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7 Materials Vinyl Chloride (VCM)

Industrial Health Foundation, Inc.
5231 Centre Avenue
Pittsburgh, Pennsylvania 15232

INDUSTRIAL HYGIENE DIGEST

NEWS ITEMS

484/80x Dr. Maltoni Reports Tumors in Rats at Still Lower Levels of Vinyl Chloride.
Occup. Health & Safety Letter 10: 3-4, March 22, 1980.

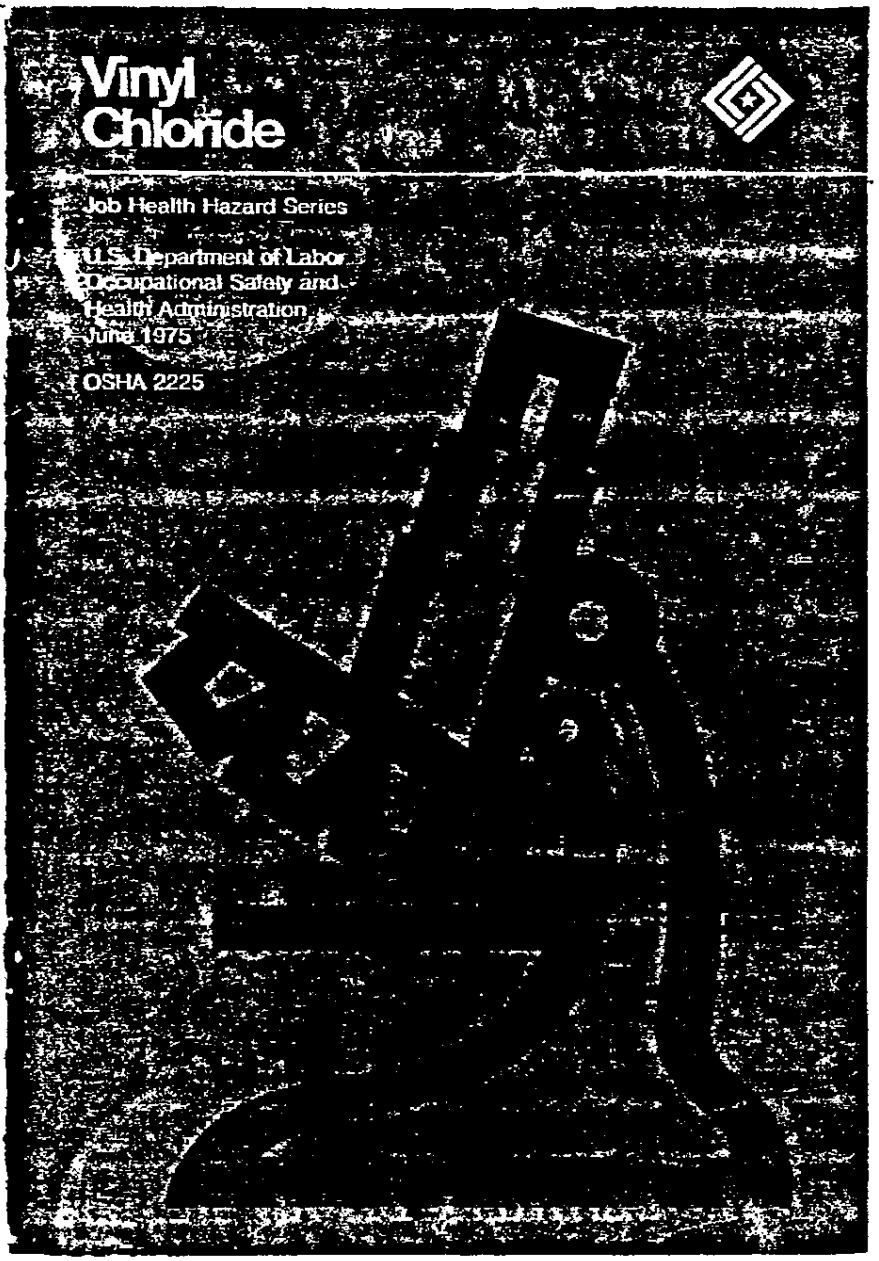
Dr. Cesare Maltoni of Italy, whose earlier studies on vinyl chloride exposure figured prominently in the OSHA standard, now reports that tumors have been found in laboratory rats exposed to as low as 25 ppm of vinyl chloride and possibly 10 ppm. At a meeting called by OSHA, NIOSH and NIEHS to hear and evaluate new data on vinyl chloride for standard-setting purposes, Dr. Maltoni made the following points: (1) In experimental animals, principally Sprague-Dawley rats but including other species as well, tumors have been found at progressively lower levels of vinyl chloride exposure--in a few cases almost down to 1 ppm. All of the animals were permitted to live a lifespan, none being sacrificed. Newborn rats were especially sensitive. (2) Tumors were found not only in the liver but also in the brain, lung, kidneys and other organs. Dr. Maltoni said this result showed that workers exposed to vinyl chloride should be monitored not only for liver damage, including angiosarcoma, but for other organs as well. In addition to the tumors, cancer precursor dysplasias were found in the livers of many animals. (3) Significant levels of tumors were found in the rats at 50 ppm at various durations of exposure in what Dr. Maltoni believed was a significant dose-response relationship. Many in the audience took issue with Dr. Maltoni's findings. For example, Dr. W. Clark Cooper of Berkeley noted that workers exposed to vinyl chloride have been monitored for multiple sites for a number of years. In his own presentation, Dr. Cooper extended the earlier studies of Drs. Tabershaw and Gaffey which indicated some excess of cancer deaths in workers exposed to vinyl chloride but came to no conclusion on a causal relationship. In his analysis, in which 3,000 additional workers were evaluated in follow-ups, the total number of deaths increased from 343 to 707, with some increase in cancers of the digestive tract, central nervous system and some in the respiratory tract. But Dr. Cooper said that, if anything, his analysis was even more inconclusive on causal relationships with vinyl chloride. --Condensed from text

