

## Isopropyl alcohol

CAS: 67-63-0

MF: C<sub>3</sub>H<sub>8</sub>O

MW: 60.1

Miscible in most organic solvents. Soluble in benzene and insoluble in salt solutions.

### Major uses

*Chemical:* feedstock in the production of acetone; manufacture of methyl isobutyl ketone, methyl isobutyl carbinol, isopropylamine, and isopropyl acetate.

Used to prepare hydrogen peroxide by alcohol auto-oxidation process. Used in gasoline to prevent icing (i.e. depresses the freezing point) of water or surfactants.

*Solvent:* oils, gums, waxes, resins, alkaloids, cements, primers, varnishes, paints, printing inks, cosmetics; aerosol formulations.

*Medical:* antiseptic; disinfectant for home, hospital, and industry; rubbing alcohol; medicinal liniments; scalp tonics; pharmaceuticals (e.g., local anaesthetics, tincture of iodine, and bathing solutions for surgical sutures and dressings) [1].

### Human toxicity

Isopropyl alcohol intoxication has a rapid onset of action (30-60 min), with peak effects within several hours [1]. The compound is generally believed to produce greater CNS depression than ethanol at comparable blood levels. Isopropyl alcohol is toxic by the oral, dermal, parenteral, and inhalation exposure routes [2].

Ingestion or inhalation of isopropyl alcohol may result in flushing, headache, dizziness, hallucinations, distorted perceptions, dyspnea, nausea, vomiting, CNS depression, and coma. Respiratory depression, hypotension, bradycardia, and hypothermia may occur with severe overdoses. Tachycardia is common. Ketonemia and ketonuria may be present, generally without metabolic acidosis. Emesis and hemorrhagic gastritis may occur following ingestion. Renal insufficiency with anuria followed by oliguria, nitrogen retention, and edema may be a complication of poisoning [2].

*Lethal symptoms:* CNS depression (main cause of death), cardiovascular failure, pneumonia.

*Mean time to death:* 3 h.

*Danger over:* 48 h

The probable oral lethal dose is 240 to 250 ml although as little as 100 ml can be fatal, and ingestion of only 20 ml has caused poisoning [2]. An adult have survived after ingesting 1000 ml of 70% isopropyl alcohol solution. Hemodialysis and supportive medical treatment were provided [2]. The mean lethal dose (based on the data from several handbooks) is 180 g [3].

The mean lethal serum concentration is 1500 mg/l [4], whereas the minimum lethal serum concentration is 1000 mg/l [5]. According to Kaye, lethal blood level is 3000 mg/l [6].

*Working place standards:* TLV-TWA: 200 ppm, TLV-STEL: 400 ppm [2].

### **Kinetic data**

*Absorption:* Isopropyl alcohol is readily absorbed (complete) from the gastrointestinal tract [2].

*Kinetics:* first-order [3]

*Volume of distribution:* 0.6 l/kg [4].

*Accumulation in vital organs:* none [3].

Based upon clinical experience, *peak plasma level* usually occurs within one hour after ingestion. Plasma levels remain higher for a longer period of time than for similar ethanol intoxication [2].

*The plasma half-life:* 5.4 h, at overdosage [3].

*Passage of blood-brain barrier:* free [3].

### **Metabolism and excretion**

Approximately 20 percent of an isopropyl alcohol dose is excreted unchanged in the urine. Isopropyl alcohol is slowly metabolized to acetone via liver alcohol dehydrogenase, with urinary acetone becoming measurable after about 3 to 4 hours and peaking at 7 to 50 hours. Acetone is further metabolized to acetate, formate, and carbon dioxide [2].

*Excretion:* both compounds, isopropyl alcohol and acetone, are excreted via the breath and urine [4].

*Metabolites more toxic than isopropyl alcohol:* none.

### **Toxicological/lethal mechanisms**

Unknown.

**Target organs:** CNS, cardiovascular system, lung (histopathological organ lesions)

### **References**

1. HSDB, TOXNET (2005)
2. Poisindex, Thomson Micromedex (2005).
3. Ekwall, B., Clemenson, C., Crafoord, B., Ekwall, B., Hallander, S., Walum, E., Bondesson, I. (1998) MEIC evaluation of acute systemic toxicity. Part V. Rodent and human toxicity data for the 50 reference chemicals. ATLA 26, 571-616.
4. Baselt, R.C. & Cravey, R.H. (1995) *Disposition of Toxic Drugs and Chemicals in Man*, 4<sup>th</sup> edn., pp. 405-406. Foster City, CA, USA: Chemical

Toxicology Institute.

5. Stead, A.H. & Moffat, A.C. (1983) *A collection of therapeutic, toxic and fatal blood drug concentrations in man*. Hum Toxicol 3, 437-464.
6. Kaye, S. (1980) *Handbook of Emergency Toxicology: A Guide for the Identification, Diagnosis and Treatment of Poisoning*, 4<sup>th</sup> edn., pp. 352-354. Springfield, IL, USA.

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