

TOXICITY PROFILE

Monoisopropanolamine

(1999)

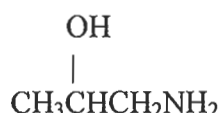
MONOISOPROPANOLAMINE

SUMMARY

A single case of eye irritation and a few cases of dermatitis have been recorded in humans occupationally exposed to monoisopropanolamine. No skin sensitization was induced in volunteers treated with dilute solutions. Monoisopropanolamine caused severe skin and eye irritation in rabbits, whilst nasal and lung irritation were observed in mice exposed to an aerosol. In laboratory animals, the acute toxicity of monoisopropanolamine was generally low when given orally, and moderate when applied dermally. A limited [oral?] study gave some indication of a foetotoxic effect in rats. There was no convincing evidence of mutagenicity in bacterial assays (including Ames tests).

IDENTIFICATION

STRUCTURAL FORMULA:



COMMON SYNONYM: 1-Amino-2-propanol

CHEMICAL ABSTRACTS REGISTRY NUMBER: 78-96-6

RELEVANT PHYSICAL PROPERTIES:

Monoisopropanolamine is a liquid which boils at 160°C. It is miscible with water, benzene and ethanol (CIR, 1987).

LOCAL EFFECTS

SKIN IRRITATION

Human

Dermatitis has been reported in five workers due to direct skin contact with monoisopropanolamine [at unspecified concentrations] (Hervin & Lucas, 1974).

Non-human

A 1% aqueous solution of monoisopropanolamine in covered contact with the skin of six rabbits for 4 hr was not irritant (Dow, 1985a), although application of 1% "isopropanolamine" to abraded skin was reported to cause irritation in unspecified animals [no further details available] (Hervin & Lucas, 1974). Aqueous solutions of 25% and above produced skin irritation [species and contact conditions unspecified] (Hervin & Lucas, 1974), whilst uncovered application of the neat material to the skin of rabbits caused mild or moderate irritation (Smyth *et al.* 1949; Union Carbide, 1971).

According to one citation (Rampy, 1972), the neat material was corrosive to the skin of rabbits when in 4-hr covered contact, whereas another citation (Marhold, 1986) states that only mild irritation occurred on the skin of rabbits subjected to 24-hr covered contact.

Seven uncovered applications caused marked redness, slight swelling and burns in rabbits, with covered applications causing more severe reactions [no details of concentration, exposure conditions or study duration were given] (Carreon & Yakel, 1981).

EYE IRRITATION

Human

A worker exposed to monoisopropanolamine reported eye irritation [no further details available] (Hervin & Lucas, 1974).

Non-human

In rabbits, severe eye damage was induced following instillation of 50 mg [approximately 0.05 ml] (Toropkov, 1980a) or an unspecified volume (Carreon & Yakel, 1981) of the neat material. In both studies, the eyes had not recovered after 3-4 wk. Severe eye irritation occurred following instillation of 970 µg (Union Carbide, 1971) or 250 µg (Marhold, 1986) into the eyes of rabbits. An "excess" of a 1% solution in propylene glycol or water (Carpenter & Smyth, 1946) also caused severe eye injury (Smyth *et al.* 1949), whereas 0.1 ml of a 1% aqueous solution caused slight discomfort and redness in rabbits' eyes (Dow, 1985b).

OTHER LOCAL EFFECTS

Nasal and lung irritation were observed in mice exposed for 3 hr to an aerosol of monoisopropanolamine at 230-1005 mg/m³ (Detwiler-Okabayashi & Schaper, 1996).

SENSITIZATION AND INTOLERANCE

Human

In an attempt to induce sensitization, 150 volunteers were given 48- to 72-hr covered patch tests with a 2% aqueous solution, three times/wk for 3 wk. After a 2-wk rest period, a 48-hr challenge patch elicited no local reactions indicating that sensitization

had not occurred (Maibach, 1986). In an attempt to induce photosensitization, 50 volunteers were given 24-hr covered patch tests with a 2% aqueous solution, 3 days/wk for 3 wk. After each patch removal, the test sites were irradiated with UV light. Following a 2-wk rest period, each volunteer was given two challenge patches. One remained in place for 24 hr after which the test site was irradiated with UV light and the other remained in place for 48 hr. No evidence of allergic or photoallergic dermatitis was apparent (Maibach, 1986).

GENERAL SYSTEMIC EFFECTS

SINGLE EXPOSURE

Non-human

Oral

Rat LD₅₀ : 1715 mg/kg bw (Anon, 1986).
2100-4260 mg/kg bw (Carreon & Yakel, 1981; Smyth *et al.* 1949;
Toropkov, 1980b).

Lethargy, diarrhoea and rough coats were observed in rats given 500-3500 mg/kg bw by stomach tube, and watery eyes were apparent at 2000 mg/kg bw. A gross examination of undisclosed organs revealed no abnormalities (Carreon & Yakel, 1981).

