

The ToxGuide™ is developed to be used as a pocket guide. Tear off at perforation and fold along lines.

## Sources of Exposure

### General Populations

- Mothballs and deodorant blocks in restrooms are important sources of 1,4-DCB for people who use these products.
- Contaminated air in general is the predominant source of exposure to DCBs for the general population.
- Concentrations of DCBs in soil, water, and food are generally low in comparison to concentrations in air.
- People who live near facilities that produce or use DCBs or near waste sites may be exposed to higher levels of these chemicals.

### Occupational Populations

- Contaminated air is an important source of exposure for workers during the manufacture of DCBs or during formulation and use of products that contain DCBs.
- Contaminated dust also is a source for dermal exposure of workers involved in the formulation and use of products containing DCBs.

## Toxicokinetics and Normal Human Levels

### Toxicokinetics

- DCBs are absorbed by the inhalation and oral routes, but quantitative data are not available. Dermal absorption is not significant.
- There are no data on tissue distribution of DCBs or metabolites in humans. In animals, DCBs distribute throughout the body, but preferentially to fat, liver, and kidneys.
- In animals, DCBs undergo microsomal oxidation, hydrolysis, and extensive conjugation.
- Conjugates are excreted mainly in the urine.
- Elimination of DCBs is relatively rapid and almost complete, but very small amounts may remain in fatty tissue for longer periods of time.

### Normal Human Levels

- Median of 0.33 ppb (µg/L) for 1,4-DCB in blood in a national survey conducted in 1994.

## Biomarkers/Environmental Levels

### Biomarkers

- DCBs can be measured in blood, urine, adipose tissue and breast milk.
- Measurement of urinary metabolites (dichlorophenols) can be used to indicate recent exposure to DCBs.
- Dichlorophenols in urine are not specific biomarkers of exposure to DCBs.

### Environmental Levels

#### *Air*

- Ambient air (ppb): 0.01–0.1, 0.001–0.1, and 0.01–1 for 1,2-DCB, 1,3-DCB, and 1,4-DCB, respectively. 0.01–100 ppb for 1,4-DCB in indoor air.

#### *Sediment and Soil*

- Maximum of 86 ppb for 1,2-DCB and 140 ppb for 1,4-DCB in streambed sediment from 20 major river basins in the U.S. in 2001.

#### *Water*

- Mean 0.63 ppb for 1,4-DCB in groundwater in a national survey in 1984. 1,2- and 1,3-DCB were not detected above the quantification limit of 0.5 ppb.

### Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for Dichlorobenzenes (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

# ToxGuide™

## for Dichlorobenzenes



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U.S. Department of Health and  
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Public Health Service  
Agency for Toxic Substances  
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## Chemical and Physical Information

### Dichlorobenzenes are solids and liquids

- Dichlorobenzenes (DCB) are synthetic chemicals.
- There are three DCB isomers based on the position of the chlorine atoms in the benzene ring: 1,2-DCB, 1,3-DCB, and 1,4-DCB.
- 1,2-DCB is a pale yellow liquid used to make herbicides.
- 1,3-DCB is a colorless liquid used to make herbicides, insecticides, medicines, and dyes.
- 1,4-DCB is a colorless to white solid that smells like mothballs.
- 1,4-DCB is used to make mothballs and deodorant blocks.
- 1,4-DCB is also used as an insecticide and in the manufacture of resins.
- 1,4-DCB vaporizes easily.
- DCBs are only slightly soluble in water, but are soluble in common organic solvents.
- DCBs can burn, but not easily.

## Routes of Exposure

- Inhalation – Predominant route of exposure for the general population. Also, important route of exposure for workers who manufacture, formulate, or use DCBs.
- Oral – Small amounts of DCBs are found in food. Potential route of exposure for children via ingestion of mothballs.
- Dermal – Skin contact may occur during manufacture or use of these substances or by touching contaminated media near waste sites, but absorption appears negligible.

### Dichlorobenzenes in the Environment

- 1,4-DCB enters the environment primarily when used in mothballs and deodorant blocks.
- 1,2- and 1,3-DCB enter the environment when used to make herbicides or when people use products that contain them.
- Most DCBs released into the environment are present as a vapor.
- The half-lives of DCBs in air range between 14 and 31 days. They are degraded in air by reacting with other chemicals.
- DCBs from surface waters and soil evaporate into air.
- DCBs are not easily degraded in soil.
- Plants and fish can absorb DCBs.

## Relevance to Public Health (Health Effects)

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 2 ppm has been derived for acute-duration inhalation exposure ( $\leq 14$  days) to 1,4-DCB.
- An MRL of 0.2 ppm has been derived for intermediate-duration inhalation exposure (15–364 days) to 1,4-DCB.
- An MRL of 0.01 ppm has been derived for chronic-duration inhalation exposure ( $\geq 1$  year) to 1,4-DCB.
- No acute-, intermediate-, or chronic-duration inhalation MRLs were derived for 1,2-DCB or 1,3-DCB.

#### Oral

- An MRL of 0.7 mg/kg/day has been derived for acute-duration oral exposure ( $\leq 14$  days) to 1,2-DCB.
- An MRL of 0.6 mg/kg/day has been derived for intermediate-duration oral exposure (15–364 days) to 1,2-DCB.
- An MRL of 0.3 mg/kg/day has been derived for chronic-duration oral exposure ( $\geq 1$  year) to 1,2-DCB.
- An MRL of 0.4 mg/kg/day has been derived for acute-duration oral exposure ( $\leq 14$  days) to 1,3-DCB.
- An MRL of 0.02 mg/kg/day has been derived for intermediate-duration oral exposure (15–364 days) to 1,3-DCB.

- No chronic-duration oral MRL was derived for 1,3-DCB.
- No acute-duration oral MRL was derived for 1,4-DCB.
- An MRL of 0.07 mg/kg/day has been derived for intermediate-duration oral exposure (15–364 days) to 1,4-DCB.
- An MRL of 0.07 mg/kg/day has been derived for chronic-duration oral exposure ( $\geq 1$  year) to 1,4-DCB.

### Health Effects

- Very high levels of 1,4-DCB in the air can cause headache, numbness, weakness of the limbs, and ataxia.
- High levels of DCBs in air can cause irritation of the eyes and respiratory tract.
- Inhalation or ingestion of high levels of 1,4-DCB can cause liver damage. Liver effects have also been observed in animals orally exposed to 1,2- or 1,3-DCB.
- Animals that ingested 1,2-DCB had damage to the thyroid and pituitary glands.
- Adverse developmental effects were also observed in animals following inhalation or oral exposure to 1,4-DCB.

### Children's Health

- Children exposed to DCBs are likely to exhibit the same effects as adults. We do not know if children would be more sensitive to these effects.