Recommendation from Scientific Expert Group

on Occupational Exposure Limits

for Dimethylamine

8 hour TWA	:	2 ppm (3.8 mg/m^3)
STEL (15 mins)	:	5 ppm (9.4 mg/m^3)
Additional classification	:	-

Substance identification:

Dimethylamine			$(CH_3)_2NH$	
Synonyms	:	DMA, N-methylmethanamine		
EINECS N°	:	204-697-4		
EEC N°	:	612-001-00-9	Classification :	F; R13 Xi; R36/37
CAS N°	:	124-40-3		
MWt	:	45.08		

Conversion factor (20°C, 101kPa) : 1.88 mg/m^3 = 1 ppm

Occurrence/use:

DMA is a strongly alkaline gas with a fishy odour. It has a MPt of -93°C, BPt of 7°C and vapour pressure of 170 kPa at 20°C. The odour threshold in air is 0.001-0.05 ppm (0.0014-0.1 mg/m^3). DMA can react with nitrite to form N-nitrosodimethylamine (NDMA), which is hepatotoxic and carcinogenic.

DMA occurs naturally in biological fluids as a result of endogenous metabolic processes. Large

amounts are found in frozen fish due to the action of trimethylamine oxidase on trimethylamine. It is manufactured by reaction of ammonia and alcohol and is used as an accelerator in vulcanising rubber, in leather tanneries as a dehairing agent, in solvents, surfactants, insecticides, fungicides and many other products.

Occupational exposure levels of 0.6 to 17.6 ppm (1.1 to 33.1 mg/m^3) have been measured. Other aliphatic amines were also present in the atmosphere, but only DMA was detected in increased amounts in the urine of workers, indicating that the other aliphatic amines, particularly trimethylamine, may be metabolised to DMA. Commonly used analytical methods detect other lower aliphatic amines.

Health Significance:

The SEG discussed the document on DMA prepared by the Dutch expert committee for occupational standards (SEG/CDO/1). DMA is rapidly absorbed following oral or inhalation exposure but exhibits low systemic toxicity. The critical effect is irritation of the upper respiratory tract, particularly the nasal passages. Eye irritation occurs at higher exposure levels. No data on human health effects were available.

A study conducted by Coon (1970) on continuous exposure of DMA at 5 ppm (9.4 mg/m^3) for 90 days demonstrated interstitial inflammation of the lungs in five species, including rats, monkeys and dogs. It was considered that these changes were not treatment related and consequently, in the absence of similar lung lesions in studies conducted at much higher exposure levels, this study should not be taken into account in recommending the exposure limits.

In rats and mice inhalation of DMA at levels of 10 to 175 ppm (19 to 329 mg/m^3), 6 hours per day, 5 days per week for 2 years, caused concentration-related lesions in the respiratory and olfactory mucosa (CIIT, 1990). In the 10 ppm (19 mg/m^3) exposure group only a few animals

were affected and lesions were confined to focal degeneration of the olfactory epithelium in the dorsal meatus. The specificity of the lesion for the nasal passages is consistent with the high water solubility of DMA, which results in the majority of DMA being absorbed by the nasal surface secretions and therefore not reaching the lower regions of the respiratory tract.

The respiratory and olfactory nasal mucosae of the rat are capable of metabolising DMA to formaldehyde *in vitro*. However, the significance of *in vivo* nasal metabolism to formaldehyde is not known. A 2-year inhalation study (175 ppm, 329 mg/m^3, 6h/day, 5d/week) gave no evidence of carcinogenicity (CIIT, 1990).

The significance of the potential nitrosation of DMA to the carcinogenic NDMA still requires clarification.

Recommendation:

The CIIT study, establishing a lowest observed effect level of 10 ppm (19 mg/m^3) was considered to be an adequate basis for setting exposure limits. An uncertainty factor of 5 was applied to allow for the absence of human data and an NOAEL. The recommended 8 hour TWA for DMA is 2 ppm (3.8 mg/m^3). To prevent short term exposure to irritant levels an STEL (15 mins) of 5 ppm (9.4 mg/m^3) is recommended. A 'skin' notation is not considered necessary as skin absorption would not contribute significantly to endogenous levels of DMA.

At the levels recommended, no measurement difficulties are foreseen.

These recommendations should be supported by additional animal data on dermal exposure and reproduction toxicology. Information on human exposure should be obtained.

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