Recommendation of the Scientific Expert Group on Occupational Exposure Limits for n-Butylacrylate

8 hour TWA	:	2 ppm (11 mg/m³)
STEL (15 mins)	:	10 ppm (53 mg/m³)
Additional classification	:	-

Substance:

n-Butylacrylate $CH_2CHCOO(CH_2)_3CH_3$

Synonyms : Acrylic acid-n-butylester
EINECS N° : 205-480-7
EEC N° : 607-062-003 Classification: R10 Xi; R36/37/38-43
CAS N° : 141-32-2
MWt : 128.2

Conversion factor (20°C, 101kPa) : 5.33 mg/m³ = 1 ppm

Occurrence/use:

n-Butylacrylate is a colourless liquid. It has a BPt of 148°C and a vapour pressure of 0.43 kPa at 20°C. It has a vapour density of 4.4 times that of air.

n-Butylacrylate is mainly used in the production of synthetic fibres and for polymer dispersions. The production rate in the EEC is in excess of 1000 tonnes per annum.

Health Significance:

Liquid butylacrylate is mildly irritating to the skin and eyes of rabbits (Carpenter *et al*, 1974). The acute toxicity after oral, dermal or inhalation exposure is low to moderate, with symptoms correlating with local irritating effects (Union Carbide, 1973).

The critical effect of butylacrylate is atrophy of the olfactory epithelium. In a well-conducted study, rats were exposed to 15, 45 and 135 ppm (80, 240 and 720 mg/m³), 6h/d, 5d/w for 2 years (Reininghaus et al, 1991). Dose-related changes were observed in the olfactory epithelium and cornea, with minimal effects in a few animals at the lowest dose, and almost all animals being affected at the high dose. Changes in the eyes were non-significant at the low and medium doses. During a 6-month recovery period, the altered olfactory epithelium was replaced by respiratory epithelium. No treatment-related tumours were reported.

Butylacrylate is not genotoxic to bacteria (Waegemaekers et al, 1983; NTP, 1984) or mammalian cells in vitro (Weigand, 1989).

Teratogenicity studies in rats and mice with oral administration have not shown effects on the fetus except at high levels causing maternal toxicity (Merkle and Klimisch, 1983; Marks and Jones-Prince, 1982).

Butyl acrylate causes skin sensitisation and may show cross-reactions with other acrylates. No reliable human inhalation data are available.

Recommendation:

The study of Reininghaus et al (1991), establishing a LOAEL of 15 ppm (80 mg/m³) for atrophy of the olfactory epithelium in rats, was considered to be the best available basis for proposing occupational exposure limits. An uncertainty factor of 5 was considered appropriate to allow for the absence of a NOAEL and of reliable human data. Taking into account the preferred value approach, the recommended 8-hour TWA is 2 ppm (11 mg/m³). A STEL (15 mins) of 10 ppm (53 mg/m³) was proposed to limit peaks of exposure which could result in irritation. No “skin” notation was considered to be necessary.

At the levels recommended, no measurement difficulties are foreseen.

Key Bibliography:

Henschler, D. (1985). Criteria document of occupational exposure limits: n-Butylacrylate (16.05.1985). VCH Weinheim.

Carpenter, C.P., Weil, C.S and Smyth Jr., H.F. (1974). Range-finding toxicity data: list 8. Toxicol. Appl. Pharmacol. 28, 313-319.

Marks, T.A. and Jones-Prince, C. (1982). Teratological evaluation of n-butylacrylate in CD1 mice. Unpubl. Status Report of Research Triangle Institute, N. Carolina, Contract no. NO1-ES-6-2127.

Merkle, J., and Klimisch, H.-J. (1983). n-Butyl acrylate: prenatal inhalation toxicity in the rat. Fund. Appl. Toxicol. 3, 443-447.

National Toxicology Program (1984). CAS No. 141-32-2.

Reininghaus, W., Koestner, A. and Klimisch, H.-J. (1991). Chronic toxicity, oncogenicity of inhaled methyl acrylate and n- butylacrylate in Sprague-Dawley rats. Food Chem. Toxicol. 29, 329-339.

Waegemaekers, T.H.J.M., Malten, K.E. and Bensink, T. (1983). Non-mutagenicity of a series of acrylate esters in the Ames Salmonella/microsome test. Mutat. Res. 113, 317-318.

Weigand, H.-J., Schiffmann, D. and Henschler, D. (1989). Non-genotoxicity of acrylic acid and n-butylacrylate in a mammalian cell system (SHE cells). Arch. Toxicol. 63, 250-251.

Union Carbide Data Sheet 4/5/73. NIOSH, RTECS, Vol 1, A-C, 1981-1982.