Vinyl acetate

108-05-4

Hazard Summary

Vinyl acetate is primarily used as a monomer in the production of polyvinyl acetate and polyvinyl alcohol. Acute (short-term) inhalation exposure of workers to vinyl acetate has resulted in eye irritation and upper respiratory tract irritation. Chronic (long-term) occupational exposure did not result in any severe adverse effects in workers; some instances of upper respiratory tract irritation, cough, and/or hoarseness were reported. Nasal epithelial lesions and irritation and inflammation of the respiratory tract were observed in mice and rats chronically exposed by inhalation. No information is available on the reproductive, developmental, or carcinogenic effects of vinyl acetate in humans. An increased incidence of nasal cavity tumors has been observed in rats exposed by inhalation. In one drinking water study, an increased incidence of tumors was reported in rats. EPA has not classified vinyl acetate for carcinogenicity.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS) (2), which contains information on inhalation chronic toxicity of vinyl acetate and the RfC, and the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for Vinyl Acetate. (1)

Uses

- Vinyl acetate is primarily used as a monomer in the production of polyvinyl acetate and polyvinyl alcohol.(1) Vinyl acetate is also used as a raw material in the production of other chemicals, in adhesives, water-based
- paints, nonwoven textile fibers, textile sizings and finishes, paper coatings, inks, films, and lacquers. (1,2)

Sources and Potential Exposure

- Exposure is most likely to occur in the workplace, where individuals may be occupationally exposed to vinyl acetate via inhalation or dermal contact during its manufacture or use. (1)
- Exposure may also occur through the inhalation of ambient air in the vicinity of facilities that manufacture or use this compound. (1)

Assessing Personal Exposure

- No medical test is currently available to measure vinyl acetate in the blood, urine, or body tissues. Measurement of metabolites are not useful for showing whether exposure has occurred. (1)

Health Hazard Information

Acute Effects:

- Acute inhalation exposure of workers to vinyl acetate has resulted in eye irritation and upper respiratory tract irritation. (1,2)
- Nasal irritation, labored breathing, lung damage, and convulsions have been observed in rodents acutely exposed to high levels of vinyl acetate by inhalation. (1,3)
- Acute animal tests in rats, mice, and rabbits have demonstrated vinyl acetate to have moderate acute toxicity by inhalation, oral, or dermal exposure. (4)

Chronic Effects (Noncancer):

- Chronic occupational exposure did not result in any severe adverse effects in workers. Some instances of upper respiratory tract irritation, cough, and/or hoarseness were reported. (1,2)
- Nasal epithelial lesions and irritation and inflammation of the respiratory tract were observed in mice and rats chronically exposed by inhalation. (1,2,5)
- The Reference Concentration (RfC) for vinyl acetate is 0.2 milligrams per cubic meter (mg/m^3) based on nasal epithelial lesions in rats and mice. 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 theRfC, the potential for adverse health effects increases. Lifetime exposure above the RfC does not imply that an adverse health effect would necessarily occur. (2)
- EPA has high confidence in the study on which the RfC was based because it identified both a no-observed-adverse-effect level (NOAEL) and a lowest-observed-adverse-effect level (LOAEL) for histopathology of the nasal olfactory epithelia in rats and mice in a chronic 2-year study, used an adequate number of animals, and was thorough in reporting experimental and exposure details; high confidence in the database because it provides sufficient supporting data for the RfC; and, consequently, high confidence in the RfC. (2)
- EPA has calculated a provisional Reference Dose (RfD) for vinyl acetate of 1.0 milligrams per kilogram body weight per day (mg/kg/day) based on altered body and kidney weights in rats. The provisional RfD is a value that has had some form of Agency review, but it does not appear on IRIS. (9)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of vinyl acetate on humans.
- In one study, reduced body weight gain was reported in rats exposed to high levels of vinyl acetate by inhalation. Fetal growth retardation occurred at the highest exposure level but may have been due to the marked reduction in maternal body weight gain and not to a direct developmental effect of vinyl acetate on the fetus. Minor skeletal fetal defects/variants were also observed at the highest exposure level, but these effects may have been secondary to maternal toxicity. (1,2)
- Reduced body weight gain was reported in study of rats exposed to vinyl acetate in their drinking water; no effects on reproductive performance were noted. (1,2)

Cancer Risk:

