

ESHA

Petition for an Emergency Standard

for the

Process of Vinyl Chloride Polymerization

by the

Industrial Union Department, AFL-CIO
at a hearing of the Occupational Safety
and Health Administration in Washington, D.C.
February 15, 1974

Peter Bommarito, President
United Rubber Workers and Chairman,
IUD Committee on the Health and Safety
of Workers, introduced by Sheldon W. Samuels,
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August 27, 1973

Argument for an Emergency Temporary Standard

Section 8(c)(1) of the Occupational Safety and Health Act of 1970 instructs the Secretary to provide an emergency temporary standard if he determines (1) that employees are exposed to grave danger from toxic substances or agents, and (2) that an emergency standard is necessary to protect employees from such danger.

The Director of the National Institute for Occupational Safety and Health has declared (in Cleveland, February 12, 1974) that, based on information related to him by the B. F. Goodrich Company and his own investigation, the cause of at least four deaths due to angiosarcoma of the liver among former employees of the company's plant must be presumed to have an occupational cause. At an earlier meeting, on February 1, 1974, he stated that "on the basis of medical, epidemiologic and toxicologic findings thus far, it would appear that a new occupational cancer has been discovered associated with the polymerization of vinyl chloride in the manufacture of polyvinyl chloride. Vinyl chloride is the chief suspect. . . ."

Approximately ten corporations and at least 6,500 production workers, organized by affiliates of the Industrial Union Department, are directly exposed in vinyl chloride synthesis and its polymerization.

A task force of NIOSH, industry and labor specialists convened on February 12 by the Director of NIOSH agreed that the process of vinyl chloride polymerization, including the production of vinyl chloride itself, must be presumed to be carcinogenic and that action should be taken for the sake of prudence in the public interest.

Actually, as the medical literature attached will indicate, vinyl chloride has been regarded by responsible investigators as highly toxic

and probably carcinogenic in man for some time. Industrial practice at the B. F. Goodrich plant in Louisville and elsewhere has aimed at achieving one-tenth of the allowable limit published in the interim, but current, standard established by the Occupational Safety and Health Administration. Even that level does not meet criteria established by the Secretary of Health, Education and Welfare for exposure to a carcinogen.

Therefore, it is clearly the responsibility of the Secretary to determine that employees are exposed to grave danger in the polymerization process by which polyvinyl chloride resin is produced.

Based on information supplied by the B. F. Goodrich Company, an investigation of their plant in Louisville, Kentucky, and other information interim work practices have been transmitted to the company and to the Manufacturing Chemists Association. There is no indication that these recommendations are being implemented, no determination that they have even been distributed to all plants and there is no means by which employees can participate or initiate compliance with these recommendations. Therefore, an enforceable regulation is necessary to ensure that employees are protected from such danger as vinyl chloride and its polymerization may pose.

Thus, the issuance of an emergency temporary standard by the Secretary is imperative.

Urgent action by the Secretary is necessary. As investigation proceeds in other countries and in other plants than that in Louisville, we are discovering disease of the liver that are likely precursors to latent and developing cancers. Additional deaths from liver cancer are being uncovered that must be attributed to exposure during the production of vinyl chloride and polyvinyl chloride resin.

The probability exists that reduction in exposure among diseased workers will reduce the risk of liver cancer and that the identification of these workers may save their lives.

II. Recommended Action

The standards advisory committee on carcinogens appointed to the Secretary, reported on August 27, 1973, proposed a scheme that still represents, in our opinion, the best thinking applicable to the control of any carcinogen. We recommend that the Secretary accept that report (attached) with the following changes appropriate to this situation:

(a) Purpose. The purpose of this standard is to prevent any worker contact or exposure to vinyl chloride during its production and polymerization as detected by the most sensitive, feasible sampling and analytical methods available. (The monitoring of vinyl chloride is seen as an index of total contamination.)

(b) Scope and application. This section applies to any workplace in which a carcinogen is manufactured, processed, used, repackaged, released, handled or stored.

(c) Terminology. Eliminate (1), retain the balance of this subsection.

(d) Requirements for areas containing carcinogens Eliminate (1), "or decontaminated" in (d)(2)(ii), "close to the point of exit" in (d)(2)(vi). Because of the volatility of vinyl chloride, we do not believe that the installation of special shower facilities is necessary. Changes to reflect this would be appropriate. The medical requirements of the advisory committee need to be amended. Our recommendations are those of Dr. Anderson, clinical consultant to the Industrial Union Department, who will make his

We believe that all of the appropriate, specific interim recommendations transmitted by NIOSH to MCA be added to the recommendations of the advisory committee.

Furthermore, in view of information supplied us by industry representatives on February 12: that 500 - 3,000 parts per million of vinyl chloride is entrapped in the polyvinyl chloride resin prior to packaging and shipment, it is essential that the concentration of vinyl chloride in the resin be reduced to less than 0.01% as quickly as possible.

