

Sources of Exposure

Toxicokinetics and Normal Human Levels

Biomarkers/Environmental Levels

General Populations

- The general population may be exposed to aldrin or dieldrin in ambient air, food, water, and soil.
- Contaminated foods include those obtained from plants grown on contaminated lands or from animals living in contaminated areas, as well as commercial food products high in animal fat, such as dairy, fatty fish, and meat products.
- Members of the general population who live in homes that were once treated for termites with aldrin or dieldrin can be exposed by inhalation of contaminated air.

Occupational Populations

- Use of aldrin and dieldrin for pest control on crops was cancelled by the EPA in 1974 and the use for extermination of termites was voluntarily cancelled by the manufacturer in 1987.
- Consequently, potential occupational exposure may be limited to workers cleaning up hazardous waste sites where these substances may have been disposed.

Toxicokinetics

- There are no studies directly showing that aldrin/dieldrin can be absorbed through the lungs. Aldrin and dieldrin can be absorbed through the gastrointestinal tract and the skin, but quantitative data are lacking.
- Aldrin in the body is rapidly converted to dieldrin in liver and lung microsomes.
- Dieldrin distributes preferentially to fat tissue where it can remain for years, depending on the type of exposure. Elimination half-lives of 266 and 369 days have been estimated in humans.
- Dieldrin can be directly oxidized by cytochrome oxidases or the epoxy ring can be opened by epoxide hydratases.
- Limited human data and results from studies in monkeys suggest that unchanged dieldrin and conjugated metabolites are excreted mainly in the feces via the bile.

Normal Human Levels

- In a U.S. national survey (2001–2002), the 95th percentile value for serum dieldrin in subjects 12-year-old and older was 0.146 ppb (whole blood).

Biomarkers

- Blood levels of dieldrin are specific biomarkers for aldrin and dieldrin.
- An elevated level of dieldrin in blood may indicate either recent exposure or past exposure.

Environmental Levels

Air

- No recent data were located.

Sediment and Soil

- Maximum concentrations of dieldrin in soil samples taken in 1995–1996 from Alabama, Ohio, Indiana, and Illinois were 23, 4,250, 69, and 13 ng/g dry weight.

Water

- Dieldrin was detected at a maximum concentration of 0.045 µg/L in 2.4% of 208 well water samples from 9 urban areas across the United States in the early 1990s
- Dieldrin was detected at a maximum concentration of 0.068 µg/L in 1.63% of 2,459 sites from the largest river basins and aquifers in the United States tested between 1992 and 1996.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Aldrin/Dieldrin (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

ToxGuide™ for Aldrin/Dieldrin

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Chemical and Physical Information

Routes of Exposure

Relevance to Public Health (Health Effects)

Aldrin and Dieldrin are Organochlorine Pesticides

- Aldrin and dieldrin are synthetic organochlorine insecticides. The technical-grade formulations contain no less than 85.5% of either chemical.
- Pure aldrin and dieldrin are white powders with mild chemical odor.
- Aldrin is readily converted to dieldrin in the environment.
- From the 1950s until 1970 aldrin and dieldrin were widely used as pesticides for crops like corn and cotton.
- Aldrin and dieldrin were also used as a prophylactic and for treatment of timber against termite infestation until 1987, when all uses were banned.

- Inhalation (breathing) – Predominant route of exposure for members of the general population living in homes that were treated with either pesticide.
- Oral (mouth) – Predominant route of exposure for the general population through ingestion of contaminated food.
- Dermal – Minor route of exposure for the general population.

Aldrin and Dieldrin in the Environment

- Aldrin is converted to dieldrin in the environment by sunlight and bacteria.
- Dieldrin binds tightly to soil and evaporates slowly to the air. The half-life of dieldrin in temperate soils is about 5 years.
- Dieldrin can travel long distances in the environment attached to dust particles blown by the wind.
- Aldrin and dieldrin are not very water soluble, but readily bind to sediment and are rarely leached in deeper soil layers and groundwater.
- Dieldrin bioconcentrates and biomagnifies through the terrestrial and aquatic food chains.

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

Minimal Risk Levels (MRLs)

Inhalation

- No inhalation MRLs were derived for aldrin or dieldrin.

Oral

- An MRL of 0.002 mg/kg/day was derived for acute-duration exposure to aldrin (≤ 14 days).
- No intermediate-duration oral MRL was derived for aldrin (15–364 days).
- An MRL of 0.00003 mg/kg/day was derived for chronic-duration exposure to aldrin (≥ 1 year).
- No acute-duration oral MRL was derived for dieldrin (≤ 14 days).
- An MRL of 0.0001 mg/kg/day was derived for intermediate-duration exposure to dieldrin (15–364 days).
- An MRL of 0.00005 mg/kg/day was derived for chronic-duration exposure to dieldrin (≥ 1 year).

Health Effects

- Acute exposure to high concentrations of aldrin or dieldrin can cause seizures and convulsions and even death.
- Prolonged exposure to lower levels has induced headaches, dizziness, irritability, vomiting, and muscle spasms.
- Studies in humans have not addressed whether adverse reproductive effects occur as a result of exposure to aldrin or dieldrin.
- There is no conclusive evidence that aldrin or dieldrin cause cancer in humans. The EPA has determined that aldrin and dieldrin are probable human carcinogens. IARC has determined that aldrin and dieldrin are not classifiable as to their carcinogenicity to humans.

Children's Health

- Children who accidentally ingested high doses of aldrin or dieldrin exhibited effects similar to those seen in adults exposed to high amounts of these chemicals.
- It is not known if children are more susceptible to poisoning with aldrin or dieldrin than adults.
- Aldrin and dieldrin can cross the placenta and dieldrin has been found in human breast milk.