

## Sources of Exposure

## Toxicokinetics and Normal Human Levels

## Biomarkers/Environmental Levels

### General Populations

- The general population may be exposed to trichlorobenzenes by breathing air, eating food, and drinking water that contain them.
- People living near a location with heavy trichlorobenzene contamination, such as a hazardous waste site, may be exposed to higher levels through breathing contaminated air or through direct skin contact with contaminated soil or water.
- People who eat large quantities of fish, from areas contaminated with trichlorobenzenes may have higher exposure to these substances since trichlorobenzenes tend to accumulate in fatty tissues.

### Occupational Populations

- Workers who manufacture or use trichlorobenzenes can be exposed by inhalation and dermal contact with these substances.

### Toxicokinetics

- No information is available regarding absorption, distribution, metabolism, or elimination of trichlorobenzenes and/or their breakdown products in humans.
- Animal studies indicate that trichlorobenzenes can be readily absorbed from the gastrointestinal tract and absorbed to some extent from the lung and through the skin.
- Available animal data indicate a high affinity of trichlorobenzenes for adipose tissue; trichlorobenzenes and/or their breakdown products are distributed to kidney and liver as well.
- Available animal data indicate that trichlorobenzenes are broken down to some extent in the body.
- Available animal data indicate that trichlorobenzenes and their breakdown products are eliminated mainly through the urine.

### Normal Human Levels

- Trichlorobenzenes have been detected in human blood, adipose tissue, follicular fluid, and breast milk. However, information regarding normal levels of trichlorobenzenes in the general population is lacking.

### Biomarkers

- Trichlorobenzenes have been detected in blood, fat samples, urine, and breast milk. Trichlorobenzene breakdown products are common to those from other highly-chlorinated benzene compounds.

### Environmental Levels

#### *Air*

- Average atmospheric trichlorobenzene levels in the U.S. range from <1 ppb to >3 ppb by volume.

#### *Water*

- Trichlorobenzene levels measuring in the ng/L range in surface water and some municipal drinking water samples, likely associated with point source releases.

#### *Soil*

- Trichlorobenzene levels ranged from 0.16 to 1.8 ng/g in some soil samples and up to 250 ng/g in Great Lakes sediment.

#### *Food*

- Trichlorobenzenes have been detected in selected seed oils, root crops, leafy vegetables, fruits, milk, eggs, fish, and meat at levels in the µg/kg food range.

### Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2014. Toxicological Profile for Trichlorobenzenes. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.



# ToxGuide™

for  
Trichloro-  
benzenes



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

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## Chemical and Physical Information

## Routes of Exposure

## Relevance to Public Health (Health Effects)

### Trichlorobenzenes are Liquid or Solid

- 1,2,4-Trichlorobenzene is a colorless liquid; 1,2,3- and 1,3,5-trichlorobenzene are colorless solids.
- Trichlorobenzenes have primarily been used as solvents and chemical intermediates to produce other chemicals.
- 1,2,4-Trichlorobenzene is produced in large quantities and used as a solvent to dissolve special materials (e.g., oils, waxes, resins, greases, and rubber) and to produce dyes and textiles.
- 1,2,3- and 1,3,5-Trichlorobenzenes are produced in lower quantities and have fewer uses.

- Inhalation** – There is some potential for inhalation exposure to trichlorobenzenes, particularly among populations living near places where trichlorobenzenes may be produced, released, or stored.
- Oral** – The general population may be exposed to trichlorobenzenes via consumption of food sources (e.g., selected seed oils, root crops, leafy vegetables, fruits, milk, eggs, fish, and meat) that contain them, or via trichlorobenzene-contaminated drinking water.

### Trichlorobenzenes in the Environment

- Airborne trichlorobenzene vapor degrades via photochemically-produced hydroxyl radicals; estimated half-lives in air range from 16 to 38 days.
- Trichlorobenzenes biodegrade under aerobic conditions in water with half-lives in the range of 62-323 days; photolysis in sunlit surface waters may be an important environmental fate process.
- In soils and sediments, trichlorobenzenes are only slowly degraded under aerobic conditions, but may degrade more rapidly under methanogenic conditions by reductive dechlorination.
- Trichlorobenzenes bioconcentrate to some extent in fish and bioaccumulate to a lesser extent in selected aquatic species.

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 1,2,4-, 1,2,3-, or 1,3,5-trichlorobenzene.

#### *Oral*

- No acute-duration oral MRL was derived for 1,2,4-trichlorobenzene.
- An intermediate-duration (15-364 days) oral MRL of 0.1 mg/kg/day was derived for 1,2,4-trichlorobenzene.
- A chronic-duration ( $\geq 365$  days) oral MRL of 0.1 mg/kg/day was derived for 1,2,4-trichlorobenzene.
- No acute-, intermediate-, or chronic-duration oral MRLs were derived for 1,2,3- or 1,3,5-trichlorobenzene.

### Health Effects

- There is virtually no information regarding health effects of trichlorobenzenes in humans. Studies in animals indicate that oral intake of trichlorobenzenes for short or long periods may affect the liver and kidney.
- There are no studies of cancer in people exposed to trichlorobenzenes. Mice given 1,2,4-trichlorobenzene in the food for 2 years developed cancer of the liver. The EPA has stated that 1,2,4-trichlorobenzene is not classifiable as to human carcinogenicity. However, this was based on studies conducted prior to 1990; newer information has not been evaluated.

### Children's Health

- Children exposed to trichlorobenzenes would be expected to experience effects similar to those expected in adults. We do not know whether children might be more susceptible than adults to the effects of trichlorobenzenes.
- Trichlorobenzenes have been detected in human breast milk, which means that mothers can transfer these chemicals to their nursing babies.
- The potential for trichlorobenzene-induced developmental effects in humans has not been evaluated. One study in rats given 1,2,4- or 1,3,5-trichlorobenzene found lesions in the eyes of the pups.