measured in your blood, urine, and body tissues if you have been exposed to a large amount. Tests to measure aldrin or dieldrin in such bodily tissues or fluids are not usually available at a doctor's office because special equipment is needed. However, a sample taken in the doctor's office can be properly packed and shipped to a special laboratory, if necessary. Because aldrin changes to dieldrin fairly quickly in the body, these methods are useful for finding aldrin only within a few days after you are exposed to aldrin. Since dieldrin can stay in the body for months, measurements of dieldrin can be made for much longer after you are exposed to either aldrin or dieldrin. The test results cannot be used to predict if you will have any adverse health effects. Exposure to other chemicals at the same time as exposure to aldrin and/or dieldrin could cause some confusion in understanding test results for aldrin and/or dieldrin. More information about tests to find dieldrin in the body is presented in Chapters 3 and 7.

1.9 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The federal government develops regulations and recommendations to protect public health. Regulations can be enforced by law. Federal agencies that develop regulations for toxic substances include the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA).

Recommendations provide valuable guidelines to protect public health but cannot be enforced by law. Federal organizations that develop recommendations for toxic substances include the Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH).

Regulations and recommendations can be expressed in not-to-exceed levels in air, water, soil, or food that are usually based on levels that affect animals; then they are adjusted to help protect

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people. Sometimes these not-to-exceed levels differ among federal organizations because of different exposure times (an 8-hour workday or a 24-hour day), the use of different animal studies, or other factors.

Recommendations and regulations are also periodically updated as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Some regulations and recommendations for aldrin and dieldrin include the following:

The federal government has developed regulatory standards and guidelines to protect people from the harmful health effects of aldrin and dieldrin. In 1974, EPA banned all uses of aldrin or dieldrin except as a termite killer. In 1981, EPA required labeling changes to warn against applying these chemicals near water supplies, heating ducts, or crawl spaces. They also warned against applying them too frequently.

EPA advises lifetime drinking water exposure concentration limits (DWELs, see Table 8-1) for aldrin and dieldrin of 0.001 and 0.002 mg/L, respectively, for protection against adverse non-cancer health effects, that assume all of the exposure to the contaminant is from drinking water. Regarding cancer risk, EPA advises a lower drinking water exposure concentration limit of 0.0002 mg/L for aldrin and dieldrin that would, in theory, limit the lifetime risk for developing cancer from exposure to each compound to 1 in 10,000.

The FDA regulates the residues of aldrin and dieldrin in raw foods. The allowable range for residues is from 0 to 0.1 ppm depending on the type of food product. This limits the intake of aldrin and dieldrin in food to levels considered to be safe.

EPA has named aldrin and dieldrin as hazardous solid waste materials. If quantities greater than 1 pound enter the environment, the National Response Center of the federal government must be told immediately.

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OSHA recommended a maximum average amount of aldrin and dieldrin in the air in the workplace to protect workers. This amount is 250 micrograms in a cubic meter of air ($\mu\text{g}/\text{m}^3$) for an 8-hour workday over a 40-hour workweek. NIOSH recommended the same limit ($250 \mu\text{g}/\text{m}^3$) for both compounds for up to a 10-hour workday over a 40-hour workweek. For more information, see Chapter 8.

1.10 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns, please contact your community or state health or environmental quality department or

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop E-29
Atlanta, GA 30333
Web site: <http://www.atsdr.cdc.gov>

* Information line and technical assistance

Phone: 1-888-42-ATSDR (1-888-422-8737)
Fax: 1-404-498-0057

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses resulting from exposure to hazardous substances.

* To order toxicological profiles, contact

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: 1-800-553-6847 or 1-703-605-6000

