

Sources of Exposure

Toxicokinetics and Normal Human Levels

Biomarkers/Environmental Levels

General Populations

- The predominant route of exposure for the general population is inhalation of contaminated air. Exposure through ingestion of food or water is expected to be low.
- People may be exposed through inhalation of air mixed with vehicle exhaust, tobacco smoke, burning wood, rubber or plastic, forest fires, or release at manufacturing plants.
- Exposure may also occur through dermal contact with gasoline or inhalation of gasoline fumes.

Occupational Populations

- Workers in the production of rubber, plastics and resins are more likely to be exposed than the general population.

Toxicokinetics

- 1,3-Butadiene is absorbed from the lungs into the bloodstream following inhalation exposure.
- The level of absorption following ingestion of 1,3-butadiene is not known.
- 1,3-Butadiene is broken down to its metabolites in the liver.
- About half of inhaled 1,3-butadiene is broken down and exhaled. The remaining chemical is broken down and excreted in the urine.

Normal Human Levels

- Background levels of 1,3-butadiene in the general population are not known.

Biomarkers

- 1,3-Butadiene metabolites in urine can be used as biomarkers of exposure.
- The determination of 1,3-butadiene-derived adducts in hemoglobin or DNA was proposed as a method to detect and estimate prior exposure.

Environmental Levels

Air

- Average concentration in cities and suburban air is 0.04–1 ppb.

Sediment and Soil

- No data were located on the concentration of 1,3-butadiene in soil.

Water

- No data were located on the concentration of 1,3-butadiene in drinking water.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2009. Toxicological Profile for 1,3-Butadiene (Draft for Public Comment). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

ToxGuide™ for 1,3-Butadiene



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U.S. Department of Health and
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Chemical and Physical Information

Routes of Exposure

Relevance to Public Health (Health Effects)

1,3-Butadiene is a Gas

- 1,3-Butadiene is a colorless gas with a mild gasoline-like odor. It is made from the processing of petroleum.
- About 60% of 1,3-butadiene produced is used to make rubber, which is then used for car and truck tires.
- 1,3-Butadiene is also used to make certain types of plastics, such as acrylics.

- Inhalation – Predominant route of exposure for the general and occupational populations.
- Oral – Minor route of exposure for the general population.
- Dermal – Minor route of exposure for the general population.

1,3-Butadiene in the Environment

- 1,3-Butadiene is released into the air by industrial sources, vehicle exhaust, cigarette smoke, burning of wood or plastics, and naturally through forest fires. Industrial release to water and soil is relatively low.
- In air, 1,3-butadiene is broken down in about 6 hours.
- In water and soil, 1,3-butadiene is expected to evaporate quickly into the air.
- 1,3-Butadiene is not believed to bioconcentrate in fish or aquatic organisms and does not biomagnify in the food chain.

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

Minimal Risk Levels (MRLs)

Inhalation

- An MRL of 0.1 ppm has been derived for acute-duration inhalation exposure (≤ 14 days).
- No intermediate- or chronic duration inhalation MRLs were derived for 1,3-butadiene.

Oral

- No acute-, intermediate-, or chronic duration oral MRLs were derived for 1,3-butadiene.

Health Effects

- The available data for 1,3-butadiene toxicity in humans and animals are limited to inhalation exposures. The effects from significant oral and dermal exposure are not known.
- Nausea, dryness of the mouth and nose, headache and decreased blood pressure and pulse rate have been reported in acutely exposed humans.

Health Effects (continued)

- The reproductive system is one of the most sensitive targets of toxicity in animals. Ovarian and testicular atrophy have been observed at the lowest tested concentrations following intermediate or chronic exposure. Hematological and lymphoreticular effects have been observed at higher doses.
- Occupational exposure to 1,3-butadiene has been associated with increased hematology, stomach, and respiratory cancer deaths. Increased tumor incidences have also been observed in rodents. DHHS, IARC, and EPA have classified 1,3-butadiene as a human carcinogen.

Children's Health

- It is unknown whether children are more sensitive to 1,3-butadiene poisoning than adults.
- In laboratory animals, 1,3-butadiene causes birth defects such as skull defects, brain growth outside of the skull, and death of unborn fetuses.