III. Discussion of Medical Documentation

Hemangioendotheliomas of the liver are very rare tumors. Fischer described the disease in 1913. Up to 1971 there were 39 cases in the world literature; Adam et al, (1972) added five cases.

Many different terms have been used to indicate this tumor, such as hemangioblastoma, Kupffer-cell sarcoma or angioreticulo-endothelial sarcoma.

Hemangioendothelioma of the liver is a rapidly progressing fatal disease. The gross appearance of the liver is characterized by multiple hemorrhagic nodules of various sizes. Spongy cavernous areas with numerous cysts may be found; thrombi with areas of infarction are also reported.

Microscopically there is a diffuse proliferation of inter-anastomosing blood vessels lined by prominent endothelial-like cells. The vascular component of the lesions is always prominent.

The course is invariably fatal and characterized by a rapid progressive downhill evolution leading to death generally within six months.

Vinyl chloride, the monomer of polyvinyl chloride, is a gas with known anesthetic effect in high concentrations. At the same high levels it is known to sensitize the heart towards the effect of catecholamines, with possibly resulting fatal arrhythmias. There are at least two fatalities in acutely exposed workers reported in the literature. Dizziness, headache, disorientation are symptoms which may be the alarm sign for acute overexposure.

The chronic effects of vinyl chloride have been studied by Torkelson, Oyex, and Rowe on laboratory animals (rats, rabbits, guinea pigs and dogs). The results, published in 1961, emphasized the toxicity for the liver and kidney at concentrations of 500, 200 and 100 ppm. The conclusion of that study stated "repeated exposure to vinyl chloride at concentrations considerably below the level that has been considered safe for human exposure (500 ppm) has been shown to have an effect on the liver and kidney of laboratory animals." It was recommended that daily exposures should be limited to 100 ppm, although this level would not offer any margin of safety. Industry sources claim that they have been successful in achieving levels of 50 ppm for many years in accordance with the preferred industrial hygiene practice of providing a margin of safety. ~~The~~ threshold limit value suggested by ACGIH was maintained at 500 ppm ~~and~~ recently when it was reduced to 200 ppm. 500 ppm is the current OSHA standard.

In a study conducted in 32 plants engaged in production and compounding of polyvinyl chloride by Warren A. Cook et al., and published in 1971, it is stated that during the cleaning operations of reactors where polymerization had taken place, workers had been exposed to concentrations in the range of 600 to 1,000 ppm. The study covered 5,011 employees in various phases of vinyl chloride and polyvinyl chloride manufacturing in 32 plants throughout the United States and Canada. It was done on the request of Manufacturing Chemists Association with the main concern to define the character, extent and possible causes of a new disease discovered in workers of this industry, the occupational acroosteolysis. The first cases had been reported in 1963, and soon reports were published from many countries, including the United States, where 31 such patients had been found by R. H. Wilson, et al., in 1967, from the Medical Division, B. F. Goodrich Company.

The main characteristics were Raynaud's phenomenon in the fingers of the hands, due to marked constriction of the local blood vessels, followed by progressive bone lesions in the distal phalanges and skin changes of the hands, forearms and sometimes even of the face, similar to those seen in scleroderma. Changes of the bones were also repeatedly described in the distal parts of the radius, as well as at the sacroiliac joint and the knee. Although there have been many attempts to find an explanation for this unique disease, no valid answer has been found until now.

In some of the reports on patients with acroosteolysis there were changes (clinical and/or laboratory) of the liver such as enlarged liver, raised serum bilirubin, increased icterus index, abnormal bromsulphalein test (Kramer and J. E. Mutchler, 1971).

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In the mentioned epidemiologic study on 5,011 exposed workers in 32 plants, there was no attempt to investigate a possible hepatotoxic effect of vinyl chloride, although experimental research on animals and reports on toxic effects on the liver in humans had been published. No other organs or systems were investigated except the hands. Therefore there is at present only a very scanty available information on the toxic effects of vinyl chloride and/or polyvinyl chloride on the liver. There are reports in the literature on the effects of polyvinyl chloride on the lungs. One case of pneumoconiosis in a 30-year-old worker who had inhaled polyvinyl chloride dust was reported; the lung biopsy showed granulomatous lesions (foreign body type) to be present. Similar fibrotic changes, and pulmonary function disturbances were reported in 96 workers exposed to polyvinyl chloride dust; the changes were more pronounced in persons with long exposure (Vertkin et al, 1970).

Polyvinyl chloride when implanted in animals, produces a fibrous reaction which often progresses to local development of cancer. Vinyl chloride was shown by Viola (1970) to be highly carcinogenic in rats.

Some preliminary evidence indicates that lesions of the liver in vinyl chloride exposed laboratory animals is histologically similar to these lesions in vinyl chloride exposed humans.