Recommendation from Scientific Expert Group

on Occupational Exposure Limits

for Hydrogen chloride

8 hour TWA	:	5 ppm (8 mg/m^3)
STEL (15 mins)	:	10 ppm (15 mg/m^3)
Additional classification	:	-

Substance:

Hydrogen chloride **HCl**

Synonyms	:	Hydrochloric acid gas	
EINECS N°	:	231-595-7	
EEC N°	:	017-002-00-2	Classification : T; R23 C; R35
CAS N°	:	7647-01-0	
MWt	:	36.46	

Conversion factor (20°C, 101kPa) : 1.52 mg/ m^3 = 1 ppm

Occurrence/use:

Hydrogen chloride is a colourless, corrosive gas with a suffocating odour. It has a MPt of -114.3°C, a BPt of -84.9°C, a vapour pressure of about 400 kPa at 20°C and a vapour density of 1.3 times that of air. The odour threshold is about 0.8 ppm (1.2 mg/m^3).

Hydrogen chloride occurs naturally in volcanic plumes; it may arise from chlorination and dechlorination procedures, in chemical manufacture and surface treatments. It is widely used in chemical synthesis, in organochlorines, polymerisation, alkylation and nitration. The production rate in the EEC is in excess of 100,000 tonnes per annum.

Health Significance:

Hydrogen chloride gas and solution aerosols are readily absorbed from the respiratory tract, forming chloride ions and becoming indistinguishable from chloride derived from dietary sources.

The acute toxicity of hydrogen chloride gas and aerosol is high: 30 minute LC50 values of 2644 - 4701 ppm (1739 - 3093 mg/m^3) and 2142 - 5666 ppm (1409 - 3728 mg/m^3) have been determined for the gas and aerosol respectively, in rats and mice (Darmer *et al*, 1974). The principal effects seen in acute toxicity studies were irritation of the eyes, upper respiratory tract and exposed areas of skin. When inhaled at high concentrations, the gas caused necrosis of the epithelial lining of the nasotracheal passages as well as alveolar emphysema, atelectasis and lung oedema. Repeated exposure of rabbits and guinea pigs to

hydrogen chloride gas at 100 ppm (152 mg/m^3) for 6h/d for 5 days resulted in only slight respiratory difficulties and eye and nasal irritation (Jones, 1972). Blood haemoglobin levels were slightly reduced. Exposure of a monkey, rabbits and guinea pigs to 30 ppm (46 mg/m^3), 6h/d for 4 weeks caused no adverse effects or morphological changes (Machle *et al*, 1942).

No data are available on genotoxicity of hydrogen chloride. In a well-conducted inhalation carcinogenicity study, rats were exposed to 10 ppm (15 mg/m^3) hydrogen chloride gas, 6h/d 5d/w for their lifetime (Albert *et al*, 1982; Sellakumar *et al*, 1985). No serious irritating effects in the nasal epithelium were observed. None of the treated animals developed any preneoplastic or neoplastic lesions indicating a lack of carcinogenic activity.

No data on reproductive toxicity or teratogenicity are available.

Data on the human health effects are generally limited to poorly reported secondary sources. Exposure of male volunteers to 50 - 100 ppm (76 - 152 mg/m^3) hydrogen chloride gas for 1 hour was claimed to be barely tolerable (Henderson and Haggard, 1943). Irritation of the throat resulted from brief exposure to 35 ppm (53 mg/m^3) and 10 ppm (15 mg/m^3) was considered to be the maximal acceptable concentration for prolonged exposure.

Recommendation:

The well-conducted carcinogenicity study reported by Albert *et al* (1982) and Sellakumar *et al* (1985), establishing that no serious irritating effects were observed in rats exposed to 10 ppm (15 mg/m^3) hydrogen chloride, was considered to be the best available basis for proposing occupational exposure limits. An uncertainty factor of 2 was applied to allow for the absence of controlled human data. The recommended 8-hour TWA is 5 ppm (8 mg/m^3). A STEL (15 mins) of 10 ppm (15 mg/m^3) was proposed 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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Sellakumar, A.R., Synder, C.A., Solomon, J.J. and Albert, R.E. (1985). Carcinogenicity of formaldehyde and hydrogen chloride in rats. Toxicol. Appl. Pharmacol. 81, 401-406.