

VCM SAFETY

INTRODUCTION

Virtually all (>99%) vinyl chloride is used in production of polyvinyl chloride and other polymers. 1972 U.S. capacity is 5.9 MMM lbs., world capacity is 22 MMM lbs. It is difficult to estimate the number of workers employed in converting, molding, and fabricating these polymers, but it is of the order of tens of thousands, working in thousands of plants.

Over 95% of the U.S. vinyl chloride capacity and 85% of the PVC capacity are represented in the MCA Technical Task Group on Vinyl Chloride Research.

PUBLISHED INFORMATION ON VCM

Vinyl chloride monomer was for many years considered to be very low in toxicity, both from single and repeated exposure. Because of its volatility, inhalation was considered the only important route of exposure for workmen. The high flammability of VCM has been considered to be a more serious hazard than inhalation.

Until 1962, the recommended time-weighted average long-term 7-8 hour daily exposure of workmen was not to exceed 500 ppm v/v. In 1963 the recommendation was modified so that 500 ppm was to be a maximum concentration (or ceiling) rather than a time-weighted average.

In 1963-1964 reports appeared in the European literature describing pain and tenderness in the fingers of polyvinyl chloride workers. X-ray examination showed that the bones of the hand were dissolving. This condition, known as acroosteolysis, was also investigated by American vinyl and polyvinyl chloride companies and similar disease was found in workers who cleaned polymerization vessels.

In May 1970, Dr. Viola, an Italian physician, reported in the Tenth International Cancer Congress that he had attempted to create a bone condition in rats similar to human acroosteolysis. Dr. Viola observed tumors in the ear canals of rats exposed to 30,000 ppm (3%) vinyl chloride vapor 4 hours per day for 12 months. Viola also reported tumors in the lungs and bones of these rats but these later tumors are of questionable significance and more due to secondary effects.

Dr. Viola was extremely vague and evasive in giving details to MCA in 1971. He did report that his vinyl chloride was quite impure and claimed to have seen tumors in rats exposed to 5000 ppm. He thought 2500 ppm would be without such an effect. He produced no data and refused to give details. He claimed he would not be concerned about workers exposed to less than 500 ppm. We are not aware of any further publications by Dr. Viola on this subject.

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TOXICITY STUDIES IN PROGRESS

1. MCA-Sponsored Inhalation Studies

The Manufacturing Chemists Association has contracted with Industrial Bio-Test Laboratories, Inc., Northbrook, Illinois, to conduct two-year studies on rats, mice and hamsters. Groups of 100 male and 100 female of each species will be exposed to either 0 (control), 2500 ppm, 200 ppm, or 50 ppm of vinyl chloride monomer, 7 hours per day, 5 days per week for 12 months. They will then be observed for an additional 12 months (6 months for mice). These animals will not have food and water during exposure.

This "lifetime" study is designed primarily as a cancer study and will include only a limited amount of other observations. Because Viola's studies involved simultaneous exposure of food, water, and bedding, a separate group of 100 rats of one sex will receive exposures to 2500 ppm along with their food, water, and bedding. This group is included to determine the possibility that a reaction of the vinyl chloride monomer with either the food, water, or bedding results in a toxic reaction product. Exposure of these animals started in August 1973, restarted September 1973.

2. MCA-Sponsored Epidemiological Studies

The Manufacturing Chemists Association has contracted with Tabershaw-Cooper Associates, Berkeley, California, to conduct a study of the cause of death in vinyl chloride and polyvinyl chloride workers. The objectives are:

- (a) to compare the mortality of individuals who have worked in vinyl chloride plants with that of the general population, corrected for area, age, and sex;
- (b) to compare mortality patterns within the population of vinyl chloride workers, based upon estimated occupational exposure; and
- (c) to compare mortality among vinyl chloride workers with the mortality of other occupational groups which TCA, Inc., has studied.

This study is expected to require at least 8 months for completion and reporting.

3. European Work

Epidemiology -- An exhaustive examination of ICI employees revealed no indication of hazard from worker exposure to vinyl chloride, and so far there is no reason to suspect any threat to human health.

Exposure Study -- Range is 50 to 10,000 ppm and repeating Viola's 30,000 ppm level. Tumors observed at 250 ppm at lowest level, and no tumors have been seen in either the blank or vinyl acetate control groups.

4. Government Status

VCM is among those chemicals due for fairly early consideration in the program of criteria documents development, perhaps mid-way in the current fiscal year. NIOSH has been told that aerosol VCM is no longer available and the uses (paint and lacquer spray) will be discontinued by the end of 1973.

RECOMMENDATIONS FOR ACTION

1. VCM producers and consumers will undertake plant atmospheric monitoring programs.
2. The industry members have agreed to exchange analytical test methods to expedite the above program.
3. The industry members of the MCA group have agreed to implement the 1972 ACGIH adopted TLV value of 200 ppm for VCM in producing and consuming plants and to work towards lower levels such as 50 ppm.
4. The results of the animal and epidemiological test programs now in progress will be followed closely by the MCA Technical Task Group on Vinyl Chloride Research and the results referred to a qualified group such as the National Academy of Sciences for review.
5. The MCA group welcomes the participation of NIOSH in the evaluation of the test data and the formulation of additional programs which may be indicated.