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EVALUATION OF THE ENVIRONMENTAL TOXICANTS
VINYL CHLORIDE (VC) AND VINYLIDENE CHLORIDE (VDC)

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EVALUATION OF THE ENVIRONMENTAL TOXICANTS
VINYL CHLORIDE (VC) AND VINYLIDENE CHLORIDE (VDC)

(Progress Report No. 9)

ABSTRACT

We have continued to study the inhalation toxicity of various levels of vinyl chloride (VC) and one level of vinylidene chloride (VDC) in rats and mice.

At the end of 6 months, rats of both sexes exposed to 50, 250, or 1,000 ppm of VC or 55 ppm of VDC, 6 hours a day, 5 days a week, did not show any significant adverse effects on various clinical laboratory data or cause any apparent gross or microscopic lesions. The weight gains of rats exposed to VDC were less than those of the controls.

Exposure to 50, 250, or 1,000 ppm of VC caused a number of deaths or early terminations in mice during the 21st to 26th week. The clinical signs in these mice included rough hair coat, lethargy, anorexia, and sudden weight loss. The high level caused changes in the peripheral blood elements including decreased hematocrit, hemoglobin concentration and/or erythrocyte count, and neutrophilia with a corresponding lymphopenia. The macrophage count in the lung washings was also elevated. All three levels caused acinar proliferation and/or bronchiolar adenoma; the middle and high level also caused angiosarcoma in the liver and/or mammary gland, ductular adenocarcinoma, and squamous cell and anaplastic carcinoma in the mammary gland. The squamous cell and anaplastic carcinomas metastasized to the lung. The incidence and severity of these tumors were in direct proportion to the levels of VC. In addition, malignant lymphoma occurred in the heart, lung, liver, spleen and kidney of one mouse exposed to the low level, and infiltrated the cervical tissue surrounding the trachea, blood vessels and esophagus of one mouse exposed to the high level. There was also a hemangioma in the connective tissue attached to the salivary gland of one mouse exposed to the high level. The tumors were responsible for deaths or early terminations of some mice. At 250 or 1,000 ppm of VC, nearly all mice that died or were terminated during the 21st to 26th weeks had tumors in one or more tissues. Exposure to the high level of VC also caused other lesions in the liver of some mice which were probably associated with angiosarcoma; these included infiltration of nucleated erythrocytes, focal degeneration with necrosis, and infiltration of inflammatory cells in the sinusoids and parenchyma.

Exposure to 55 ppm of VDC for up to 6 months in mice did not cause any adverse signs, including changes in laboratory data or macrophage counts in the lung washings. At the end of 6 months, one male of the eight mice which were terminated had a mild bronchiolar adenoma and two other males had mild acinar proliferation in the lung.

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gland of two females and hemangioma in the connective tissue adjacent to the salivary gland of one male exposed to the high level. The pathogenesis or sequence of changes for the various tumors in the mammary gland is complex. Whether the tumors started at first as ductular adenocarcinoma and then underwent a metaplastic change to squamous cell and anaplastic carcinomas, or all tumors started simultaneously is questionable. However, the squamous cell and anaplastic carcinomas did metastasize to the lung, suggesting a strong malignancy of the neoplasms. In addition, a marked, diffuse malignant lymphoma was found in the heart, lung, liver, spleen and kidney of one mouse exposed to the low level of VC and a malignant lymphoma infiltrated the cervical tissue surrounding the trachea, blood vessels and esophagus of one mouse exposed to the high level. Between the 5th and 6th months the various tumors occurred in five of 10 mice necropsied at 50 ppm, 10 of 11 mice necropsied at 250 ppm, and all 12 mice necropsied at 1,000 ppm. The severity of these tumors in the lung, liver, and mammary gland was also in direct proportion to the exposure level of VC. These tumors were responsible for the various deaths and early terminations of some mice.

Exposure to the high level of VC also caused other lesions, probably associated with angiosarcoma, in the liver of some mice. These lesions were infiltration of nucleated erythrocytes, focal degeneration and necrosis, and infiltration of inflammatory cells in the sinusoids and parenchyma. Intranuclear inclusions increased in the hepatic cells of two mice exposed to the high level of VC. The significance of this increase as related to the treatment is questionable.

