

# Acrylic Acid

79-10-7

---

## Hazard Summary

Acrylic acid is used in the manufacture of plastics, paint formulations, and other products. Exposure occurs primarily in the workplace. It is a strong irritant to the skin, eyes, and mucous membranes in humans. No information is available on the reproductive, developmental, or carcinogenic effects of acrylic acid in humans. Animal cancer studies have reported both positive and negative results. EPA has not classified acrylic acid for carcinogenicity.

---

Please Note: The main source of information for this fact sheet is EPA's [Integrated Risk Information System \(IRIS\)](#) (3), which contains information on the inhalation and oral chronic toxicity of acrylic acid and the [RfC](#) and the [RfD](#). Other secondary sources include the [Hazardous Substances Data Bank \(HSDB\)](#) (1), a database of summaries of peer-reviewed literature, and the [Registry of Toxic Effects of Chemical Substances \(RTECS\)](#) (4), a database of toxic effects that are not peer reviewed.

## Uses

- Acrylic acid is used in the manufacture of plastics, in latex applications, in floor polish, in polymer solutions for coatings applications, emulsion polymers, paint formulations, leather finishings, and paper coatings. Acrylic acid is also used as a chemical intermediate. (1,7)

## Sources and Potential Exposure

- Exposure to acrylic acid occurs primarily in the workplace via inhalation and dermal contact during its manufacture or use. (1,2)
- Consumers may be exposed to acrylic acid in polishes, paints, coatings, rug backings, adhesives, plastics, textiles, and paper finishes. (1)
- Acrylic acid may be released in wastewater and as emissions during its production and use. Individuals may be exposed by inhaling ambient air or ingesting contaminated water. (1)
- Acrylic acid is also produced naturally by some species of algae. (1)

## Assessing Personal Exposure

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

## Health Hazard Information

### Acute Effects:

- Acrylic acid is a strong irritant to the skin, eyes, and mucous membranes in humans. The liquid may cause blindness if splashed into the eye. (1,2)
- Acute (short-term) exposure of rats to acrylic acid by inhalation has been observed to produce nose and eye irritation, lung hemorrhage, and degenerative changes in the liver and kidneys. (3)
- Tests involving acute exposure of rats, mice, and rabbits have demonstrated acrylic acid to have moderate acute toxicity by inhalation or ingestion, and high acute toxicity by dermal exposure. (4)

### Chronic Effects (Noncancer):

- Information on the chronic (long-term) effects of acrylic acid in humans is not available. (3)
- In mice and rats chronically exposed to acrylic acid by inhalation, lesions of the nasal mucosa were observed. (3)
- Reduced body weights and altered organ weights were observed in rats orally exposed to acrylic acid. (3)
- The Reference Concentration (RfC) for acrylic acid is 0.001 milligrams per cubic meter ( $\text{mg}/\text{m}^3$ ) based on degeneration of the nasal olfactory epithelium in 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 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. (3)
- EPA has medium confidence in the study on which the RfC was based because although it was well conducted and identified a lowest-observed-adverse-effect level (LOAEL) for a mild occurrence of the most sensitive effect, a no-observed-adverse-effect level (NOAEL) was not identified, a small number of animals were used, and there is limited description of the nasal lesion reported; medium confidence in the database due to lack of chronic inhalation data; and, consequently, medium confidence in the RfC. (3)
- The Reference Dose (RfD) for acrylic acid is 0.5 milligrams per kilogram body weight per day ( $\text{mg}/\text{kg}/\text{d}$ ) based on reduced pup weights in rats. (3)
- EPA has high confidence in the principal studies on which the RfD is based because a sufficient number of animals were used and all relevant endpoints were reported thoroughly; high confidence in the database because it contains two developmental studies and two chronic studies of good quality, all of which are consistent in identifying the critical effect; and consequently high confidence in the RfD. (3)

### Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of acrylic acid in humans.
- Decreased body weight gain and decreased fertility were reported in one study of rats exposed to acrylic acid by ingestion, although the decrease in fertility was not statistically significant compared with the control. (3)
- Embryotoxic and teratogenic effects (birth defects) were observed in rats injected with acrylic acid. (5)

### Cancer Risk:

- No information is available on the carcinogenic effects of acrylic acid in humans.
- In one study, squamous cell carcinomas of the skin were reported in mice treated topically with acrylic acid. Other animal studies have not reported carcinogenic effects. (5,6)
- EPA has not classified acrylic acid for carcinogenicity.