485/80x Vinyl Chloride Detector Sensitive to Below ppb.
Chem. & Eng. News 58: 43, April 7, 1980.

The ability to detect traces of vinyl chloride has been extended a thousandfold to measure levels below parts per billion, report scientists at the University of Colorado and National Oceanic & Atmospheric Administration Aeronomy Laboratory in Boulder. The development depends on a conventional nickel-63 electron capture detector in which the nitrogen carrier gas is doped with nitrous oxide (N_2O). The "dramatic improvement" in sensitivity is due to a reaction in the detector of vinyl chloride with O^-, which forms when nitrous oxide reacts with electrons at 350° C. Because of the high sensitivity, air samples could be collected in cigarette-pack-sized devices worn by workers. If applied, the method could eliminate "all of the complex handling, storage, and desorption procedures" now being used to measure vinyl chloride in industrial settings. --Text reprinted

486/80x Polychlorinated Biphenyls (PCBs): Final Amendment to the Disposal Requirements for PCB Capacitors in Chemical Waste Landfills. Environmental Protection Agency.
Fed. Reg. 45: 20473-20475, March 28, 1980.

Action: Final rule. On November 21, 1979 EPA requested comment on a proposed amendment modifying the disposal provisions of the PCB regulation (43 FR 7150, February 17, 1978; superseded by 44 FR 31514, May 31, 1979). The November amendment proposed to extend the deadline for allowing disposal of large PCB capacitors in chemical waste landfills from January 1, 1980 to thirty days after EPA announced that an Annex I incinerator was approved and operational for disposal of PCB capacitors. That amendment is being promulgated by this notice with certain modifications. First, EPA is treating small PCB capacitors owned by manufacturers of PCB capacitors or equipment the same as large PCB capacitors for purposes of disposal. Second, EPA will permit disposal of capacitors in chemical waste landfills until March 1, 1981. Third, the Assistant Administrator for Pesticides and Toxic Substances may authorize the reopening of chemical waste landfills after March 1, 1981, for disposal of PCB capacitors under specified conditions. Fourth, EPA will require all PCB capacitors to be containerized and packed with absorbent material prior to their disposal in a chemical waste landfill. Effective March 28, 1980. --Summary


Vinyl Chloride
Job Health Hazard Series
U.S. Department of Labor
Occupational Safety and Health Administration
June 1975
OSHA 2225

About This Pamphlet

The purpose of this pamphlet is to give employees, as well as the general public, an overview of the dangers involved in working with vinyl chloride (VC) and to explain the OSHA standards that apply to its use in the workplace.

Vinyl chloride is the basic ingredient in making polyvinyl chloride (PVC), which is used in about 55 percent of today's plastic products. As such, it is an important element in today's technology and economy. It is possible to work with these substances in a manner that will not cause illness. But doing so requires an understanding of the hazards involved and of the measures necessary to eliminate or reduce these hazards.