2. Vinylidene Chloride

Mice exposed to 55 ppm of VDC for up to 6 months did not show any adverse signs, any changes in laboratory data or macrophage counts in the lung washings. Cytogenetic effects are under evaluation. One male of eight mice terminated at the end of 6 months had a mild bronchiolar adenoma. Two other males had mild acinar proliferation in the lung. These three and another male also had increased intranuclear inclusions in the hepatic cells. The clinical significance of this increase is not understood.

Vinylidene chloride

long-term epidemiologic study by Shell Oil Company found what NIOSH reported as a significant increase in respiratory cancer deaths (Current Report, August 17, p. 520) and an inhalation study which found an increase in nasal carcinomas in rats, the institute said.

In addition, NIOSH noted cytogenic studies of human peripheral lymphocytes that have shown a "highly significant" increase in chromosome abnormalities of exposed workers.

Single copies of the NIOSH bulletin, including recommendations for monitoring and controlling worker exposure to epichlorohydrin, will be available from Publications Dissemination, DTS, NIOSH, 4676 Columbia Parkway, Cincinnati, Ohio 45226.

Antimony**HALF MILLIGRAM LIMIT RECOMMENDED IN NIOSH-CRITERIA DOCUMENT TO DOL**

Present federal standards should be maintained and workers should not be exposed to antimony at concentrations greater than 0.5 milligrams per cubic meter, according to a National Institute for Occupational Safety and Health criteria document.

The document, transmitted September 28 to the Department of Labor for consideration as a standard, also suggests an "action level" of one-half the recommended 10-hour time-weighted average at which certain controls and testing would be initiated.

According to a NIOSH memorandum to Assistant Labor Secretary Eula Bingham, the recommendations are based on human and animal studies which have shown that exposure to antimony can cause adverse effects on the heart, lungs, skin, and mucous membranes.

NIOSH cited one study reporting increased reproductive problems in female antimony workers and lower than normal weight gain in their infants. The institute said that it does not regard the study as conclusive evidence on which to base the recommended standard, but it urged that workers be advised of the existence of the reported results.

NIOSH said it currently is supporting research to determine any carcinogenic effect of antimony trioxide, noting that an English epidemiologic study raising the suspicion of increased lung cancer risk for antimony workers is "severely deficient."

Text of the NIOSH recommendations will appear in a future Current Report.

Vinyl Halides**NIOSH, OSHA BULLETIN RECOMMENDS TREATMENT OF SUBSTANCES AS CARCINOGENS**

Vinyl bromide and vinylidene chloride should be treated in the workplace as potential carcinogens to humans and should be controlled with "the same degree of prudence" used regarding vinyl chloride, the National Institute for Occupational Safety and Health and the Occupational Safety and Health Administration said September 21.

In a joint Current Intelligence Bulletin No. 28 on vinyl halides, including vinyl chloride, the two agencies said their recommendation is based on results of recent studies indicating that exposure to vinyl bromide and vinylidene chloride causes angiosarcoma of the liver and other cancers in laboratory animals. Vinyl halides were the subject of a NIOSH criteria document in September (Current Report, September 21, p. 320).

A list of animal studies compiled by the two agencies shows reported tumors in the liver, zymbal gland, lung, breast, mesenteric lymph node, and lymphatic system in rats exposed to vinyl bromide. Mice exposed to vinylidene chloride showed evidence of liver, lung, and kidney tumors while rats reportedly had mesenteric lymph node, breast, and zymbal gland tumors.

In humans, there have been no reported cases of cancer associated with exposure to either of the two substances, NIOSH and OSHA said. They noted, however, that vinyl bromide has been in commercial production in the United States only since 1971 and, due to the long latent period characteristic of occupationally induced cancers, no unusual risk of cancer among exposed workers would be expected to be detected. While vinylidene chloride has been in production since the early 1940s, the two agencies said, methodologic limitations of the one study reporting no excessive risk among exposed workers do not allow for an adequate evaluation of the substance's contribution to carcinogenic risk.

