

March 7, 1962

VINYL CHLORIDE

Vinyl chloride (monochlorethylene) has been used and handled safely for many years in industry. It is gaseous at ordinary temperatures and has a weak sweetish odor. It has a very slight irritating effect and is narcotic in its action. At one time it was suggested as an anesthetic agent. According to Schaumann<sup>1</sup>, the narcotic limiting concentration for humans is 7 - 10 vol. % (70,000 - 100,000 p.p.m.), and above 12 vol. % (120,000 p.p.m.) it is dangerous. After absorption, vinyl chloride is eliminated very quickly and is not cumulative.

In the published list of Threshold Limit Values for 1961 as adopted by the American Conference of Governmental Industrial Hygienists, 500 parts per million is given as the concentration of vinyl chloride in air considered safe for an eight-hour exposure.

Most of the studies of the toxicity of vinyl chloride have consisted of acute and subacute exposures of small animals. These are not considered adequate as a basis for conclusions as to possible chronic effects, although human cases of chronic poisoning have not been reported. In some twenty-five years of experience in our own chemical industry, we are not aware of any human poisonings due to exposure to vinyl chloride.

A report on "The Toxicity of Vinyl Chloride as Determined by Repeated Exposure of Laboratory Animals" by T. R. Torkelson, F. Oyen, and V. K. Rowe was published in the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION JOURNAL (Vol. 22, No. 5, pp. 354-361, October, 1961). In this study groups of

UCC  
013004

laboratory animals were exposed up to six months to either 500, 300, 100, or 50 p.p.m. of vinyl chloride in air. Detectable changes occurred at all but the lowest concentration. It is of interest that the only effect noted after daily seven-hour exposures to 100 p.p.m. for six months was a slight increase in the average weight of the rat livers. The effects noted in animals at 500 p.p.m. were only slight to moderate; growth, mortality, and general appearance were unaffected. The data presented in this article indicate that there is little likelihood of injury to be expected if repeated daily seven-to-eight-hour exposures are limited to 100 p.p.m. or less.

#### Application as an Aerosol Propellant

In the proposed application and usage as an additive to an aerosol propellant, the suggested mixture is 22% vinyl chloride and 78% of a 50/50 mixture of fluorocarbons 11 and 12. The following calculation was made of an exaggerated condition:

A 16-ounce container of a hair spray would contain 70% of the propellant mixture, or 11.2 ounces. Of this, 22%, or 2.46 ounces, is vinyl chloride. This corresponds to 67,618 milligrams.

The entire contents are sprayed into a room of 15' x 15' x 9', or 2,025 cubic feet, which equals 58,317.5 liters.

UCC  
013005

67,618 milligrams divided by 58,317.5 liters equals 1.1 milligrams of vinyl chloride per liter of air. One milligram of vinyl chloride per liter is equal to 391 parts per million. One and one-tenth times 391 gives 430 parts per million, the concentration of vinyl chloride in such a room.

This concentration is very far below the 70,000 to 100,000 p.p.m. necessary to produce an anesthetic effect. It is below the presently accepted threshold limit of 500 p.p.m. In actual use such a spray would be applied only in bursts and not continually. It would seem that there is a large factor of safety.

Vinyl chloride would not be a skin irritant because the liquid would evaporate rapidly if it were spilled on the skin. Its use in industry has not indicated it to be a causative factor in production of skin sensitizations. Since it is gaseous at normal temperatures, test procedures such as patch tests are not practicable.

To prevent polymerization, 25 parts per million of methyl ether of hydroquinone are added to the vinyl chloride used in the propellant mixture. This is a very small amount, especially when it is considered that only 2.46 ounces of vinyl chloride might be used in a 16-ounce containers. It would be approximately 1.84 milligrams in the 2.46 ounces of vinyl chloride. Our laboratories have found the single oral LD<sub>50</sub> dosage to rats of methyl ether of hydroquinone to be 1.63 grams per kilogram. It is also of interest that in the Landsteiner intradermal test on guinea pigs no sensitization was produced.

Thomas W. Nale, M. D.

#### REFERENCE

- 1 K. B. Lehmann and F. Flury, TOXICOLOGY  
AND HYGIENE OF INDUSTRIAL SOLVENTS.  
The Williams and Wilkins Company, Baltimore.  
1943, page 171.