1-Bromopropane
C_3H_7Br
[CAS No.106-94-5]
OEL-C: 0.5 ppm

Summary of OEL-C documentation

The epidemiological study[1] shows adverse effects of exposure to 1-bromopropane on important parameters of neurotoxicity, such as vibration sense in the toe or distal latency in a motor nerve. However, as the parameters lack uniform dose-dependencies[2] and the basis for grouping the workers is insufficient, the committee deems that 6.60 ppm, the median of exposure level in all workers, is the lowest exposure level associated with the adverse effects. (This is translated from a part in the main text.)

Based on the epidemiological study[1], it is considered that 6.60 ppm is the lowest level associated with adverse effects of this exposure to 1-bromopropane on vibration sense and distal latency of a motor nerve in lower limbs. Occupational exposure limit of 0.66 ppm could be estimated by dividing the level of 6.60 ppm by a factor of 10, if no animal studies were used for this estimation

Regarding the animal experiment, the NTP report shows that 1-bromopropane is carcinogenic in two years' inhalation studies in mice and rats, but its genotoxicity was not detected[3]. Thus, the threshold model can be applied for risk assessment on carcinogenicity of 1-bromopropane. The NTP study showed that LOAELs on carcinogenicity are 125 ppm in rats and 62.5 ppm in mice[3]. Another experiment in male mice showed that the LOAEL in the liver and epididymal sperm indices is 50 ppm[4], which is lower than the LOAEL on carcinogenicity in mice. Conversely, the epidemiological studies[1,5] did not show liver toxicity, while the mechanism of liver toxicity of 1-bromopropane explaining the difference between humans and mice has not been well understood. However, the epidemiological study showed elevation of FSH in female workers[1]. Taken together with temporal disruption of the menstrual cycle in female workers intoxicated with 1-bromopropane in the USA[6], the committee is concerned about the reproductive toxicity of 1-bromopropane in humans. Thus the LOAEL of 50 ppm on male reproductive toxicity in mice can be used for estimation of occupational exposure limit. NOAEL of 5 ppm is estimated by dividing the LOAEL of 50 ppm by a 10-fold uncertainty factor. The occupational exposure limit of 0.5 ppm is derived by dividing the NOAEL of 5 ppm by a 10-fold uncertainty factor of species.

Considering overall the above epidemiological study and animal experiment on male reproductive toxicity, the committee proposes 0.5 ppm as the occupational exposure limit of 1-bromopropane.

Year of Proposal: 2012

References

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3) NTP techinical report on toxicology and carcinogenesis studies of 1-bromopropane (CAS NO. 106-94-5) in F344/N rats and B6C3F1 mice (Inhalation Studies). 2009. Report No.: NTP TR 564.
4) Liu F, Ichihara S, Mohideen SS, Sai U, Kitoh J, Ichihara G. Comparative study on susceptibility to 1-bromopropane in three mice strains. Toxicol Sci 2009; 112(1): 100−110.
5) Ichihara G, Li W, Shibata E, Ding X, et al. Neurologic abnormalities in workers of a 1-bromopropane factory. Environ Health Perspect. 2004;112(13): 1319−1325.
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