The following pamphlet contains general information only. It should not be considered a substitute for any of the provisions of the Occupational Safety and Health Act or for any regulations issued by the U. S. Department of Labor's Occupational Safety and Health Administration.

Vinyl Chloride

Job Health Hazard Series

U.S. Department of Labor
Occupational Safety and
Health Administration
June 1975

OSHA 2225

Endangered Workers

Most job health hazards—such as lead, mercury, and silica—have been recognized for decades or centuries. But vinyl chloride, a gas used in the production of more than half of today's plastic products, has only recently been shown to be highly dangerous.

Until January 1974, the gas was generally considered of low toxicity. Then it was found to cause a rare form of cancer of the liver—angiosarcoma—which cannot be diagnosed until it is incurable.

Vinyl chloride (VC), which has always been handled with relative care, since it is both explosive and highly flammable, is the basic ingredient in making polyvinyl chloride (PVC).

PVC is all around us. The chances are you ride to work on a vinyl seat, walk across vinyl-tiled floors on PVC-soled shoes, eat sandwiches wrapped in PVC from a vinyl tablecloth, relax to the sound of PVC records. Infants suck on PVC pacifiers.

Although studies are continuing in both government and private laboratories, no one has yet discovered any danger in these finished products. By the time the plastics reach this stage, most of the vinyl chloride has been chemically locked into the PVC and will not come out again.

The danger comes during the production process. Three basic steps are necessary to the production of vinyl products. First the vinyl chloride, or "monomer," is produced in a closed process, usually involving a reaction between ethylene and chlorine.

The VC monomer is shipped as a compressed, liquefied gas to plants that produce the PVC resin. Batches of VC are "polymerized" by mixing them with catalysts in giant vats or reactors.

After drying, the PVC resins are compounded by the addition of stablizers, lubricants, and plasticizers. Before being shipped to fabrication plants, the resin may be converted to pellets, powders, pastes, or film.

The fabrication end of the PVC industry covers a huge range of processes in which the PVC is turned into its myriad of finished products.

In the United States there are 15 monomer plants employing about 1,000 workers, 36 PVC plants with 5,600 workers, and some 7,500 fabrication plants with about 350,000 employees. At each stage there are certain potential trouble spots where the VC gas may escape into the air and reach the workers.

Both monomer and polymerization plants face the problems of random leaks from pump seals, compressors, valves, gaskets, and storage tanks. Both must also deal with reducing the amount of the gas that escapes during quality control sampling. During loading or unloading of the monomer, tank car workers may be exposed to high concentrations in the air.

Because of the danger from fire and explosion, the plants are usually spread over sites of several acres, with the result that the VC gas is not confined to small areas, but often can be found in low levels throughout the plant.

Most plants that produce the basic monomer are open-air operations and generally have lower concentrations of gas in the air than polymerization plants.

The highest exposures in the entire industry apparently are those experienced by the workers who climb into the polymerization vats or reactors to chip out the PVC residue. In the past, these cleaners were surrounded by concentrations as high as 1,600 parts of VC per million parts of air; exposure levels for reactor cleaners still may reach 500 parts per million (ppm). Fourteen of the 16 men who have died from VC-related angiosarcoma in the United States had, at one time or another, been vat cleaners.

By the time the PVC reaches the fabricating plant, the danger is the small amount of VC gas that was not chemically locked into the PVC. These may leak out of the PVC in processing or handling. The fabrication procedures that hold the most potential for exposure involve mixing and heating the resin, as in extruding PVC around an electrical wire. The heat may drive off any remaining gas into the workplace air.

What It Can Do to You

In addition to the danger of angiosarcoma of the liver, recent studies of workers exposed to VC show that they have higher than normal rates of cancer of the lung, brain, and bone marrow. Suicide rates were found to be twice normal in one study of 161 workers in a Kentucky plant.

Vinyl chloride's attacks are slow; the cancers, for example, may not show any symptoms until 15 years after the beginning of a worker's exposure.

Prevention of Vinyl Chloride Poisoning

The basic protection from VC must come from engineering controls: avoiding leakage of the gas into the air. Under the Occupational Safety and Health Act, this is the responsibility of employers, many of whom have expressed doubts about being able to meet the stringent OSHA standard of one part per million of VC in the air, averaged over an 8-hour day, with a maximum peak of five ppm.

