

DOCUMENTATION OF THE THRESHOLD LIMIT VALUES FOR
SUBSTANCES IN WORKROOM AIR - Third Edition 1971

VINYL CHLORIDE



200 ppm (Approximately 770 mg/m³)

Vinyl chloride is a flammable gas with anesthetic properties at high concentrations. At anesthetic concentrations (8 to 12%) it has serious effects on cardiac muscle resulting in arrhythmias and sensitization in dogs(1,2). There is a wide margin between anesthetic and lethal concentrations (30-40%)(3). Torkelson, Oyen and Rowe(4) reported that repeated seven-hour exposures for six months at 200 ppm resulted in histologic changes in the central lobular region of the livers of rabbits, but not in rats, guinea pigs and dogs. At 100 ppm there was only slight liver enlargement. A subsequent report by Lester, Greenberg and Adams(5) on the effects of repeated exposure of rats to vinyl chloride assaying 99 + percent purity at 2 and 5% concentration stated that, although liver changes were noted, they were not considered to be of pathological significance. In their opinion, a recommended TLV of 500 ppm was satisfactory for worker exposure.

An interim report was made by Mutchler and Kramer(6) of long industrial health experience with vinyl chloride workers. Beginning in 1950, continuous monitoring was begun at five or six stations and the results compared with breath analyses(7) for vinyl chloride for 50 workers. Between 1950 and 1967 the mean air concentration was 160 ppm, with one maximal peak at 600 ppm of vinyl chloride and with great daily variation from 30 to 170 ppm, on the average. During part of this time vinylidene chloride* was an associated air contaminant estimated at around 5 ppm. Twenty-one clinical parameters were measured for comparison with the environmental data, and relationships were obtained by stepwise multiple linear regression analysis. Of medical examinations numbering 404 on 97 workers, 66 were used for comparison with 650 controls. These examinations with final diagnoses made according to the international classification of diseases, failed to reveal any overt condition attributable to vinyl chloride (or vinylidene chloride) exposure. No differences of physiologic significance were found in blood pressure, hemoglobin, electrocardiograms, and no body abnormalities (acro-osteolysis) appeared. No one was clinically ill. Six clinical parameters appeared to be altered, however. Among these, beta lipoprotein, icterus index, and bromosulfalein retention time may have some physiologic significance. The investigators felt, from a review of the interim findings, that a time-weighted average exposure concentration at 300 ppm (combined vinyl chloride and 5 ppm vinylidene chloride) could result in some degree of liver dysfunction. The multiphasic screening tests are continuing on all exposed workers, and analysis of the findings is being made on an individual worker basis. In the meantime, a time-weighted average threshold limit value of 200 ppm vinyl chloride (with a few ppm vinylidene chloride) seems appropriate to prevent adverse systemic effects from long-continued daily exposure.

(* A 90-day animal inhalation exposure to vinylidene chloride at 5 ppm was without observable effect.)

References:

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