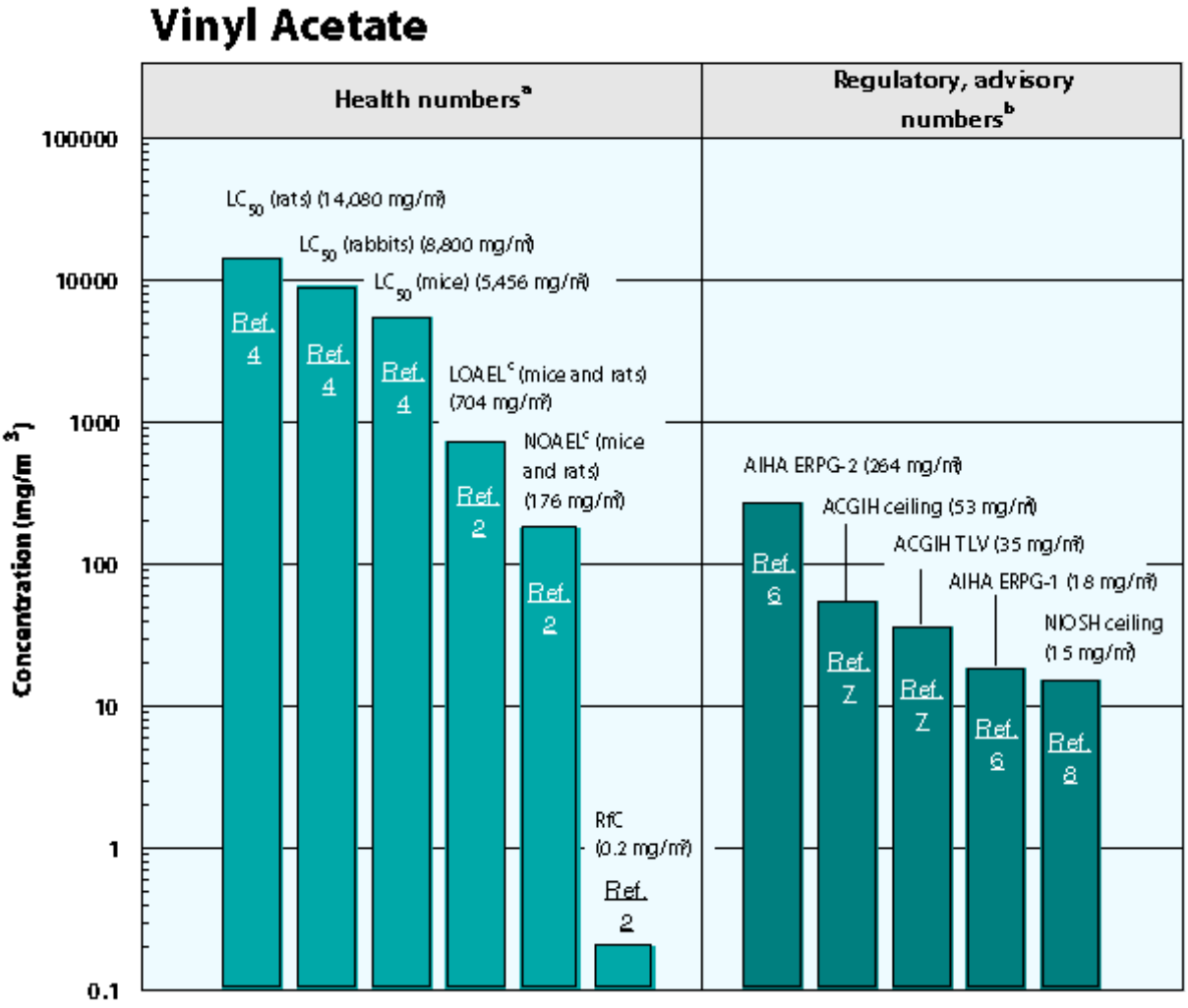
- No information is available on the carcinogenic effects of vinyl acetate in humans.
- An increased incidence of nasal cavity tumors has been observed in rats exposed by inhalation, but not mice. (1)
- In rats exposed to vinyl acetate in drinking water, an increased tumor incidence (including neoplastic nodules of the liver, adenocarcinomas of the uterus [in females], and C-cell adenomas or carcinomas of the thyroid) was reported. However, there are many limitations to this study. (1,5)
- In another drinking water study, no treatment-related tumors were observed in rats. (1)
- EPA has not classified vinyl acetate as to its possible human carcinogenicity. (2)

Physical Properties

- The chemical formula for vinyl acetate is $C_4H_6O_2$, and its molecular weight is 86.09 g/mol. (1)
- Vinyl acetate occurs as a clear, flammable liquid that dissolves easily in water. (1)
- Vinyl acetate has a sweet, pleasant, fruity odor in small quantities, but may be sharp and irritating at higher levels; the odor threshold is 0.5 parts per million (ppm). (1)
- The vapor pressure for vinyl acetate is 115 mm Hg at 25 °C, and its log octanol/water partition coefficient ($\log K_{ow}$) is 0.21-0.73. (1)

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 vinyl acetate: 1 ppm = 3.52 mg/m^3.

Health Data from Inhalation Exposure



AIHA ERPG--American Industrial Hygiene Association's emergency response planning guidelines. ERPG 1 is the maximum airborne concentration below which it is believed nearly all individuals could be exposed up to one hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor; ERPG 2 is the maximum airborne concentration below which it is believed nearly all individuals could be exposed up to one hour without experiencing or developing irreversible or other serious health effects that could impair their abilities to take protective action.
ACGIH ceiling--American Conference of Governmental and Industrial Hygienists' threshold limit value ceiling; the concentration of a substance that should not be exceeded during any part of the working exposure.
ACGIH TLV--ACGIH's threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.
LC_{50} (Lethal Concentration$_{50}$)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.
LOAEL--Lowest-observed-adverse-effect level.
NIOSH ceiling--National Institute of Occupational Safety and Health's recommended exposure limit ceiling; the concentration that should not be exceeded at any time.
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. NIOSH, ACGIH, and AIHA numbers are advisory.

[c] The LOAEL and NOAEL are from the critical study used as the basis for the EPA RfC.

Summary created in April 1992, updated in January 2000

References

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