If these limits are not met, employers must reduce exposures to the "lowest practicable level," and personal respirators must be made available to the employees who are exposed. In certain situations, employees have a choice as to whether or not to wear respirators. Until April 1, 1976, a worker can decline to wear a respirator when the VC concentrations are above one ppm but not above 25 ppm.

Federal Standards for Vinyl Chloride Exposure

The OSHA standard for vinyl chloride exposure, although promulgated in October 1974, to take effect January 1, 1975, was held in abeyance pending action on a suit brought by the plastics manufacturers. Under a decision by a special three-judge panel of the United States Second Circuit Court, the standard went into effect April 1, 1975. The plastics manufacturers have indicated that they intend to appeal this decision to the U. S. Supreme Court.

The standard applies to the "manufacture, reaction, packaging, storage, handling or use of VC and PVC" but not to the handling or use of finished PVC products. PVC is considered a "finished product" when it has passed through all production steps that involve mass melting. The standard, for example, would cover such operations as molding, extrusion, banbury mixing, and calendering. It would not cover thermoforming or blister packaging.

Although the standard sets an air concentration limit of one ppm

of vinyl chloride on an average over an 8-hour workday, and a five ppm allowable peak exposure, it sets no deadlines for manufacturers to reach such levels. The technology involved is too uncertain.

But the employers must draw up plans for reaching the standard levels, and make those plans available to OSHA.

Because of the wide variety of types of plants involved in polyvinyl chloride production, the concept of an "action level" has been made part of the standard.

If a fabricating plant tests its air and finds that VC levels are less than 0.5 ppm ("action level"), the plant is effectively exempted from much of the rest of the standard. If less than 0.5 ppm is in the air, the employer is exempted from further monitoring unless changes are made in the processing, or there is other reason to believe the levels may have risen.

When the monitoring reveals VC levels above one ppm, the employer must set up a regulated area within the plant—that area in which the dangerous amounts are found—and restrict it to "authorized personnel." A daily roster of such persons within the area must be maintained.

Employees must be informed of the cancer risk associated with VC, instructed in the proper use of respirators, and made aware of work practices that could release dangerous quantities of the gas.

All employees exposed to levels higher than 0.5 ppm, whether they wear respirators or not, must be given free medical examinations, including blood tests, once a year. Workers with more than 10 years exposure must be examined every 6 months.

Records of exposure must be kept for at least 30 years, and the results made available to employees or their authorized representatives. Medical records must be held 30 years, or 20 years after employment, whichever is longer. Copies of medical records must be furnished to a physician on request of the employee.

Warning signs in regulated areas and labels on VC and unfinished PVC containers must include the words "cancer-suspect agent."

U.S. DEPARTMENT OF LABOR

Regional Offices for Occupational Safety and Health

REGION I (CT, ME, MA, NH, RI, VT)
18 Oliver Street
Boston, MA 02110
Telephone: (617) 223-6712

REGION II (NY, NJ, PR, VI, CZ)
Room 3445, 1 Astor Plaza
1515 Broadway
New York, NY 10036
Telephone: (212) 971-5941

REGION III (DE, DC, MD, PA, VA, WV)
15220 Gateway Center
3535 Market Street
Philadephia, PA 19104
Telephone: (215) 597-1201

REGION IV (AL, FL, GA, KY, MS, NC, SC, TN)
1375 Peachtree Street, N.E.
Suite 587
Atlanta, GA 30309
Telephone: (404) 526-3573

REGION V (IL, IN, MN, MI, OH, WI)
230 South Dearborn
32nd Floor
Chicago, IL 60604
Telephone: (312) 353-4716

REGION VI (AR, LA, NM, OK, TX)
555 Griffin Square
Room 602
Dallas, TX 75202
Telephone: (214) 749-2477

REGION VII (IA, KS, MO, NE)
911 Walnut Street, Room 3000
Kansas City, MO 64106
Telephone: (816) 374-5861

REGION VIII (CO, MT, ND, SD, UT, WY)
Room 15010, Federal Bldg.
1961 Stout Street
Denver, CO 80202
Telephone: (303) 837-3883

REGION IX (CA, AZ, NV, HI)
Box 36017
450 Golden Gate Avenue
San Francisco, CA 94102
Telephone: (415) 556-0586

REGION X (AK, ID, OR, WA)
Federal Office Bldg., Room 6046
909 First Avenue
Seattle, WA 98174
Telephone: (206) 442-5930