

Recommendation from the Scientific Expert Group
on Occupational Exposure Limits
for Propionic acid

8 hour TWA	:	10 ppm (31 mg/m ³)
STEL (15 mins)	:	20 ppm (62 mg/m ³)
Additional classification	:	-

Substance:

Propionic acid	CH ₃ -CH ₂ -COOH	
Synonyms	:	propane acid; methylacetic acid
EINECS N°	:	201-176-3
EEC N°	:	607-089-00-0
CAS N°	:	79-09-4
MWt	:	74.1
Classification	:	C; R34
Conversion factor (20°C, 101kPa)	:	3.08 mg/m ³ = 1 ppm

Occurrence/use:

Propionic acid is a colourless oily liquid with a sour odour. It has a MPt of -22°C, a BPt of 141°C and a vapour pressure of 0.4 kPa at 20°C. It has a vapour density of 2.57 times that of air and is explosive in the range 2.1 - 12% in air. The odour threshold is about 0.03 ppm (0.08 mg/m³).

Propionic acid and its salts are used as, and in the synthesis of, fungicides, herbicides and food preservatives, and in cosmetics and cellulose propionate plastics. The production rate in the EEC is in excess of 10,000 tonnes per annum.

Health Significance:

There are no data available on uptake of propionic acid. It is an intermediary of normal metabolism in the form of propionyl-coenzyme A.

Concentrated propionic acid is moderately irritating to human skin following dermal application for 1 hour. The ACGIH stated that acute occupational exposure causes mild to moderate skin burns, mild eye irritation and, in a single incident, an asthmatic cough. A source or exposure levels were not quoted.

There are no inhalation data available on propionic acid. Chronic administration of 4 % propionic acid in the diet (approximately 2400 mg/kg body weight) for up to 3 years produced hyperplasia, hyperplastic ulcers, papillomas and proliferation of basal cells in the forestomach of rats (Griem, 1985; Anonymous, 1987). Areas of "carcinomatous degeneration" were described. No effects were seen with a concentration of 0.4 % in the diet. More recently it was shown that proliferative changes were induced after only 7 days exposure (Harrison *et al*, 1991). Rats appeared to be the most sensitive species. In dogs, hyperplastic changes in the oesophagus developed after administration of 3% propionic acid (approximately 750 mg/kg body weight) in the diet for 90 days (Anonymous, 1987). The effects seemed to be reversible and did not occur at lower concentrations (0.3 %, 1 %).

Propionic acid was not mutagenic to *Salmonella typhimurium* and induced no sister chromatid exchanges in Chinese hamster V79 cells (Basler *et al*, 1987). Both tests were conducted with and without metabolic activation. A micronucleus test in hamsters was also negative (Basler *et al*, 1987).

There are no data available on developmental toxicity.

Recommendation:

In view of the negative mutagenicity data, and the production of forestomach papillomas in rats at dosages associated with hyperplasia, propionic acid is not considered to be a carcinogenic risk to humans. As there are no data available on propionic acid appropriate for a basis for proposing occupational exposure limits, analogy to acetic acid is made. Slight irritation of the skin and mucous membranes has been reported in workers exposed for 7 to 12 years to average concentrations of 60 ppm (150 mg/m³) acetic acid plus one hour daily to 100 - 260 ppm (250 - 650 mg/m³) (Vigliani and Zurlo, 1955). The only data available for comparing the toxic effects of propionic and acetic acids are the acute oral toxicity and skin irritancy potential. LD50 values in rats are of the same order of magnitude (propionic acid : 2.60 - 5.76 g/kg; acetic acid : 3.31 - 3.53 g/kg). Minor necrosis of the skin in humans occurred after dermal application of propionic acid for 1 hour, which was reversible after 3 days, whereas moderate necrosis developed with acetic acid, which was reversible after 8 days. Since propionic acid seems to have a lower skin irritation potency than acetic acid, an 8-hour TWA of 10 ppm (31 mg/m³) is considered sufficient. A STEL (15 mins) of 20 ppm (62 mg/m³), which is derived from the 8-hour TWA, is recommended to limit peaks of exposure which could result in irritation.

No "skin" notation was considered necessary.

At the levels recommended, no measurement difficulties are foreseen.

Key Bibliography:

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