Mouse LD₅₀ : 2200 mg/kg bw (Toropkov, 1980b).
Guinea-pig LD₅₀ : 2700 mg/kg bw (Toropkov, 1980b).
Rabbit LD₅₀ : 3200 mg/kg bw (Toropkov, 1980b).

Dermal

Rabbit LD₅₀ : 1560 mg/kg bw (24-hr covered contact) (Smyth *et al.* 1949).
: 1640 mg/kg bw [exposure conditions not specified] (Union Carbide,
1971).
: 1851 mg/kg bw [exposure conditions not specified] (Carreon & Yakel,
1981).

Undefined applications of 630 mg/kg bw and above caused lethargy and anorexia in rabbits; 1300 mg/kg bw produced diarrhoea. A gross examination of undefined organs revealed no abnormalities (Carreon & Yakel, 1981).

Inhalation

No deaths occurred in six rats exposed to the saturated vapour [concentration unspecified] for 8 hr (Smyth *et al.* 1949).

Nasal and lung irritation were observed in mice exposed for 3 hr to an aerosol of monoisopropanolamine at 230-1005 mg/m³. A concentration of around 400 mg/m³ produced a 50% decrease in breathing rate. The animals showed moderate to good recovery immediately after exposure (Detwiler-Okabayashi & Schaper, 1996).

Intraperitoneal

Four out of five mice given an injection of 480 mg/kg bw died within 2 hr, while one of three given 240 mg/kg bw died on day 3. There were no deaths within 7 days among groups of three mice given 30, 60 or 120 mg/kg bw (SKICR, 1952).

REPEATED EXPOSURE**Human*****Inhalation***

According to a US Governmental report (from NIOSH) monoisopropanolamine and its vapour are not considered to be toxic in the usual industrial setting but one worker experienced headache, stomach ache, sore throat and eye irritation when working with monoisopropanolamine [no further details available] (Hervin & Lucas, 1974).

Non-human***Oral***

Altered liver or kidney weight [the limited report does not specify which] was seen in rats given 2220 mg/kg bw/day for 90 days but there was no effect on growth. No adverse effects were apparent in a limited tissue examination of ten rats given 600 mg/kg bw/day (Smyth *et al.* 1951). According to an abstract of a Soviet study, the threshold dose for rats in "chronic" studies was 0.28 mg/kg bw/day and for guinea-pigs was 0.17 mg/kg bw/day (Toropkov, 1980b). [No further details given.]

Inhalation

Small groups of male and female rats and mice exposed to up to 75 ppm [about 230 mg/m³], 6 hr/day, 5 days/wk for a total of nine exposures, remained in good health throughout. No effects were seen in gross and microscopic examinations of an undisclosed range of tissues, and blood and urine analyses were normal (Dow, 1982).

REPRODUCTIVE TOXICITY**Non-human**

According to a limited Soviet study a dose of 0.28 mg/kg bw/day given to rats [probably orally for an undefined period] had no effect on fertility or the incidence of foetal malformations, but an increase in early foetal deaths was observed. No effect on a number of other reproductive parameters was apparent at 0.028 mg/kg bw/day (Toropkov, 1980c).

CARCINOGENICITY

No relevant data identified.

OTHER GENOTOXICITY

One group of investigators tested monoisopropanolamine (96.4% pure) in the Ames test with four strains of the bacteria *Salmonella typhimurium*. No evidence of mutagenicity was found in three of the strains, but "questionable" results were reported in one strain (TA 1535), in the presence but not in the absence of a liver metabolic activation system (Zeiger *et al.* 1987). Although the effect was slight, nevertheless the increase in mutant frequency represented more than a doubling in comparison with controls, with the effect observed just below the toxic concentration of around 2.8-3.3 mg/plate.

Another Ames study on monoisopropanolamine (97% pure) provided no evidence of mutagenic activity in five *Salmonella* strains tested (including TA 1535), either with or without a liver metabolic activation fraction. In this study the chemical was tested up to a maximum level of 5 mg/plate, a concentration at which growth inhibition was observed (Shimizu *et al.* 1985). There was also no indication of mutagenicity in *Escherichia coli* bacteria, both in the presence and absence of a liver metabolic activation fraction (Shimizu *et al.* 1985).

No sex-linked recessive lethal mutations occurred in *Drosophila melanogaster* (the fruit fly) given monoisopropanolamine either in the feed for 72 hr or by injection (Foureman *et al.* 1994).

OTHER TOXICITY CONSIDERATIONS

The nitrosamine, N-nitroso-5-methyl-1,3-oxazolidine (NMO) can form slowly from monoisopropanolamine, aqueous formaldehyde and sodium nitrate [nitrite?] under alkaline conditions at room temperature (CIR, 1987). NMO was carcinogenic in rats given oral doses of about 2 mg/kg bw/day, 5 days/wk, for 50 wk (Lijinsky & Reuber, 1982).

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