

## Acrylaldehyde (Acrolein)

CAS: 107-02-8

MF: C<sub>3</sub>H<sub>4</sub>O

MW: 56.06

Soluble in water (208 g/l, at 20 °C); soluble in alcohol, ether and acetone.

### Major use

Acrylaldehyde (acrolein) is used in the manufacture of pharmaceuticals, perfumes, food supplements, and resins. It is also used as a biocide and fungicide [1]

### Human toxicity

Acrolein is a highly reactive and toxic aldehyde, recognized as a pulmonary irritant following inhalation.

Ingestion may produce severe irritation of the mouth and gastrointestinal tract; acrolein also causes severe lacrimation. Hypertension and tachycardia may result from inhalation of acrolein. Inhalation can also cause loss of consciousness and coma [2].

*Lethal symptoms:* Lung injury/respiratory failure, pulmonary edema, coma [3].

*Mean time to death:* Delay onset of toxicity 24-48 h.

TCLo - Human inhalation: 1 ppm [1, 4-poisindex].

LCLo - Human inhalation: 153 ppm for 10 min [1, 4]. Pulmonary edema and death have been reported after exposure to 10 ppm for 10 minutes (reviewed in [2]).

Working place standards: TLV-Ceiling: 0.1 ppm [1, 4]

No data on lethal blood concentrations after acute oral poisoning with acrolein are available in the literature.

### Kinetic data

*Absorption:* No human data available

*Volume of distribution:* No data available.

*The plasma half-life:* No data available.

*Plasma protein binding:* No data available.

*Elimination:* The conjugation with GSH represents an important pathway of elimination as well as of detoxification of acrolein [5].

### Metabolism and excretion

In rats, major urinary metabolites after oral administration were S-carboxyethyl-N-acetylcysteine (S-carboxyethylmercapturic acid) and S-(propionic acid methyl ester) mercapturic acid [1] N-acetyl-S-(3-hydroxypropyl)-L-cysteine was isolated from the urine of rats given acrolein subcutaneously [1].

Glyceraldehyde was formed from acrolein *in vitro* by liver and lung microsomal enzymes [1]. Acrolein may be transformed into acrylic acid via liver cytosol or microsomes [7].

### **Toxicological mechanisms**

Acrolein is cytotoxic. Due to its molecular structure, acrolein is highly reactive and can cause serious damage to any exposed tissue. It has a corrosive effect on contact, and causes severe irritation to eyes, skin, oral and gastric mucosa, and especially the respiratory tract. Many biochemical and toxic effects are due to reaction with critical sulfhydryl groups [1, 6]. Acrolein appears to act on glyceraldehyde-3-phosphate dehydrogenase to suppress glycolysis [7].

**Target organ:** lungs.

### **References**

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4. Poisindex, Thomson Micromedex (2005).
5. Beauchamp, R.O., Andjelkovich, D.A., Klingerman, A.D., Morgan, K.T., and Heck, H.(1985) A critical review of the literature on acrolein toxicity, *Crit Rev Toxicol* 14, 309-80.
6. Bingham, E., Cohns, B., & Powell, C.H. (2001) *Patty's Toxicology*, 5<sup>th</sup> ed, John Wiley & Sons, Inc, New York, NY.
7. Plunkett, E.R. (1976) *Handbook of Industrial Toxicology*, Chemical Publishing Company, Inc, New York, NY.

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