

Sources of Exposure

Toxicokinetics and Biomonitoring

Biomarkers/Environmental Levels

General Populations

- Aldrin and dieldrin are highly chlorinated insecticides. Their use in the United States has been cancelled since 1989.
- General population exposure is expected to be low since the compounds are no longer manufactured or approved for use in the United States.
- The most likely source of exposure to dieldrin would be through contaminated food and the resulting breast milk; levels of aldrin in these are expected to be very low.
- Individuals living in homes contaminated by past termite treatment may have been exposed to aldrin and dieldrin from indoor air.
- People living near hazardous waste sites may be exposed to aldrin and/or dieldrin in the air, soil, or water.

Occupational Populations

- Occupational exposure should be negligible since aldrin and dieldrin are no longer produced or approved for use in the United States. Possible exposure may occur for workers at hazardous waste sites or landfills.

Toxicokinetics

- Aldrin and dieldrin are readily absorbed from the gastrointestinal tract; limited data indicate that aldrin or dieldrin are also absorbed from the lung and skin.
- Absorbed aldrin is rapidly converted to dieldrin (primarily in the liver); distribution is initially widespread, but quickly redistributed mainly to adipose tissue.
- Dieldrin and its metabolites are mainly excreted in the feces (via bile) and to a lesser extent in the urine.

NHANES Biomonitoring

- In the Fourth National Report on Human Exposures to Environmental Chemicals, aldrin levels in blood were below the level of detection for all age groups.
- Geometric mean levels of dieldrin in the serum (lipid adjusted) could not be calculated due to the proportion of results below the limit of detection (survey years 2000–2002 and 2003–2004).

Biomarkers

- Exposure to aldrin and dieldrin is measured almost exclusively by determining levels of dieldrin in blood.

Environmental Levels

Air

- Low levels of aldrin (up to 11 pg/m³) and dieldrin (up to 201 pg/m³) were detected in 2019 in ambient air samples from the Great Lakes.

Water

- Dieldrin was detected in <1% of groundwater and surface water samples in 2016–2021 at levels of 0.0676–1,780 and 1.9–87 ng/L, respectively; aldrin was not detected.

Sediment and Soil

- Aldrin and dieldrin were detected in ≤5% of soil samples collected in 2018 at levels of 21.9–40.7 and 25.2–34.8 μg/kg, respectively.
- In sediment, they were detected in <3% of samples collected in 2016–2020; levels were 0.0249–12.34 μg/kg for aldrin and 0.64–1.53 μg/kg for dieldrin.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2022. Toxicological Profile for Aldrin and Dieldrin. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

ToxGuide™

for

Aldrin and Dieldrin

$C_{12}H_8Cl_6$ and
 $C_{12}H_8Cl_6O$

(CAS # 309-00-2 and 60-57-1)

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U.S. Department of Health and
Human Services
Public Health Service
Agency for Toxic Substances
and Disease Registry
www.atsdr.cdc.gov



Chemical and Physical Information

Routes of Exposure

Relevance to Public Health (Health Effects)

Aldrin and Dieldrin are Solids

- Aldrin and dieldrin are white powders with a mild chemical odor. They do not occur naturally in the environment.
- Aldrin and dieldrin are highly chlorinated insecticides used from 1950 to 1970 on such crops as cotton, corn, and citrus products. Their approved use for termite extermination continued until 1989.
- Aldrin is readily converted to dieldrin in biological systems.

- Inhalation – Not likely an exposure route for populations without contaminated soil near the home.
- Oral – Most likely route of exposure for the general population through ingestion of contaminated food stuffs.
- Dermal – Possible exposure route of concern for the general population.

Aldrin and Dieldrin in the Environment

- Aldrin and dieldrin exist in both the vapor and particulate phases in the air. The vapor phase undergoes atmospheric degradation quickly. The particulate phase can be transported through the air and removed by wet and dry deposition.
- Aldrin and dieldrin can volatilize from water surfaces.
- Aldrin and dieldrin have a strong affinity for organic matter and sorb tightly to soil particulates.
- In soil, aldrin can be converted to dieldrin.
- Aldrin and dieldrin are expected to be immobile in soil and do not readily leach into the groundwater. Mobility can be enhanced at hazardous waste sites where organic solvents may be present.
- Aldrin and dieldrin enter surface water primarily via run-off. They are found mostly in sediments at the bottom of lakes, ponds, and streams.
- Aldrin and dieldrin possess high potential for bioaccumulation. They have been observed to bioconcentrate in aquatic and terrestrial ecological systems.

Health effects are determined by the dose (how much), the duration (how long), and the route of exposure.

Minimal Risk Levels (MRLs)

Inhalation

- No acute-, intermediate-, or chronic-duration inhalation MRLs were derived for aldrin or dieldrin.

Oral

- An acute-duration (≤ 14 days) oral MRL of 0.002 mg/kg/day was derived for aldrin.
- No intermediate-duration oral MRL was derived for aldrin.
- A chronic-duration (≥ 365 days) oral MRL 0.00004 mg/kg/day was derived for aldrin.
- No acute-duration oral MRL was derived for dieldrin.
- An intermediate-duration (15–364 days) oral MRL of 0.0001 mg/kg/day was derived for dieldrin.
- A chronic-duration (≥ 365 days) oral MRL of 0.00005 mg/kg/day was derived for dieldrin.

Health Effects

- Acute high-level exposure of aldrin or dieldrin in humans has resulted in central nervous system excitation culminating in convulsions and death. Longer-term occupational exposure has resulted in central nervous system toxicity.
- Oral exposure of animals to aldrin and dieldrin has led to histopathologic liver lesions, neurological effects (tremors, hyperexcitability, impaired learning, and neural degeneration), and reproductive effects (decreased fertility, delayed estrus, and increased number of stillbirths).
- Decreased pup survival was observed in maternal animals administered aldrin or dieldrin orally during gestation.
- Liver tumors were seen in mice after oral exposure to aldrin and dieldrin. The International Agency for Research on Cancer (IARC) has categorized dieldrin and aldrin metabolized to dieldrin as *probably carcinogenic to humans* (Group 2A). The U.S. Environmental Protection Agency (EPA) has classified aldrin and dieldrin as *probable human carcinogens* (Group B2).

Children's Health

- It is not known if children are more sensitive to aldrin or dieldrin exposure than adults.