## Physical Properties

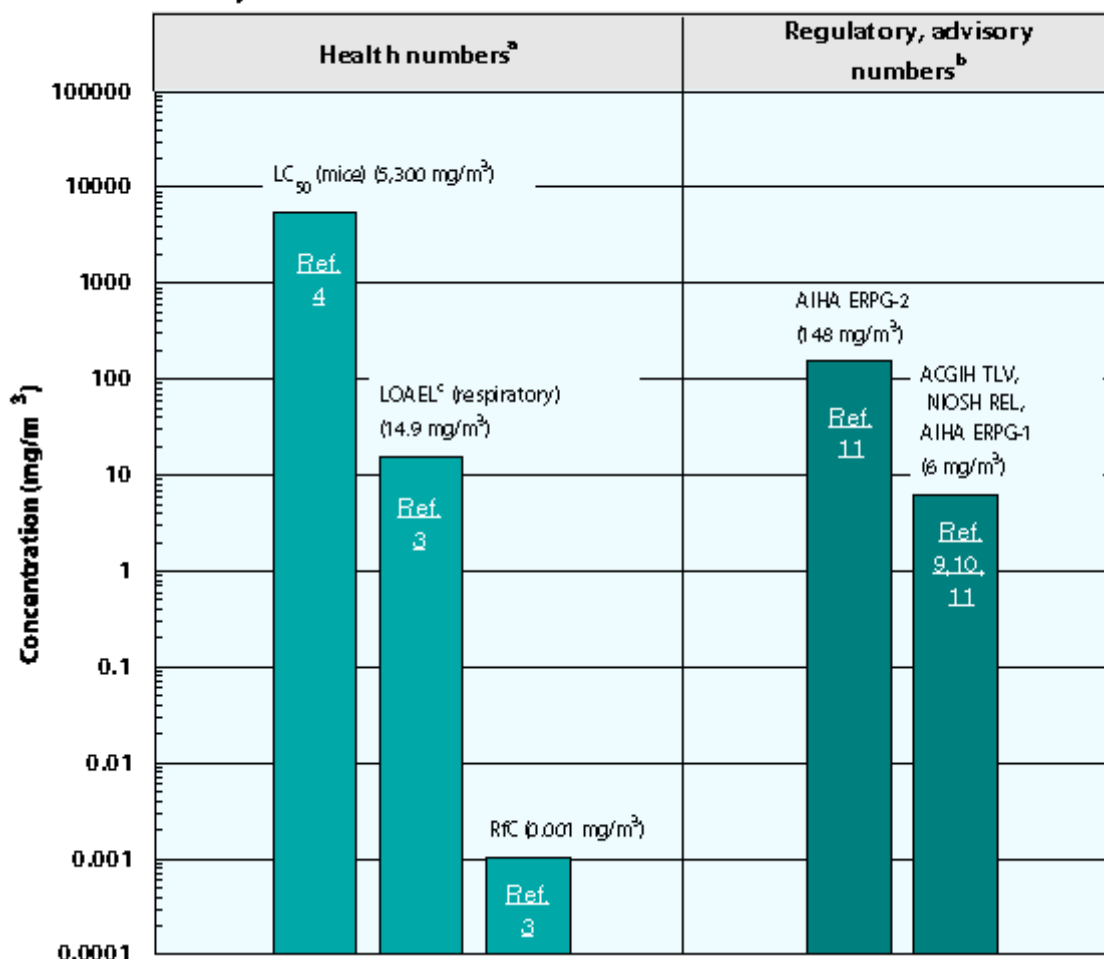
- The chemical formula of acrylic acid is  $\text{C}_3\text{H}_4\text{O}_2$ , and it has a molecular weight of 72.06 g/mol. (5)
- Acrylic acid occurs as a corrosive, colorless liquid that is miscible with water. (5,7)
- Acrylic acid has an acrid odor with an odor threshold of 0.094 parts per million (ppm). (5,7,8)
- The vapor pressure for acrylic acid is 52 mm Hg at 20 °C. (5)

---

### Conversion Factors:

To convert concentrations in air (at 25°C) from ppm to  $\text{mg}/\text{m}^3$ :  $\text{mg}/\text{m}^3 = (\text{ppm}) \times (\text{molecular weight of the compound})/24.45$ . For acrylic acid, 1 ppm = 2.95  $\text{mg}/\text{m}^3$ .

# Acrylic acid



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.

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.

LC<sub>50</sub> (Lethal Concentration<sub>50</sub>)--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.

NIOSH REL--National Institute of Occupational Safety and Health's recommended exposure limit; NIOSH--recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.

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

<sup>a</sup> Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

<sup>b</sup> 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.

<sup>c</sup> This LOAEL is from the critical study used as the basis for the EPA RfC.

## References

1. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
2. M. Sittig. Handbook of Toxic and Hazardous Chemicals and Carcinogens. 2nd ed. Noyes Publications, Park Ridge, NJ. 1985.
3. U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS) on Acrylic Acid. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. 1999.
4. U.S. Department of Health and Human Services. Registry of Toxic Effects of Chemical Substances (RTECS online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
5. International Agency for Research on Cancer (IARC). IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans: Some Monomers, Plastics and Synthetic Elastomers, and Acrolein. Volume 19. World Health Organization, Lyon. 1979.
6. E.J. Calabrese and E.M. Kenyon. Air Toxics and Risk Assessment. Lewis Publishers, Chelsea, MI. 1991.
7. The Merck Index. An Encyclopedia of Chemicals, Drugs, and Biologicals. 11th ed. Ed. S. Budavari. Merck and Co. Inc., Rahway, NJ. 1989.
8. J.E. Amoores and E. Hautala. Odor as an aid to chemical safety: Odor thresholds compared with threshold limit values and volatilities for 214 industrial chemicals in air and water dilution. *Journal of Applied Toxicology*, 3(6):272-290. 1983.
9. American Conference of Governmental Industrial Hygienists (ACGIH). 1999 TLV's and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents, Biological Exposure Indices. Cincinnati, OH. 1999.
10. National Institute for Occupational Safety and Health (NIOSH). *Pocket Guide to Chemical Hazards*. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention. Cincinnati, OH. 1997.
11. American Industrial Hygiene Association. 1998 Emergency Response Planning Guidelines and Workplace Environmental Exposure Level Guides. 1998.