In addition, other adverse health effects observed from exposure to vinylidene chloride in combination with other vinyl compounds include liver function abnormalities, headaches, vision problems, dizziness, fatigue, weakness, and neurological sensory disturbances, the agencies said. No similar reports for vinyl bromide exposure were found.

Current Intelligence Bulletin No. 28 is available in single copies from Publications Dissemination, DTS, NIOSH, 4676 Columbia Parkway, Cincinnati, Ohio 45226.

Diisocyanates**NIOSH SUGGESTS EXPOSURE LIMITS FOR WORKPLACE USE OF SUBSTANCE MONOMERS**

Workplace exposure to certain diisocyanate monomers should be limited to a time-weighted average concentration of five parts per billion for up to a 10-hour workshift, 40-hour workweek, the National Institute for Occupational Safety and Health recommended September 27.

The NIOSH recommendations, in a criteria document submitted to the Department of Labor, also called for limiting exposure to a ceiling concentration of 20 ppb over a 10-minute sampling period. The recommendations apply to toluene diisocyanate (TDI), diphenylmethane diisocyanate (or methylene bisphenyl isocyanate (MDI), hexamethylene diisocyanate (HDI), naphthalene diisocyanate (NDI), isophorone diisocyanate (IPDI), and dicyclohexyl-methane-4,4'-diisocyanate (hydrogenated MDI).

Primary adverse effects from workplace exposure, NIOSH told DOL in a memorandum, involve the respiratory tract in addition to skin and eye irritation. NIOSH also noted that a major concern of exposure is the development of diisocyanate sensitization in certain individuals.

The NIOSH recommendations, which the institute noted supersede earlier suggested limits in other criteria documents and the Standards Completion Program, will appear in a future Current Report.

Health Hazards**N-ALKANE MONO THIOLS, OTHER SUBSTANCES ARE SUBJECTS OF NIOSH CRITERIA DOCUMENT**

The National Institute for Occupational Safety and Health September 26 submitted to the Labor Department

URL 20164

Vinylidene chloride

A DOMINANT LETHAL STUDY IN MALE RATS AFTER REPEATED EXPOSURES TO VINYL CHLORIDE OR VINYLIDENE CHLORIDE

Robert D. Short, Jan L. Minor, Joseph M. Winston, Cheng-Chun Lee

Pharmacology and Toxicology, Midwest Research Institute,
Kansas City, Missouri

Male CD rats were exposed 6 hr/day for 5 days/wk to 0, 50, 250, or 1,000 ppm of vinyl chloride or 55 ppm of vinylidene chloride. Starting on week 11 of exposure, these males were mated with untreated females. There was no evidence of either preimplantation loss or postimplantation loss in pregnant females that resulted from these matings. Consequently, it was concluded that these exposures did not produce germinal mutation, as manifested by a dominant lethal effect, in male rats.

INTRODUCTION

Vinyl chloride (VC) and vinylidene chloride (VDC) are structurally related monomers used in the synthesis of plastics. VC is carcinogenic in both humans (Creech and Johnson, 1974) and animals (Viola et al., 1971; Maltoni and Lefemine, 1975; Lee et al., 1977). In addition, both VC and VDC are mutagenic in a variety of microbial systems (Loprieno et al., 1976; Bartsch et al., 1975). Epidemiological studies suggest that VC produces germinal mutations, as manifested by increased fetal loss, in humans (Infante et al., 1976). However, there was no evidence of a dominant lethal mutation in male mice exposed to VC for 5 days and sequentially mated with untreated females (Anderson et al., 1976). The purpose of this study was to determine whether repeated exposures to VC or VDC, for 11 wk, produced germinal mutations of the dominant lethal type in male rats.

METHODS

CD rats (Charles River Breeding Laboratories, North Wilmington, Massachusetts) were used in this study. Adult males weighing 180-200 g were exposed 6 hr/day for 5 days/wk to 0, 50, 250, or 1,000 ppm of VC or 55 ppm of VDC (Lee et al., 1977). All rats were given free access to

The authors gratefully acknowledge the competent technical assistance of Brett Ferguson and Tim Unger.

