Sources of Exposure

General Populations

- There are no known natural sources of hexachlorobutadiene. The predominant source of hexachlorobutadiene is its production as a waste byproduct of chlorinated hydrocarbon synthesis.
- The general population can be exposed to low levels of hexachlorobutadiene through ingestion of contaminated food and water and inhalation.

Occupational Populations

- Occupational exposure is most likely to occur for workers employed at chlorinated hydrocarbon production plants or involved in manufacturing rubber compounds.

Toxicokinetics and Biomonitoring

Toxicokinetics

- There are no data regarding the toxicokinetics of hexachlorobutadiene in humans, but there are limited data from studies in animals.
- Based on health effects and excretion data in animals, hexachlorobutadiene is absorbed following inhalation, oral, or dermal exposure.
- Absorbed hexachlorobutadiene is distributed throughout the body, with the highest concentrations found in the kidney, liver, and fat.
- The predominant pathway for hexachlorobutadiene metabolism is conjugation with glutathione in the liver and subsequent metabolism to form cysteine conjugates. The cysteine conjugates can be further metabolized by β-lyase to form reactive intermediates.
- The major route of excretion of hexachlorobutadiene is expiration of the parent compound or metabolite (carbon dioxide) through the lung, urinary excretion of metabolites and parent compound, and fecal excretion of parent compound and metabolites.

NHANES Biomonitoring

- Hexachlorobutadiene has been detected in human adipose and liver tissue. However, information regarding levels in the general population is lacking.

Biomarkers/Environmental Levels

Biomarkers

- Hexachlorobutadiene can be measured in blood and adipose tissue.
- Hexachlorobutadiene metabolites can be detected in urine.

Environmental Levels

Air

- There are no recent monitoring data for levels of hexachlorobutadiene in air.
- In the late 1970 and early 1980s, hexachlorobutadiene levels ranged from 2 to 11 ppt.

Water

- There are no recent monitoring data for levels of hexachlorobutadiene in water.
- In the mid-1980s, concentrations of 1.6–2.7 ppt were detected in drinking water samples from two cities.

Sediment and Soil

- There are no recent monitoring data for levels of hexachlorobutadiene in sediment or soil.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2021. Toxicological Profile for Hexachlorobutadiene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

ToxGuide™ for Hexachloro-butadiene

C_4Cl_6

(CAS # 87-68-3)

March 2021

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

Hexachlorobutadiene is a Manufactured Substance

- Hexachlorobutadiene is a colorless liquid with a turpentine-like odor.
- Hexachlorobutadiene is manufactured by the chlorination of hexyl oxide. It is also produced as a waste byproduct of manufacturing certain chlorinated hydrocarbons.
- Hexachlorobutadiene's principal use is as a chemical intermediate in the manufacture of rubber compounds.
- To a lesser extent, hexachlorobutadiene is used as a solvent, a fluid for gyroscopes, a heat transfer liquid, a hydraulic fluid, and a chemical intermediate in production of chlorofluorocarbons and lubricants.

Routes of Exposure

- Inhalation – Most likely route of exposure route for the general and occupational population.
- Oral – Most likely route of exposure for the general population through ingestion of contaminated food stuffs and water.
- Dermal – Not likely an exposure route of concern for the general population.

Hexachlorobutadiene in the Environment

- Hexachlorobutadiene may be released into the environment from industrial facilities or by disposal of waste in landfill operations.
- Hexachlorobutadiene adsorbs to soil with high organic carbon content. Volatilization from surface soils is relatively low.
- Hexachlorobutadiene has preferential partitioning to sediment and biota over water. Surveys report higher levels of hexachlorobutadiene in sediments than in the waters that contain them.
- Hexachlorobutadiene can exist in the atmosphere as a vapor or adsorbed to airborne particulate matter. Volatilization occurs from surface water, yet is reduced by adsorption to organic material in the water.
- In air, it will likely react with reactive oxygen species and have a half-life ranging from 60 days to 1.6 years. The estimated half-life in surface water is estimated to be between 3 and 300 days.

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

Oral

- An acute-duration (≤14 days) oral MRL of 0.006 mg/kg/day was derived for hexachlorobutadiene.
- An intermediate-duration (15–364 days) oral MRL of 0.002 mg/kg/day was derived for hexachlorobutadiene.
- A chronic-duration (≥365 days) oral MRL was not derived for hexachlorobutadiene.

Health Effects

- Studies in experimental animals suggest that the kidney, respiratory tract, and developing organisms are sensitive targets of hexachlorobutadiene toxicity.
- Kidneys are the most sensitive target to hexachlorobutadiene. Renal toxicity, characterized as histological damage and alterations in biomarkers of impaired renal function, has been observed following inhalation, oral, and dermal exposures of hexachlorobutadiene in experimental animals.
- Respiratory effects, characterized as nasal irritation, decreases in respiratory rate, and breathing difficulties, have been observed in rats and mice exposed to hexachlorobutadiene vapor.
- Inhalation and oral exposure of hexachlorobutadiene in rats resulted in decreased fetal or pup body weights and decreased maternal body weight gain.
- The U.S. Environmental Protective Agency (EPA) classified hexachlorobutadiene as a possible human carcinogen (Group C). The International Agency for Research on Cancer (IARC) categorized hexachlorobutadiene as not classifiable as to its carcinogenicity in humans (Group 3).

Children's Health

- It is not known if children are more sensitive to hexachlorobutadiene exposure than adults.