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Vinyl Acetate: A Study of Chronic Human Exposure

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Atmospheric studies of vinyl acetate in three production units of a Gulf Coast chemical plant indicated chemical operators' average long-term exposures ranged from 5 to 10 ppm with intermittent exposures near 50 ppm and potential acute exposures to 300 ppm. Subjective response studies indicated odor to be detectable by some persons at levels as low as 0.4 ppm with no significant eye or upper respiratory irritation below 10 ppm. Levels of 21.6 ppm produced eye and throat irritation. Clinical studies and medical records revealed no evidence to suggest chronic effects at the determined long-term levels or serious residual injury from acute exposure if treated promptly.

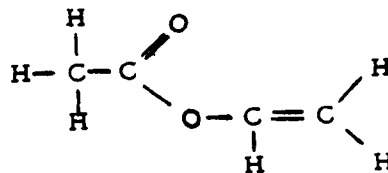
Introduction

FOR MANY YEARS vinyl acetate has been generally regarded as a chemical of low toxicity and minimal physiological hazard.¹ Twenty-two years of experience in a plant which produces and polymerizes this material suggests that this opinion is correct. Aside from its acknowledged capacity to irritate and even burn the skin and eyes, we have seen nothing else which suggests other toxic properties. Its reactivity hazards have been well documented.² No reports of long-term chronic effects in man are known to exist. Reported animal studies conclude that the systemic toxicity for laboratory animals of vinyl acetate is not remarkable; dogs exposed six hours daily for several weeks at concentrations beginning at an average of 91 ppm and ending after about 11 weeks at 186 ppm, showed no circulatory abnormalities or evidence of altered metabolism.³ Toxicity range-finding studies⁴ rated: (1) acute ingestion as a moderate hazard (LD_{50} - 2.92 gm/Kg in rats); (2) harmful skin absorption as unlikely to occur (LD_{50} > 5 ml/Kg in rabbits); (3) inhalation as a moderate hazard (1000 ppm not fatal to rats in four hours; 4000 ppm fatal to three of six rats in two hours; 8000 ppm fatal to all in two hours); and (4) skin irritation as unreactive on rabbit belly. However industrial experience has shown that

continued contact may result in severe irritation or blister formation on the skin of some persons. This study has been directed toward establishing the average environmental exposure levels of chemical operators, detecting any chronic affects in these operators which might be attributable to their exposure on a long-term basis, and determining subjective human response to short-term exposures. Studies were conducted by the Medical Division of a Gulf Coast chemical plant.

The Chemical

Vinyl acetate is a monocarboxylic, unsaturated aliphatic ester which will react violently with itself.



The reaction is polymerization which can be inhibited by hydroquinone or diphenylamine. It is a clear and colorless flammable liquid which boils at 72.7°C. Its vapor has a not unpleasant, sweetish smell. Russian investigators reported the odor threshold as 1 mg/m³ (approximately 0.3 ppm).⁵ The vapor pressure at 25.3°C is 115 mm of mercury. It is