Requests for reprints should be sent to Robert D. Short, Pharmacology and Toxicology, Midwest Research Institute, 425 Volker Boulevard, Kansas City, Missouri 64110.

Vinylidene Chloride

8

Fig. 7
near here

Comparative studies (25) provide clues of differences between rats and mice in the processing of vinylidene chloride (Fig. 7). Thus, in mice, the production of thiodiglycollic acid is considerably reduced and the formation of the N-acetyl-S-cysteinylacetyl metabolite is increased. The higher β -thionase activity in mice than in rats accounts for the greater conversion of thiodiglycollic acid into dithioglycollic acid via thioglycollic acid in the former species of animal. Yllner's (26) mice excreted a proportion of a dose of chloroacetic acid as unchanged starting acid. Thus, in mice, the metabolic pathway from chloroacetic acid to thiodiglycollic acid seems to be readily saturable, possibly on account of an inadequacy in the reaction catalysed by glutathione S-acyl transferase. Under these circumstances, detoxification of 1,1-dichloroethylene oxide by glutathione S-epoxide transferase and the modification of DNA by 1,1-dichloroethylene oxide or chloroacetyl chloride would be expected to be more significant in mice than in rats. This diagnosis of species susceptibility seems to accord with Maltoni's (24) discovery of vinylidene chloride oncogenicity in (the kidneys of) mice.

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Vinylidene chloride emerges as an agent of low, perhaps very low, oncogenic potential, which can be damaging only in a special set of biological circumstances, which we have partially defined (v. supra) and on which work is continuing.

From: Comparative Metabolism of vinyl and vinylidene chlorides in Relation to Oncogenic Potential.

Attached to letter from J. Stafford to R N Whalen dated 2/8/77 in vinyl chloride file.

effect of CCl_4 on liver triglycerides seen in this study is in agreement with the results of Sakaguchi and Hamaguchi (*Bull. Jap. Soc. Sci. Rish.* 41, 283, 1975) who reported elevations in SGOT and SGPT with 1 ml/kg CCl_4 in the yellow tail with no change in lipid levels in the hepatopancreas.

198. *Distribution of [^{14}C]1,1-DCE in Fed or Fasted Rats.* L. G. SHONER, R. J. JAEGER and S. D. MURPHY, Department of Physiology, Harvard School of Public Health, Boston, Massachusetts.

1,1-Dichloroethylene (1,1-DCE, vinylidene chloride), a monomer used in plastics manufacture, is a potent hepatotoxin. The hepatotoxicity is greatly potentiated in rats fasted for 18 hr prior to exposure. Fed or fasted rats were examined for differences in the distribution of non-volatile radiolabel from 1,1-DCE to determine whether an altered distribution associated with the fasting state might be responsible for the increased toxicity. Four male Holtzman rats (160-260 g) were put into a closed circuit inhalation system. [^{14}C]1,1-DCE (sp act 1.57 $\mu\text{Ci}/\text{mm}$) was injected to give an initial concentration of 2000 ppm. During the exposure the declining chamber concentration was monitored. The animals were taken from the chamber after 2 hr and killed at 0.5, 2, 4, and 6 hr postexposure. Livers were removed, homogenized, and fractionated by differential centrifugation. Each sample and its TCA precipitate (TCA ppt) were heated at 55°C for 18 hr to remove nonvolatile radiolabel. At 0.5 hr postexposure, fasted rats had twice as much radiolabel as fed rats in the total and TCA ppt fractions. At 2, 4, and 6 hr postexposure, the increased amounts of radiolabel in fractions from fasted rats were observed only in TCA ppts. The time course for disappearance of radioactivity from the fractions was observed to be different between fed and fasted rats. To determine if the difference in concentration or radiolabel between fed and fasted rats was a systemic effect, kidney, heart, and skeletal muscle from rats killed at 0.5 hr were examined. Heart and skeletal muscle revealed no fed-fast differences in either total or TCA ppt fractions. Increased activity was observed in the total kidney homogenates from fasted animals, a result similar to that seen in liver homogenates. However, only liver homogenates had a fed-fast difference in the TCA ppt fraction. This suggests that organ specific binding of 1,1-DCE or its metabolites may be associated with the mechanism of toxic injury. (Supported by a gift from the Dow Chemical Co., OH-00315, and ES-00002.)

