1,4-Dichlorobenzene (para-Dichlorobenzene)

106-46-7

Hazard Summary

The primary exposure to 1,4-dichlorobenzene is from breathing contaminated indoor air. Acute (short-term) exposure to 1,4-dichlorobenzene, via inhalation in humans, results in irritation of the skin, throat, and eyes. Chronic (long-term) 1,4-dichlorobenzene inhalation exposure in humans results in effects on the liver, skin, and central nervous system (CNS). No information is available on the reproductive, developmental, or carcinogenic effects of 1,4-dichlorobenzene in humans. A National Toxicology Program (NTP) study reported that 1,4-dichlorobenzene caused kidney tumors in male rats and liver tumors in both sexes of mice by gavage (experimentally placing the chemical in their stomachs). EPA has classified 1,4-dichlorobenzene as a Group C, possible human carcinogen.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS) (4), which contains information on inhalation chronic toxicity of 1,4-dichlorobenzene and the Reference Concentration (RfC), and the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for 1,4-Dichlorobenzene. (1)

Uses

- 1,4-Dichlorobenzene is used mainly as a fumigant for the control of moths, molds, and mildews, and as a space deodorant for toilets and refuse containers. (1)
- 1,4-Dichlorobenzene is also used as an intermediate in the production of other chemicals, in the control of tree-boring insects, and in the control of mold in tobacco seeds. (1)

Sources and Potential Exposure

- The general population is mainly exposed to 1,4-dichlorobenzene through breathing vapors from 1,4-dichlorobenzene products used in the home, such as mothballs and toilet deodorizer blocks. The median indoor air concentration of 1,4-dichlorobenzene detected at 2,121 sites was 0.283 parts per billion (ppb). (1)
- Ambient air levels of 1,4-dichlorobenzene are very low; a study with 1,447 samples reported the majority of levels below the detection limit. (1)
- 1,4-Dichlorobenzene has been detected in drinking water at levels ranging from 0.01 to 1.54 ppb.
- Occupational exposure to 1,4-dichlorobenzene may occur in factories that produce or process 1,4dichlorobenzene products. (1)

Assessing Personal Exp osure

• Exposure to 1,4-dichlorobenzene can be assessed by measuring its breakdown product, 2,5dichlorophenol, in urine and blood. (1)

Health Hazard Information

Acute Effects:

- Acute exposure to 1,4-dichlorobenzene via inhalation in humans results in irritation to the eyes, skin, and throat. (2)
- Animal studies have reported effects on the blood, liver, and kidneys from oral exposure to 1,4dichlorobenzene. (1)
- Tests involving acute exposure of rats and mice have shown 1,4-dichlorobenzene to have moderate toxicity from oral exposure. (3)

Chronic Effects (Noncancer):

- Chronic exposure to 1,4-dichlorobenzene by inhalation in humans results in effects on the liver, skin, and CNS (e.g., cerebellar ataxia, dysarthria, weakness in limbs, and hyporeflexia). (1)
- Animal studies have reported effects on the respiratory system, liver, and kidneys from inhalation exposure to 1,4-dichlorobenzene, while oral studies have reported effects on the blood, liver, and kidneys. (1,4)
- The Reference Concentration (RfC) for 1,4-dichlorobenzene is 0.8 milligrams per cubic meter (mg/m³) based on increased liver weights in rats. The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups), that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk but rather a reference point to gauge the potential effects.At exposures increasingly greater than the RfC, the potential for adverse health effects increases. Lifetime exposure above the RfC does not imply that an adverse health effect would necessarily occur. (4)
- EPA has medium confidence in the study on which the RfC was based because the critical study employed an extensive reproductive protocol including histopathologic examination of tissues of adults and offspring; medium confidence in the database because there are a number of supporting studies for the developmental and reproductive toxicology database; and, consequently, medium confidence in the RfC. (4) EPA has not established a Reference Dose (RfD) for 1,4-dichlorobenzene. (4)
- ATSDR has established an intermediate oral minimal risk level (MRL) of 0.4 milligrams per kilogram body weight per day (mg/kg/d) based on liver effects in rats. The MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse noncancer health effects over a specified duration of exposure. (1)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of 1,4-dichlorobenzene in humans. (1)
- In one animal study, exposure of pregnant rats to 1,4-dichlorobenzene via inhalation did not result in developmental effects in the offspring. In another study, an increase in the incidence of an extra rib was reported in the fetuses of pregnant rats administered 1,4-dichlorobenzene by gavage. (1,2)
- A study reported decreased number of live births, pup survival, and pup weights, but no birth defects in the offspring of animals exposed to 1,4-dichlorobenzene via inhalation. (4)

Cancer Risk:

- No information is available on the carcinogenic effects of 1,4-dichlorobenzene in humans. (1)
- No adequate animal cancer studies are available on exposure to 1,4-dichlorobenzene via inhalation. (1)
- In an NTP study, 1,4-dichlorobenzene was found to cause kidney tumors in male rats and liver tumors in both sexes of mice when administered via gavage. (8)
- EPA has classified 1,4-dichlorobenzene as a Group C, possible human carcinogen. (7)
- EPA has calculated an oral cancer slope factor of 0.024 (mg/kg/d)⁻¹. (7)

Physical Properties

- 1,4-Dichlorobenzene is a white solid with a sweet taste and a strong odor. (1)
- The odor threshold for 1,4-dichlorobenzene is 0.18 parts per million (ppm). (7)

- The chemical formula for 1,4-dichlorobenzene is $C_H_Cl_2$ and the molecular weight is 147.02 g/mol. (1)
- The vapor pressure for 1,4-dichlorobenzene is 1.76 mm^4 Hg at 25 °C, and it has a log octanol/water partition coefficient of 3.52. (1)

Conversion Factors:

To convert concentrations in air (at 25 °C) from ppm to $mg/m^3 : mg/m^3 = (ppm) \times (molecular weight of the compound)/(24.45).$ For 1,4-dichlorobenzene: 1 ppm = 6 mg/m³.

Health Data from Inhalation Exposure



1,4-Dichlorobenzene

ACGIH TLV --American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.

NIOSH IDLH –-National Institute of Occupational Safety and Health's immediately dangerous to life or health limit; NIOSH recommended exposure limit to ensure that a worker can escape from an exposure condition that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from the environment. OSHA PEL--Occupational Safety and Health Administration's permissible exposure limit expressed as a timeweighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek. NOAEL-- no-observed-adverse-effect-level.

The health and regulatory values cited in this factsheet were obtained in December 1999.

^a Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

^b Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH and ACGIH numbers are advisory.

The NOAEL is from the critical study used as the basis for the RfC.

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