

## Sources of Exposure

## Toxicokinetics and Normal Human Levels

## Biomarkers/Environmental Levels

# ToxGuide™

for

## Dichloropropenes



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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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### General Populations

- Exposure to 1,3-DCP may occur by inhalation of contaminated air, ingestion of contaminated water, or by touching contaminated soil. These levels may be higher near hazardous waste sites.
- 1,1-, 1,2-, 2,3-, and 3,3-DCP are not commonly detected in air, surface water, ground water, drinking water, soil, or food.
- People who live near facilities that produce or use 2,3-DCP may be exposed to higher levels of this chemical.

### Occupational Populations

- Workers involved in the production or use of 1,3-DCP as a pesticide.
- Workers involved in the manufacture or use of 2,3-DCP to make other chemicals.
- Workers involved in the manufacture of 1,1-, 1,2-, or 3,3-DCP, although only very small amounts of these chemicals are produced.

### Toxicokinetics

- 1,3-DCP vapors are readily absorbed through the lungs in humans. Over 70% absorption was estimated in volunteers.
- 1,3-DCP vapor is absorbed through the skin. Dermal absorption may account for 2–5% of absorption from inhalation.
- There are no data about oral absorption on any isomer.
- There are no data on tissue distribution of DCP isomers in humans.
- In humans, 1,3- and 2,3-DCP are conjugated with glutathione and excreted in urine as N-acetyl cysteine conjugates.
- Depletion of glutathione may result in formation of toxic metabolites.
- There are no *in vivo* data on the metabolism or elimination of 1,1-, 1,2-, or 3,3-DCP in humans or animals.
- DCPs do not accumulate in the body.

### Normal Human Levels

- No data were located.

### Biomarkers

- The N-acetyl cysteine conjugate of 1,3-DCP in urine correlated well with exposure levels in workers.
- For single exposures, urinary testing must be conducted within 2 days of exposure because the metabolite is eliminated quickly.

### Environmental Levels

1,1-, 1,2-, 2,3-, and 3,3-DCP are not commonly found at measurable concentrations in air, water, or soil samples.

#### *Air*

- 1,3-DCP was detected in <5% of urban air samples. The mean concentration in urban and rural air samples was 0.088–0.33 ppb.

#### *Sediment and Soil*

- 1,3-DCP is not commonly found at measurable quantities in soil or sediment samples.

#### *Water*

- 1,3-DCP levels in 1999-2006 U.S. monitoring data ranged between 0.002–25 ppb (mean= 0.5 ppb).

### Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Toxicological Profile for Dichloropropenes. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

## Chemical and Physical Information

## Routes of Exposure

## Relevance to Public Health (Health Effects)

### Dichloropropenes are Liquids

- DCPs are synthetic chemicals.
- There are five DCP isomers based on the position of the chlorine atoms in the three-carbon chain: 1,1-DCP, 1,2-DCP, 1,3-DCP, 2,3-DCP, and 3,3-DCP.
- 1,3-DCP is a colorless liquid with a sweet smell. It dissolves in water and evaporates easily.
- 1,2- and 2,3-DCP dissolve in water and all isomers dissolve in organic solvents.
- 1,3-DCP is used mainly in farming as soil fumigant for parasitic nematodes.
- 2,3-DCP is used as a chemical intermediate.
- No uses were found for 1,1-, 1,2-, or 3,3-DCP.

- Inhalation – Predominant route of exposure to 1,3-DCP for the general population. Also, important route of exposure for workers who manufacture 1,3-DCP or 2,3-DCP, or use 1,3-DCP as a soil fumigant for farming.
- Oral – Potential route of exposure at or near waste sites via ingestion of contaminated media.
- Dermal – Skin contact may occur during manufacture or use of these substances or by touching contaminated media near waste sites.

### Dichloropropenes in the Environment

- 1,3-DCP in soil and water may undergo hydrolysis and be broken down by microorganisms.
- 1,3-DCP that volatilizes to the atmosphere is degraded by photooxidation or by reaction with ozone.
- The half-life of 1,3-DCP in air ranges between 7 and 50 hours.
- Some 1,3-DCP in air may be washed down onto the ground, lakes, or streams by rain.
- Some 1,3-DCP in soil may travel through the soil and reach groundwater.
- Other DCP isomers are expected to behave similarly to 1,3-DCP in the environment, but specific data are not available.

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 1,3-DCP.
- An MRL of 0.008 ppm has been derived for intermediate-duration inhalation exposure (15–364 days) to 1,3-DCP.
- An MRL of 0.007 ppm has been derived for chronic-duration inhalation exposure ( $\geq 1$  year) to 1,3-DCP.
- An MRL of 0.002 ppm has been derived for acute-duration inhalation exposure ( $\leq 14$  days) to 2,3-DCP.
- No intermediate- or chronic-duration inhalation MRLs were derived for 2,3-DCP.
- No inhalation MRLs were derived for 1,1-, 1,2-, or 3,3-DCP for any exposure duration.

#### Oral

- No acute-duration oral MRL was derived for 1,3-DCP.
- An MRL of 0.04 mg/kg/day has been derived for intermediate-duration oral exposure ( $\leq 15$ –364 days) to 1,3-DCP.
- An MRL of 0.03 mg/kg/day has been derived for chronic-duration oral exposure ( $\geq 1$  year) to 1,3-DCP.

- No oral MRLs were derived for 1,1-, 1,2-, 2,3-, or 3,3-DCP for any exposure.

### Health Effects

- High concentrations of 1,3-DCP in the air cause respiratory effects including mucous membrane irritation, chest pain, and cough.
- Ingestion of high concentrations of 1,3-DCP causes severe stomach damage.
- Skin contact with pesticides containing 1,3-DCP has produced contact dermatitis and blisters in workers, and an allergic reaction on the skin.
- Dogs that ingested 1,3-DCP developed microcytic anemia.
- EPA has classified 1,3-DCP as a probable human carcinogen based on inadequate data in humans and sufficient evidence in animals. Other isomers have not been classified. DHHS has determined that 1,3-DCP may reasonably be anticipated to be a human carcinogen.

### Children's Health

- It is not known whether children are more susceptible to DCPs poisoning than adults.
- Children exposed to DCPs would probably experience the same effects as adults.