199. *Hepatotoxicity of 1,1-Dichloroethylene: Influence of Altered Thyroid Function in Rats.* R. J. JAEGER, S. SZABO, L. COFFMAN, M. T. MOSLEN, E. S. REYNOLDS and S. D. MURPHY, Department of Physiology, Harvard School of Public Health and Departments of Pathology, Harvard Medical School and Peter Bent Brigham Hospital, Boston, Massachusetts.

1,1-Dichloroethylene (vinylidene chloride, 1,1-DCE), a plastics monomer, has an 8-hr TLV of 10 ppm (TWA). It is a potent hepatotoxin and will kill 18-hr fasted rats within 24 hr of a 4-hr exposure at 200 ppm. Fed rats are resistant. Increased 1,1-DCE sensitivity is associated with decreased liver glutathione (GSH) concentration. Since Szabo *et al.* suggested that thyroidectomy (TR-X) increased liver GSH concentrations (*Tox. Appl. Pharmacol.* 30, 175, 1974), we hypothesized that TR-X or chemical modification of thyroid function would alter 1,1-DCE toxicity. On Day 1, 200-g male rats were thyroidectomized or were treated po with methimazole (M, 30 mg/kg/day), propylthiouracil (P, 60 mg/kg/day), or thyroxine (T, 0.5 mg/kg/day, sc) for 7 days. On Day 8, after an 18-hr fast, groups were either exposed to 2000 ppm of 1,1-DCE for 4 hr or were not exposed. All were killed at 5-7 hr. TR-X, M, and P increased liver GSH significantly in unexposed controls while T decreased it. Elevations in serum alanine- α -ketoglutarate transaminase (AKT) following 1,1-DCE were significantly reduced or prevented by TR-X, P, or M. T increased mortality and only one rat survived exposure. In fasted exposed rats, pronounced centrilobular hemorrhagic necrosis, intramitochondrial Ca^{2+} deposition, and loss of histochemical glucose-6-phosphatase occurred. Liver Na^+ and Ca^{2+} increased three- and sixfold, respectively. TR-X, P, and M minimized these changes. Oxygen uptake in succinate-ADP supplemented liver homogenates, an indicator of mitochondrial function, was decreased in fasted rats exposed to 1,1-DCE. In rats pretreated with M or P, oxygen uptake was normal after exposure. As indicated above, both compounds decreased injury. Since decreased oxygen uptake may have resulted from injury, we measured it in fasted exposed rats that were killed at 1, 2, and 3 hr, i.e., before serum AKT elevation. A 3 hr and in the absence of increased AKT, oxygen uptake was decreased by 39%. From these data and because of the demonstrated effect of modifiers of thyroid function on 1,1-DCE injury, it is suggested that mitochondrial damage is an early event in 1,1-DCE liver injury. The role of GSH in preventing such injury is as yet unclear. (Supported by ES-00002, OH-00315, AM-16183, HL-06370, and GM-07309.)

URL 20167



~~CONFIDENTIAL~~ D. P. Kallinger, Stanford
Vinylidene chloride
DOW CHEMICAL U.S.A.

December 23, 1975

BARSTOW BUILDING
2020 DOW CENTER
MIDLAND, MICHIGAN 48640

Uniroyal, Incorporated
Purchasing Department
Waterford, Connecticut 06385

Attention: Purchasing Agent
Dick Krajewski
Phil Haas

Gentlemen:

~~CONFIDENTIAL~~
Middletown
Naugatuck

Dr. W. Harris
For your file
P.G. Haas

Recently it has been brought to our attention that preliminary results from BASF Wyandotte's medical surveillance program has revealed a higher incidence of liver abnormalities among their South Kearny, New Jersey plant workers than would be expected in the normal population. These workers have had exposure to many chemicals including vinylidene chloride, and further studies are continuing by BASF Wyandotte.

