

Sources of Exposure

Toxicokinetics and Normal Human Levels

Biomarkers/Environmental Levels

General Populations

- Mirex and chlordane are insecticides that have not been used in the United States since the late 1970s when all registered uses were canceled; therefore, exposure to the general population is not likely.
- Populations living in areas around hazardous waste sites may be exposed via contaminated soil or ingestion of indigenous wildlife. Drinking water is not a likely source of exposure since both compounds are relatively insoluble in water.

Occupational Populations

- There is currently no occupational exposure to mirex or chlordane at production facilities or pesticide application areas because mirex and chlordane are no longer produced or used in the United States.
- Current occupational exposure is most likely to occur for workers employed at waste disposal sites or those engaged in remediation activities including removal of soils and sediments contaminated with these compounds.

Toxicokinetics

- Mirex and chlordane are absorbed through the respiratory tract, although there are no data on percent absorbed.
- Absorption from the gastrointestinal tract is estimated to be 70% for mirex and 90% for chlordane.
- Chlordane is absorbed through the skin, 1–10% depending on the dose; percent absorbed was inversely related to dose. There are no data on the dermal absorption of mirex.
- Mirex is widely distributed throughout the body and is sequestered in the fat.
- Chlordane is also widely distributed throughout the body with highest levels found in the liver.
- Mirex is not metabolized in humans or laboratory animals.
- Chlordane is metabolized to form glucuronide conjugates.
- Mirex is primarily excreted in the feces as the parent compound.

Normal Human Levels

- A National Health and Nutrition Examination Survey (NHANES) of the U.S. general population conducted in 2009–2010 reported mean lipid-adjusted serum mirex concentrations ranging from 4.04 to 14.2 ng/g lipid.

Biomarkers

- Mirex and chlordane can be measured in blood.
- Mirex can also be detected in fat, feces, and milk, and chlordane can be detected in saliva, feces, and tissues.

Environmental Levels

Air

- There are no recent monitoring data for mirex and chlordane.

Water

- Mirex and chlordane are poorly soluble in water and are more likely to be associated with particulate matter in the water.

Sediment and Soil

- Background levels of mirex and chlordane are not available for sediment and soil.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2020. Toxicological Profile for Mirex and Chlordane. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

ToxGuide™ for Mirex and Chlordane

$C_{10}Cl_{12}$ and $C_{10}Cl_{10}O$
(CAS # 2385-85-5 and 143-50-0)
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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)

Mirex and Chlordecone are Manufactured Substances

- Mirex and chlordecone bind strongly to organic matter in water, sediment, and soil where they may persist for long periods of time.
- Both compounds are lipophilic and bioaccumulate and biomagnify in aquatic and terrestrial food chains.
- Mirex and chlordecone were used as insecticides; all registered uses were canceled in the late 1970s.
- Chlordecone was also released to the environment directly as a contaminant of mirex and indirectly from the degradation of mirex.

Mirex and Chlordecone in the Environment

- Inhalation – Not likely an exposure route of concern for the general population.
- Oral – Most likely route of exposure for the general population through ingestion of contaminated food stuffs.
- Dermal – Potential route of exposure.
- Adsorption and volatilization are the more important environmental fate processes for mirex and chlordecone, which strongly bind to organic matter in water, sediment, and soil.
- When bound to organic-rich soil, mirex and chlordecone are highly immobile; however, when adsorbed to particulate matter in water, they can be transported great distances before partitioning out to sediment.
- Mirex is a very persistent compound in the environment and is highly resistant to both chemical and biological degradation.
- The primary process for the degradation of chlordecone in soil or sediments is anaerobic biodegradation.

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 mirex or chlordecone.

Oral

- No acute- or intermediate-duration oral MRLs were derived for mirex.
- A chronic-duration (≥ 365 days) oral MRL of 0.0003 mg/kg/day was derived for mirex.
- An acute-duration (≤ 14 days) oral MRL of 0.01 mg/kg/day was derived for chlordecone.
- An intermediate-duration (15–364 days) oral MRL of 0.003 mg/kg/day was derived for chlordecone.
- A chronic-duration (≥ 365 days) oral MRL of 0.0005 mg/kg/day was derived for chlordecone.

Health Effects

- The primary targets of mirex toxicity include the liver, kidneys, selected developmental endpoints, and thyroid gland.
- Effects observed in experimental animals exposed to mirex include decreased hepatobiliary function with decreased glycogen storage, increases in glomerulosclerosis, cystic follicles in the thyroid, and cardiac dysrhythmias and cataracts following prenatal or early postnatal exposure.
- The primary targets of chlordecone toxicity include the liver, kidneys, nervous system, reproductive system, endocrine system, and selected developmental endpoints.
- The observed effects from chlordecone exposure include hepatomegaly and fatty degeneration, renal lesions, adrenal gland lesions, tremors, decreased sperm count and motility, increased stillbirths, and decreased postnatal viability.
- The Department of Health and Human Services (HHS) determined that mirex and chlordecone may reasonably be anticipated to be human carcinogens. The U.S. Environmental Protection Agency (EPA) determined that chlordecone is likely to be carcinogenic to humans.

Children's Health

- It is not known if children are more sensitive to mirex and chlordecone exposure than adults.