Sources of Exposure

General Populations

- The U.S. EPA banned all uses of chlordane in 1988.
- For the general population, the most likely source of exposure to chlordane was from living in homes that were treated with chlordane for termites.
- The next most likely source was from eating chlordane-contaminated food or drinking water than may have been contaminated from chlordane when it was used as a pesticide prior to 1988.
- People who live near hazardous waste sites containing chlordane may be exposed from contaminated air, surface water or groundwater, or soil.

Occupational Populations

- Occupational exposure to chlordane may have occurred through inhalation or dermal contact for those involved in the manufacturing, handling or application of this chemical prior to its ban in 1988.

Toxicokinetics and Biomonitoring

Toxicokinetics

- Chlordane (a highly lipophilic substance) appears to be well absorbed following inhalation, oral, and dermal exposure.
- Initially, tissue levels are highest in the liver and kidneys; subsequently, chlordane and its metabolites are redistributed to fat, where they persist for long periods of time.
- Metabolism results in several oxidation products, including oxychlordane, which persist in body fat as the predominant chlordane residues.
- Chlordane induces its own metabolism to toxic intermediates.
- Chlordane and its metabolites are excreted more readily in the bile than in the urine. Substantial amounts are also excreted via lactation.

NHANES Biomonitoring

- The geometric mean serum levels of the chlordane metabolites oxychlordane and trans-nonachlor were 9.37 and 14.7 ng/g of lipid, respectively (NHANES 2003-2004).

Biomarkers/Environmental Levels

Biomarkers

- Chlordane and/or several its metabolites can be measured in blood, adipose tissue, breast milk, urine, and feces. However, no information is available correlating levels found in these tissues and fluids with the chlordane exposure.

Environmental Levels

Air

- There are no recent monitoring data for air levels chlordane in the United States.

Water

- There are no recent monitoring data for water levels of chlordane in the United States.

Sediment and Soil

- There are no monitoring data for levels of chlordane in the sediment or soil in the United States.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2018. Toxicological Profile for Chlordane. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

ToxGuide™ for Chlordane

$C_{10}H_6Cl_8$

CAS # 12789-03-6

February 2018

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

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Chemical and Physical Information

Chlordane

- Chlordane is a man-made, thick liquid ranging from colorless to amber; it may have no smell or a mild, irritating smell.
- Chlordane does not dissolve in water.
- Technical chlordane is a mixture of >140 related chemicals; major components are trans-chlordane and cis-chlordane (60–85% of technical chlordane); other components include chlordane, heptachlor, and cis- and trans-nonachlor. Technical chlordane is the major focus of the toxicological profile for chlordane.
- Prior to 1978, chlordane was used as a pesticide on agricultural crops, lawns, and gardens, and as a fumigating agent.
- From 1983 until 1988 chlordane's only approved use was to control termites in homes.
- EPA canceled all uses for chlordane in 1988 because of concerns over cancer risk, evidence of human exposure and build up in body fat, persistence in the environment, and danger to wildlife.

Routes of Exposure

- Inhalation – Likely route of exposure for general and occupational populations.
- Oral – Likely route of exposure for the general population through ingestion of contaminated food or water.
- Dermal – Likely route of exposure for general and occupational population.

Chlordane in the Environment

- Chlordane is expected to volatilize from surface water and surface soil.
- In air, chlordane is expected to degrade by photolysis and oxidation.
- Residues in soil that do not leach or volatilize appear to be persistent.
- In soil, chlordane attaches strongly to particles in upper layers where it may remain as long as 20 years; chlordane in soil is not likely to enter groundwater.
- In water, chlordane attaches strongly to sediment and particles in the water column.
- Chlordane does not break down rapidly in air and accumulates in fish, birds, and mammals.

Relevance to Public Health (Health Effects)

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 duration inhalation MRL was derived for chlordane.
- An intermediate duration inhalation MRL of 0.0002 mg/m^3 was derived for chlordane.
- A chronic duration inhalation MRL of 0.00002 mg/m^3 was derived for chlordane.

Oral

- An acute duration oral MRL of 0.001 mg/kg/day was derived for chlordane.
- An intermediate duration oral MRL of 0.0006 mg/kg/day was derived for chlordane.
- A chronic duration oral MRL of 0.0006 mg/kg/day was derived for chlordane.

Health Effects

- Central nervous system effects, including headaches, dizziness, muscle tremors, and convulsions, have been reported in humans, and tremors and convulsions have been observed in animals following inhalation, oral or dermal exposure.
- Hepatic effects (increased liver weight, hepatocellular hypertrophy, and degenerative histopathologic changes) were seen following inhalation and oral exposure in animals.
- Increased leukocyte count was seen after a single oral dose and intermediate-duration inhalation in animals.
- Oral animal studies suggest that pre- and postnatal exposure may adversely affect neurobehavioral development, cause immune system effects, and decrease postnatal survival.
- Most studies found no association between chlordane exposure and cancer in humans, although other studies have reported increased cancer of male reproductive tract, pancreas, rectum, and breast, and non-Hodgkin's lymphoma. Chronic oral exposure in mice found increases in liver tumors.
- The U.S. Department of Health and Human Services has not classified chlordane as to its carcinogenicity. Chlordane has been classified by the U.S. EPA as probable carcinogenic to humans (Group B2), and by IRAC as possibly carcinogenic to humans (Group 2B).

Children's Health

- It is not known if children are more sensitive to chlordane exposure than adults. Infants may be unusually susceptible to a chronic seizure disorder following exposure, particularly if they have a hereditary predisposition, such familial history of febrile convulsions.