Chloroacetic Acid

79-11-8

Hazard Summary

Exposure to chloroacetic acid is most likely to occur in the workplace. Acute (short-term) inhalation or dermal exposure may irritate or cause severe damage to the skin, eyes, respiratory tract, and mucous membranes and cause depression of the central nervous system in humans. No information is available on the chronic (long-term) effects of chloroacetic acid in humans. Damage to the respiratory tract has been observed in rodents chronically exposed to chloroacetic acid by inhalation, orally, and via gavage (experimentally placing the chemical in the stomach). EPA has not classified chloroacetic acid for potential carcinogenicity.

Please Note: The main source of information for this fact sheet is EPA's Health and Environmental Effects Document for Chloroacetic Acid (2). Other secondary sources include the Hazardous Substances Data Bank (HSDB) (3), a database of summaries of peer-reviewed literature, and the Registry of Toxic Effects of Chemical Substances (RTECS) (6), a database of toxic effects that are not peer reviewed.

Uses

- Chloroacetic acid is used in the manufacture of cellulose ethers (used mainly for drilling muds, detergents, food, and pharmaceuticals), as a post-emergence contact herbicide and defoliant, and in the manufacture of glycine and thioglycolic acid. (2)
- Chloroacetic acid is also used in the manufacture of various dyes, synthetic caffeine, and organic chemicals. (1,4)

Sources and Potential Exposure

- Individuals are most likely to be exposed to chloroacetic acid in the workplace. (1)
- Chloroacetic acid may be released to the environment during its production and use. (2)

Assessing Personal Exposure

- No information was located regarding the measurement of personal exposure to chloroacetic acid.

Health Hazard Information

Acute Effects:

- Acute inhalation or dermal exposure to chloroacetic acid may cause severe damage to the skin and mucous membranes in humans. Chloroacetic acid irritates and may burn the skin, eyes, and respiratory tract. (3-5)
- Depression of the central nervous system may occur in humans following acute inhalation exposure. (5)
- Acute exposure by ingestion of chloroacetic acid may interfere with essential enzyme systems in the body and cause intestinal perforation and peritonitis in humans. (3,5)
- Mice acutely exposed by ingestion have exhibited neurological dysfunction. (2)
- Tests involving acute exposure of animals in rats, mice, and guinea pigs have demonstrated chloroacetic acid to have extreme toxicity from inhalation and moderate to high acute toxicity from ingestion.(6)

Chronic Effects (Noncancer):

- No information is available on the chronic effects of chloroacetic acid in humans.
- Damage to the respiratory tract, including inflammatory changes in the respiratory organs, inflammatory lesions of the nasal mucosa, metaplasia of the olfactory epithelium, and respiratory congestion, have been observed in rodents chronically exposed to chloroacetic acid by inhalation, orally, and via gavage. (2,7)
- Chronic exposure via gavage has resulted in myocarditis (inflammation of the muscular tissue of the heart wall) and mortality due to myocardial failure in rats and hepatic vacuolar degeneration in mice. (2,7)
- EPA has not established a Reference Concentration (RfC) for chloroacetic acid.
- EPA has calculated a provisional Reference Dose (RfD) of 0.002 milligrams per kilogram body weight per day (mg/kg/d) for chloroacetic acid. The RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral 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 RfD, the potential for adverse health effects increases. Lifetime exposure above the RfD does not imply that an adverse health effect would necessarily occur. The provisional RfD is a value that has had some form of Agency review, but it does not appear on IRIS. (8)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of chloroacetic acid in humans or animals. (2)

Cancer Risk:

- No information is available on the carcinogenic effects of chloroacetic acid in humans. (2)
- Chloroacetic acid was not found to be tumorigenic to mice when administered via gavage or by subcutaneous injection or when applied to the skin. (2)
- In a National Toxicology Program (NTP) study, no statistically significant increases in tumor incidences were reported in rats and mice exposed to chloroacetic acid via gavage. (7)
- EPA has not classified chloroacetic acid for potential carcinogenicity.

Physical Properties

- The chemical formula for chloroacetic acid is $C_2H_3ClO_2$, and its molecular weight is 94.5 g/mol. (2,4)
- Chloroacetic acid occurs as a colorless or white crystalline solid and is very soluble in water. It is also corrosive. (2,4)
- The odor of chloroacetic acid is penetrating, similar to vinegar; the odor threshold has not been established. (5)
- The vapor pressure for chloroacetic acid is 0.065 mm Hg at 25 °C, and its log octanol/water partition coefficient (log K_{ow}) is 0.22. (2)

Note: There are very few health numbers or regulatory/advisory numbers for chloroacetic acid; thus, a graph has not been prepared for this compound. The health information cited in this fact sheet was obtained in December 1999.

Conversion Factors:
To convert concentrations in air (at 25 °C) from ppm to mg/m^3: mg/m^3 = (ppm) × (molecular weight of the compound)/(24.45). For chloroacetic acid: 1 ppm = 3.86 mg/m^3.

Summary created in April 1992, updated in Janaury 2000.

References

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8. U.S. Environmental Protection Agency. Health Effects Assessment Summary Tables. FY 1997 Update. Solid Waste and Emergency Response, Office of Emergency and Remedial Response, Cincinnati, OH. EPA/540/R-97-036. 1997.