Social Europe

Recommendation from the Scientific Expert Group on Occupational Exposure Limits for ammonia

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European Commission

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8 hour TWA:	20 ppm (14 mg/m^3)
STEL (15 mins):	50 ppm (36 mg/m^3)
Notation:	-

Substance:

Ammonia

Synonyms :

EINECS N° : 231-635-3

EECN° : 007-001-00-5

Classification : RIO T; R23

CAS N° : 7664-41-7

MWt : 17.03

Conversion factor (20°C, IOIkPa) : 0.71 mg/m^3 = l ppm

1 Occurrence/use

Ammonia is a colourless gas at ambient temperature and pressure with a strong, irritating odour, a MPt of -78°C, a BPt of -33°C and a vapour pressure of 8.7 atm. at 20°C. It is explosive over the range 16 - 27%. The odour threshold is about 5 ppm (3.6 mg/irr).

Ammonia is present in the environment as a result of biological, agricultural and human activity. Together with industrial sources, the total production of ammonia in the EEC is in excess of 10 million tonnes per annum. It is present in a number of industrial activities mainly related to fertilizer production. It is commercially available as the liquified gas or as aqueous solutions.

2 Health Significance

The critical effect of ammonia is irritation of the eyes, skin and upper respiratory tract. Studies in human volunteers have indicated that, in some individuals, subjective symptunis stau to occur at exposures of around 50 ppm (36 mg/m-*) for periods ranging from 10 minš to 6 hours and that acclimatization occurs (MacEwen *et al,* 1970; Industrial Biotest Labs, 1973; Ferguson *et al,* 1977; Verbeck, 1977).

No signs of toxicity were reported in rats, rabbits, guinea-pigs, dogs and monkeys following continuous exposure to 56 ppm (40 mg/nr·') ammonia for 114 days (Coon *et al,* 1970).

There is no evidence for mutagenicity or carcinogenic!ty of ammonia (Litton-Bionetics, 1975; Toth, 1972). Reproductive toxicity of ammonia has not been adequately investigated.

3 Recommendation

The studies cited above, indicating a LOAEL of 50 ppm (36 mg/m^0) for mild irritation in humans, were considered to be the best available basis for setting exposure limits. An uncertainty factor of 2 was applied to allow for individual variability. According to the preferred value approach of the SEG, the recommended 8-hour TWA for ammonia is 20 ppm (14 mg/irr).

A STEL of 50 ppm (36 mg/m) is recommended to limit peaks in exposure which could result in irritation.

At the level recommended, no measurement difficulties are foreseen.

4 Bibliography

Principal reference

Scientific document on professional exposure limit for ammonia. Prepared by S.Basilico and T. Garlanda, Milan.

Key Studies

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Ferguson, W.S., Koch, W.C., Webster, L.B., Gould, J.R. (1977). Human physiological response and adaptation to ammonia. J. Occup. Med. 19. 319-326.

Industrial Biotest Laboratories, Inc. (1973). Irritation threshold evaluation study with ammonia, IBL Inc. (Report to International Institute of Ammonia Refrigeration, Publ. No. 663-03161.

Litton Bionetics Inc. (1975). Mutagenic evaluation of compound FDA 73-42 ammonium sulfate, granular, food grade, Washington DC, LBI (prepared for U.S. Food and Drug Administration) (N'H8 PB-245 506).

MacEwen, J.D., Theodore, J., Vernot, E.H. (1970). Human exposure to EEL concentrations of monoethylhydrazine. In: Proceedings of the 1st Annual Conference on Environmental Toxicology, Ohio, Wright-Patterson Air Force Base, 9-11 September 1970, Aerospace Medical Research Laboratory, pp 355-363 (AMRL-TR-70-102, Paper No 23).

Toth, B. (1972). Hydrazine, methylhydrazine and methylhydrazine sulfate carcinogenesis in Swiss mice. Failure of ammonium hydroxide to interfere in the development of tumors. Ulnt. J. Cancer 9, 109.

Verberck, M.M. (1977). Effects of ammonia in volunteers. Int. Arch. Occup. Environ. Health 39,73-81.