

ISOAMYL ALCOHOL

Synonyms: Isopentyl alcohol; 3-methylbutanol-1.

Structure: $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{OH}$.

Description and physical properties: Merck Index (1976).

Occurrence: Constitutes the major portion of fusel oil. It has been identified as an ester among the constituents of Roman camomile oil, and in the oils of French peppermint, Java citronella, Reunion geranium, tea, *Teucrium chamaedrys*, *Eucalyptus amigdalina*, *Aschlea azeratum*, *Artemisia camphorata* and others; it is also present in the aromas of strawberry and raspberry and has been identified in rum (Fenaroli's Handbook of Flavor Ingredients, 1975).

Preparation: By purifying fusel oil (Poucher, 1974).

Uses: In public use since the 1930s. Use in fragrances in the USA amounts to approximately 1000 lb/yr.

Concentration in final product (%):

	Soap	Detergent	Creams, lotions	Perfume
Usual	0.005	0.0005	0.0025	0.04
Maximum	0.03	0.003	0.015	0.8

Analytical data: Gas chromatogram, RIFM no. 76-151; infra-red curve, RIFM no. 76-151.

Status

Isoamyl alcohol was given GRAS status by FEMA (1965), is approved by the FDA for food use (21 CFR 172.515) and was listed by the Council of Europe (1974) with an ADI of 1 mg/kg. Browning (1965) has a monograph on isoamyl alcohol. CAS Registry No. 123-51-3.

Biological data

Acute toxicity: The oral LD_{50} in rats has been reported as 4.0 g/kg for females and 1.3 g/kg for males, with signs of liver and kidney degeneration (Purchase, 1969), as 7.07 ml/kg (Smyth, Carpenter, Weil, Pozzani, Stiegel & Nyman, 1969) and as 4.36 ml/kg (Golovinskaya, 1976). Single oral doses of 6 g/kg administered in a 50% aqueous solution to female rats moderately increased liver weight (Gaillard & Derache, 1965a) but had no effect on liver triglyceride, cholesterol or phospholipid levels (Gaillard & Derache, 1966). In rabbits, the oral lethal dose reported by Munch & Schwartz (1925) and by Munch (1972) was 4.25 ml/kg (39 mmol/kg) and the oral ND_{50} (narcotic dose) was 8 mmol/kg (Munch, 1972), while the oral narcotic dose in guinea-pigs was 0.69 g/kg (Hufferd, 1932).

In rabbits treated iv, the narcotic dose was 0.85 g/kg and the lethal dose was 6.39 g/kg (Lehman & Newman, 1937), whereas in cats the lethal iv dose was only 210 mg/kg (Macht, 1920). Spector (1955) gave the minimum lethal iv dose in rabbits as 1570 mg/kg. Administration ip to rats demonstrated a lethal dose of 813 mg/kg according to Spector (1955) and of 600 mg/kg according to Haggard, Miller & Greenberg (1945), while Zagradnik, Chvapil, Vostal & Teisinger (1962) reported that the lethal ip dose in mice was 2.64 mmol/kg. The sc lethal dose in mice was 7.48 g/kg (Spector, 1955) and the dermal (percutaneous) LD_{50} for a single administration to rabbits was reported as 3.97 ml/kg (Smyth *et al.* 1969) and as more than 5 g/kg (Moreno, 1976). In mice, skin absorption of isoamyl alcohol has caused necrosis (Browning, 1965).

Doses of 8, 16 and 40 mg/egg resulted in 85, 40 and 0% hatchability, respectively, in a study to determine the toxicity of isoamyl alcohol by the chick-embryo method (McLaughlin, Marlic, Verrett, Mutchler & Fitzhugh, 1964).

Subacute toxicity: When groups of rats were given daily oral doses of 150, 500 or 1000 mg isoamyl alcohol/kg for 17 wk, body-weight gain was reduced at the highest dose level but no other toxic signs were noted (Carpanini, Gaunt, Kiss, Grasso & Gangolli, 1973).

Inhalation: In the rat, inhalation of the concentrated vapour for 8 hr produced no deaths (Smyth *et al.* 1969). Treon (1963) reviewed the effects of inhalation of amyl alcohol (mixed isomers) in man. They include marked irritation of eyes and respiratory tract, headache, vertigo, dyspnoea, cough, nausea, vomiting and diarrhoea; anaemia has been noted. Eye, nose and throat irritation has been reported in man after inhalation of 100-150 ppm "amyl" (isoamyl) alcohol for 3-5 min (Nelson, Ege, Ross, Woodman & Silverman, 1943). The *Atcock Index* (1976) notes that isoamyl alcohol may be moderately irritating to mucous membranes; high concentrations may cause central nervous system depression and necrosis and lower concentrations, headache and dizziness.

Human oral toxicity: Signs of isoamyl alcohol poisoning in humans who had ingested 50-100 ml included central nervous system depression, weakness, pain, a burning sensation in the chest and stomach, nausea, headache, sleep within 10-15 min, terminal coma and death within 1 hr to 6 days (Avdeev, 1966). The cause of death was asphyxiation, and turgor of brain tissues and all internal organs, swollen gastric mucosa and vascular effects were noted.

Irritation: Isoamyl alcohol has been reported to cause corneal injury and to irritate shaved uncovered rabbit belly (Smyth *et al.* 1969). Applied full strength to intact or abraded rabbit skin

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