Sources of Exposure

General Populations

- The general population is not likely to be exposed to large amounts of hexachlorobenzene, but some exposure is likely in small amounts from low-level contamination of food.
- Populations that live near an industrial site where hexachlorobenzene is produced as a by-product or who live near a hazardous waste site where hexachlorobenzene has been discarded may be exposed.
- Contact with contaminated soil or dust particles or inhaling contaminated air are other potential sources of exposure.

Occupational Populations

- Hexachlorobenzene is not currently manufactured as a commercial product in the United States. However, occupational exposure is possible for workers involved in the production of chlorinated hydrocarbons, which releases hexachlorobenzene as a by-product.
- Farmers may also be more susceptible to hexachlorobenzene exposure because of its past use as a pesticide.

Toxicokinetics and Normal Human Levels

Toxicokinetics

- Hexachlorobenzene is poorly absorbed through the inhalation route in humans, but is moderately absorbed when animals are orally exposed, though gastrointestinal absorption is variable.
- Orally exposed hexachlorobenzene is distributed widely in mammalian tissues and organs, especially in adipose tissues.
- Hexachlorobenzene is slowly metabolized in mammals. Reductive dechlorination appears to be an important metabolic pathway forming metabolites including pentachlorophenol and pentachlorobenzene (in humans)
- Ingested hexachlorobenzene is excreted mostly in the feces as unchanged hexachlorobenzene, and to a lesser extent in urine as metabolites.

Normal Human Levels

- NHANES II found the median level in blood from the general population (collected from 1976–1980) to be 1.7 ppb.

Biomarkers/Environmental Levels

Biomarkers

- Hexachlorobenzene levels in serum have been correlated with fecal levels, as well as length of breast- feeding and infant serum levels; however, there are insufficient data to correlate either biomarker with exposure levels.
- Porphyria is the primary biomarker of effect from human exposure to hexachlorobenzene, although it is not specific to hexachlorobenzene exposure.

Environmental Levels

Air

- Hexachlorobenzene is usually not detected in ambient air samples except at very low concentrations.

Sediment and Soil

- No recent data are available on current concentrations in soil; however, the occurrence of hexachlorobenzene residues in agricultural soils was associated with hexachlorobenzene's registered pesticide uses rather than general environmental contamination.

Water

- No recent data are available on current concentrations in water.

Reference

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

ToxGuide™ for Hexachlorobenzene C_6Cl_6

CAS# 118-74-1

September 2002

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

Contact Information:
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ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Chemical and Physical Information

Hexachlorobenzene is a Crystalline Solid

- Hexachlorobenzene is a crystalline solid that is practically insoluble in water.
- Hexachlorobenzene is a chlorinated hydrocarbon industrial chemical that is no longer manufactured, but is formed as a waste product when producing several chlorinated hydrocarbons.
- When heated to decomposition, it emits toxic fumes of chlorides.

Routes of Exposure

- Inhalation (breathing) – Minor route of exposure for general population. Predominant route of occupational exposure.
- Oral – Predominant route of exposure via ingestion of low-level contaminated food.
- Dermal (skin) – Minor route of exposure for the general population.

Hexachlorobenzene in the Environment

- Hexachlorobenzene is very persistent in the environment due to its chemical stability and resistance to biodegradation.
- In soil, the half life is 3–6 years, in surface water the half life is 2.7–5.7 years, and in groundwater the half life is 5.3–11.4 years.
- Because of its low solubility in water, hexachlorobenzene settles in particles on the bottom of lakes and rivers.
- Evaporation into the air is not significant under normal ambient conditions.

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 MRLs were derived for acute, intermediate, or chronic-duration inhalation exposure.

Oral

- An MRL of 0.008 mg/kg/day has been derived for acute-duration oral exposure (≤14 days).
- An MRL of 0.0001 mg/kg/day has been derived for intermediate-duration oral exposure (≤15–364 days).
- An MRL of 0.00005 mg/kg/day has been derived for chronic-duration oral exposure (≥1 year).

Health Effects

- The primary effects associated with exposure to hexachlorobenzene hepatic, reproductive, and developmental toxicity and carcinogenesis.

Health Effects (continued)

- The most common hepatic exposure related effect is porphyria.
- Reproductive performance of rats has been affected at low doses, with the ovaries being identified as a target organ.
- Exposure-related developmental effects include impaired neurological development, cleft palate, renal agenesis and minor skeletal abnormalities.
- DHHS, IARC, and EPA consider hexachlorobenzene to be a probable human carcinogen.

Children's Health

- Maternal hexachlorobenzene can be transferred to the fetus through the placenta, and nursing children may be exposed through breast milk where hexachlorobenzene can be concentrated.
- Infants and young children are at increased risk from exposure to hexachlorobenzene compared to adults. Orally exposed infants had a high rate of mortality associated with dermal lesions. Adolescents exhibited exposure-related effects more frequently than adults. Exposure-related neurological effects were also seen in children but not in adults.