

## Sources of Exposure

## Toxicokinetics and Normal Human Levels

## Biomarkers/Environmental Levels

### General Populations

- The most likely route of human exposure is by inhalation because bromomethane exists as a gas at room temperature.
- Significant exposure of the general population to bromomethane is not likely because production and use of bromomethane in the United States was phased out in 2005, except for specific agricultural exemptions. Bromomethane is banned for use in homes and residential settings.
- Oceans are natural sources of bromomethane production and its release into the atmosphere.
- The general population is not likely to be exposed to bromomethane via the oral route; however, exposure to a small amount of bromomethane could occur via contaminated water or food.

### Occupational Populations

- In commercial agriculture, bromomethane is used in the form of a gas, compressed liquid, or in solution as a fumigant for the control of insects, fungi, and rodents.
- Exposure to inhaled bromomethane is more likely to occur in workers than in the general population.
- Exposure of workers to bromomethane is highly variable, depending on conditions. The highest exposures are most likely to occur during fumigation activities, especially when bromomethane is first released to the environment after fumigation ends.

### Toxicokinetics

- Bromomethane is well absorbed through the respiratory tract, gastrointestinal tract, and skin.
- Absorbed bromomethane is widely distributed throughout the body, including the brain.
- Bromomethane undergoes extensive metabolism. Metabolites include bromide ion and methanol.
- Bromomethane is cleared very rapidly from the body (half-life 15–30 minutes).
- Urine and exhaled breath are the main routes of excretion for bromomethane and its metabolites. Methanol is also used in the production of bromomethane.

### Normal Human Levels

- No information on blood levels of bromomethane in blood in the U.S. population was identified.

### Biomarkers

- The bromide ion level in blood or serum has been used as a biomarker of bromomethane exposure. However, this is not specific for bromomethane because exposure to other brominated compounds may also increase blood bromide levels.

### Environmental Levels

- Air :
  - Range near agricultural use sites 0.04–8.7 ppb
  - Median in ambient air 0.007 ppb. Maximum 8.7 ppm
- Water:
  - Groundwater range 0.50–6.4 ppb
  - Not detected in surface water

### Reference

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

# ToxGuide™ for Bromomethane CH<sub>3</sub>Br

CAS# 591-78-6  
March 2020

U.S. Department of Health and  
Human Services  
Agency for Toxic Substances  
and Disease Registry  
[www.atsdr.cdc.gov](http://www.atsdr.cdc.gov)



## Chemical and Physical Information

## Routes of Exposure

## Relevance to Public Health (Health Effects)

### Bromomethane is an Odorless Gas at Room Temperature

- Bromomethane is also known as methyl bromide.
- Bromomethane is highly volatile.
- Because bromomethane depletes the ozone layer, its production and use were phased out in the United States in 2005 and the U.S. Environmental Protection Agency (EPA) only permits limited uses of bromomethane.
- Bromomethane is also used to synthesize other chemicals.

- **Inhalation** –Inhalation is a primary route of exposure for the general population and workers.
- **Oral** – Exposure may occur through ingestion of contaminated water or food. However, this is not a primary route of exposure.
- **Dermal** – Dermal contact is not a primary route of exposure for the general population or workers.

### Bromomethane in the Environment

- Bromomethane exists in the atmosphere as a gas.
- Bromomethane readily volatilizes into air from water and soil, with volatilization increasing with temperature.
- In air, the main degradation pathway for bromomethane is reaction with photochemically-generated hydroxyl radicals.
- Bromomethane degrades in water through a combination of abiotic (e.g., hydrolysis) and biotic processes.
- In soil, bromomethane degrades by three principle mechanisms: hydrolysis, methylation by organic matter, and biological oxidation by soil microorganisms.

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 bromomethane.
- An intermediate-duration (15–364 days) inhalation MRL of 0.02 ppm was derived for bromomethane.
- A chronic-duration ( $\geq 365$  days) inhalation MRL of 0.001 ppm was derived for bromomethane.

#### *Oral*

- No acute-, intermediate-, or chronic-duration oral MRLs were derived for bromomethane.

### Health Effects

- Studies in humans and animals provide evidence that inhalation of bromomethane produces damage to the respiratory tract. Acute exposure of humans has been reported to cause cough, edema, hemorrhagic lesions, and dyspnea. In animals, the most sensitive effect of inhaled bromomethane is damage to the respiratory tract.

### Health Effects

- Neurological effects have been observed in humans and animals exposed to inhaled bromomethane. In humans, effects include headache, weakness, ataxia, tremors, paralysis, and seizures. Sufficiently high doses have caused death, possibly from damage to the nervous and respiratory systems.
- In animal studies, exposure during pregnancy caused reduced birth weight and birth defects. In these studies, the exposure to bromomethane in air was much higher than the expected exposure of the general population. However, it is unknown if these effects would occur in humans.
- Erythema, edema, and blisters have been observed in workers dermally exposed to liquefied bromomethane or bromomethane vapor.
- In workers exposed to bromomethane vapor, conjunctivitis, erythema, and edema of the eyelids have been reported.
- The Department of Health and Human Services (HHS) has not categorized the carcinogenicity of bromomethane. The International Agency for Research on Cancer (IARC) and the EPA have determined that bromomethane is not classifiable as to human carcinogenicity.

### Children's Health

- Children exposed to bromomethane would be expected to experience effects similar to those expected in adults.