

ESTABLISHMENT OF PAST EXPOSURE CONCENTRATION IN VCM/PVC PLANTS

Many, including Dr. David Rall of NIEHS, have noted that rodents appear more susceptible to vinyl chloride induced angiosarcoma than humans. If this were not true the exposures of workmen to vinyl chloride in previous years would have resulted in hundreds of angiosarcomas in the U.S. rather than the 20-24 cases reported since 1961. This is extremely important to the vinyl industry since future animals studies will no doubt result in cancer at lower and lower levels of exposure, putting pressure on governmental agencies for more restrictive and expensive regulations.

It would be most useful if we could at least semi-quantitatively ascribe numbers to previous exposures. These estimates need not be precise, orders of magnitude will be adequate. They must be realistic and not under-estimates. Therefore, it is requested that each company thoroughly investigate all the methods which it can to realistically evaluate previous exposures of their employees included in the Equitable Environmental Health (Tabershaw-Cooper or MCA) study.

It must be remembered that prior to 1962 there was no accepted industrial hygiene guide for vinyl chloride. In 1962, the TLV committee of the American Conference of Governmental Industrial Hygienists suggested a time weighted average (TWA) of 500 ppm and in 1963 a ceiling of 500 ppm. Thus until 1963, there was no guide on peak exposures and an employee could have experienced less than 500 ppm as a TWA but have had peak exposures of several thousand parts per million for several minutes. Obviously controlling to 500 ppm as a ceiling could mean time-weighted-averages exposures well over 200 ppm.

The following are suggested as possible ways of documenting past vinyl chloride exposures. Each has serious limitations but please remember we only need to establish whether exposures were nearer 10, 100, 1000, 10000 or even 100,000 ppm in order to show a difference between people and rodents.

1. Odor - Odor is a highly variable response but certainly an odor suggests exposures of several hundred ppm based on Union Carbide data.
2. Explosimeter - The lower explosive limit (LEL) for vinyl chloride is about 3.5% (35000 ppm). Common practice was to control to 1/10 the LEL or 3500 ppm. Some plants had a practice of allowing entry into kettles when ventilation had reduced the concentrations to 1/10 the LEL; hence kettle cleaners and others may have had peak exposures of 3500 ppm (Note that this concentration for 1 hour per day would not have exceeded the old TWA of 500 ppm for 8 hours.) Furthermore 3500 ppm might not have been noticeably anesthetic since Mastromateo et al showed 10,000 ppm (1%) was necessary before even minor anesthetic effects were observed in human subjects.

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3. Hot work permits - What practice was used for permitting welding and cutting in your plants? Were these documented? Are work practice manuals available? Were explosimeter readings made?
4. First Aid and Medical Calls - Are there any records of men being overcome or inebriated by vinyl chloride? Exposure much greater than 10,000 ppm would be necessary to produce these effects. Unconsciousness would indicate several hundred thousand ppm (20-30%).
5. Deliberate sniffing - This is hard to document but no doubt resulted in exposures to greater than 10,000 ppm.
6. Plant or Operation Logs - Some plants maintained diaries with narrative records describing leaks, spills, accidents, etc. Have these been kept? Interviews with old or retired employees may be of extreme value.
7. Operating manuals and procedures - Past plant practices may give clues to exposures concentrations. The following may give clues to past exposures: Tank entry procedures; frequency of cleaning kettles, filters, valves and other equipment, use of respirators, blowing or pumping of materials and frequency of spills.
8. Industrial Hygiene Measurements - Even limited measurements will be of value in documenting past exposures. Not only should company records be searched but federal, state or local industrial hygiene reports may be available.

It is recommended that a very small committee of industrial hygienists be formed to study this problem. They may wish to employ an outside consultant to coordinate company activities and to visit plants. This group could then assign estimated exposure concentrations to various operations such as changing filters, cleaning valves, etc depending upon whether the plant had indoor or outdoor construction, open sewers and other contributing factors. General ventilation design may be useful information. Based on estimates of the time spent by the employee in each operation a time weighted daily exposure could be calculated for job classification in each plant. This will require considerable time, expense and ingenuity, as well as commitment by each company, but it is essential in relating illness to degree of exposure.

Management must understand the importance of this problem. Unless we accurately describe the degree of exposure men had in years past, there will be no defense against more restrictive governmental controls imposed as the result of animal studies. The cost of these unnecessary controls will increase the cost of PVC. This cost must be weighted against legal and other considerations.

T. R. Torkelson
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