

Sources of Exposure

Toxicokinetics and Normal Human Levels

Biomarkers/Environmental Levels

ToxGuide™

for

Bromodichloromethane

CHBrCl₂

CAS# 75-27-4

February 2020

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

General Populations

- Bromodichloromethane is formed as a byproduct of water disinfection methods using chlorination.
- The primary source of exposure for the general population is chlorinated household water.
- Chlorinated swimming pools are also sources of bromodichloromethane exposure.

Occupational Populations

- Workers in chemical plants or laboratories where bromodichloromethane is made or used may be exposed to higher amounts.
- People working at chlorinated pools (especially indoor pools), such as lifeguards, may be exposed to bromochloromethane more often than the general population.

Toxicokinetics

- Bromodichloromethane is rapidly absorbed through the gastrointestinal tract and skin and is presumed to be rapidly absorbed through the respiratory tract.
- Absorbed bromodichloromethane is distributed throughout the body with the highest concentrations in the fat, liver, lungs, and kidneys.
- The primary pathway for bromodichloromethane metabolism is cytochrome P450 oxidation. It is also metabolized via reduction to a dichloromethyl radical and by glutathione conjugation.
- Bromodichloromethane is rapidly excreted; the half-life of a single oral dose was 1.5–2 hours in rats and mice. The primary route of excretion is exhaled air; smaller amounts are excreted in urine and feces.

Normal Human Levels

- The geometric mean urinary bromodichloromethane levels in a representative sample of the U.S. population is below the detection limit of 6.00 pg/mL.

Biomarkers

- Bromodichloromethane can be measured in blood, exhaled air, and urine. Because it is rapidly excreted, these biomarkers assess recent exposure.
- There are no specific biomarkers of effect for bromodichloromethane.

Environmental Levels

- Air:
 - Maximum annual mean concentration across the United States is 0.033 ppbv
- Water:
 - Groundwater: >0.2 µg/L
 - Drinking water: 1.62 µg/L

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2019. Toxicological Profile for Bromodichloromethane. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

CHBrCl₂



Chemical and Physical Information

Routes of Exposure

Relevance to Public Health (Health Effects)

Bromodichloromethane is a Colorless Liquid

- Bromodichloromethane has a relatively high vapor pressure and high water solubility.
- It is a disinfection byproduct formed during water chlorination.
- Bromodichloromethane is used as a chemical intermediate for organic synthesis and as a chemical laboratory reagent.

- Inhalation – Exposure from bromodichloromethane volatilized from water during showering, bathing, washing dishes, and swimming pool activity is a primary route of exposure.
- Oral – Exposure to bromodichloromethane formed as a byproduct of water disinfection is a primary route of exposure.
- Dermal – Dermal contact with chlorinated water is also a primary route of exposure.

Bromodichloromethane in the Environment

- Bromodichloromethane has a relatively high vapor pressure. Over 99% of the bromodichloromethane present in the environment is estimated to exist in air. Low levels are found in groundwater and soil.
- Only trace amounts of bromodichloromethane are found in food.
- Bromodichloromethane in the atmosphere likely degrades via oxidative reactions with hydroxyl radicals or singlet oxygen. Its atmospheric lifetime is estimated to be 2–3 months.
- The environmental fate of bromodichloromethane in water and soil involves volatilization and biodegradation.
- Bromodichloromethane is not likely to bioaccumulate in fish or other aquatic species.

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

Minimal Risk Levels (MRLs)

Inhalation

- No acute-, intermediate- or chronic duration inhalation MRLs were derived for bromodichloromethane.

Oral

- An acute-duration oral MRL of 0.07 mg/kg/day was derived for bromodichloromethane.
- No intermediate-duration oral MRL was derived for bromodichloromethane.
- A chronic duration oral MRL of 0.008 mg/kg/day was derived from bromodichloromethane.

Health Effects

- A small number of epidemiological studies have examined possible relationships between exposure to bromodichloromethane and adverse health effects in the general population. These studies involve exposure to multiple disinfection byproducts and do not establish causality.

Health Effects

- Studies in laboratory animals have identified several targets of toxicity including the liver, kidney, immune system, and developing organism.
- The effects observed in laboratory animals occur at exposure levels much higher than what humans normally encounter through residential or environmental exposure to bromodichloromethane.
- Hepatic effects are a presumed health effect for humans. They include increases in serum enzymes and hepatocellular fatty degeneration. Bile duct damage has also been observed.
- Renal effects are a suspected health effect for humans. Renal tubular degeneration and decreases in immune responses to stimulants have also been observed in rats and mice exposed to bromodichloromethane.
- Developmental effects are a presumed health effect for humans. Increases in full litter resorptions, delays in skeletal ossification, and decreases in birth weight have been seen in animals.

Children's Health

- Children exposed to high levels of bromodichloromethane would be expected to experience the same effects as expected in adults.