Dow has had experience since 1944 with workers exposed to known levels of vinylidene chloride. This history includes both manufacture of vinylidene chloride monomer and the use of monomer to produce polymers and copolymers.

Epidemiological studies of this worker population have shown no health problems associated with vinylidene chloride. Included in Dow's medical surveillance program are health history, SMA-12 (blood chemistry), hematology, blood pressure, pulmonary function, EKG, etc.

We do not feel that vinylidene chloride presents a health hazard when properly used. Please call your local Dow sales office if you have any further questions.

Very truly yours,

R. H. Stephens
Product Sales Manager
Industrial Chloro-Chem
Inorganic Chemicals Department

to



ment of Transportation, according to Robert E. Lenhard, managing director, Compressed Gas Association, Inc., New York, N.Y.

The committee is scheduled to meet again in Washington, D.C., on November 4-5.

General Policy

ASSISTANT LABOR SECRETARY WARNS OF BOGUS INSPECTORS, ADVERTISING

Employers should be alert for persons posing as Occupational Safety and Health Administration inspectors and should watch out for misleading advertisements of safety equipment, according to Assistant Labor Secretary John H. Stender.

Stender said OSHA inspectors carry special Labor Department credentials and if employers doubt the authenticity of an inspector, the identification number and inspector's name can be verified quickly by telephoning his home office. Bogus inspectors use several "con games," he said.

"Some will demand on-the-spot payment of penalties for conditions they claim violate OSHA rules," he said.

"Others will point out so-called violations and suggest they can be corrected by a particular tool, machine or piece of equipment. These usually are followed a day or so later by an accomplice who offers to sell the employer the recommended items."

He said both procedures violate federal law.

Stender also warned employers to be alert for misleading advertisements for safety equipment. He said that any assertion that the product is "OSHA-approved" is incorrect since OSHA does not approve any safety equipment.

Noting that several past instances of improper advertising were referred to the Federal Trade Commission for action, Stender asked that employers bring to OSHA's attention any examples of what they believe to be misleading advertisements.

Health Hazards

NIOSH IS CONDUCTING LITERATURE SEARCH FOR INFORMATION ON VINYLIDENE CHLORIDE

A literature search to gather information on potential hazards associated with vinylidene chloride is being conducted by the National Institute for Occupational Safety and Health.

NIOSH noted at the moment, no hard data exists to support the possible carcinogenicity of VDC.

Documentation of some European data is being sought including evidence of reticulum cell sarcomas following a year of exposure of varying concentrations of the compound, discovered by Professor Viola in Italy. Viola's animal experiments included exposures of 400 ppm, 200 ppm, and 100 ppm.

Field Memoranda

MEMORANDA DISCUSS MARITIME INDUSTRY SIC CODE, SWING RADIUS OF CRANE REAR

An interpretation of 29 CFR 1926.550 (a) (9) was issued by the Occupational Safety and Health Administration in OSHA Field Information Memorandum 74-80.

The full text of the memorandum follows:

"In order to assure uniformity within all 10 regions, the following interpretation of 29 CFR 1926.550(a) (9) shall be used as a basis for enforcement.

"Accessible areas within the swing radius of the rear of the rotating superstructure of the crane are meant to be those areas within the 360 degrees of travel. A barricade is required in accessible areas when the swing radius of the rear of the rotating structure of the crane, either permanently or temporarily mounted, may cause an employee to be crushed between other objects and the rear of the crane or any portion of the crane carriage' regardless whether it be front, rear, or side.

"Historically, most fatalities have been caused by employees getting between the rotating superstructure and the turntable or other portions of the crane itself.

"This interpretation is applicable for all equipment covered under subpart 'N' of 29 CFR 1926 when used in such a manner that the hazard as described in 29 CFR 1926.550 (a) (9) is created and an exposure is observed."

OSHA Field Information Memorandum 74-78 requested that OSHA assistant regional directors direct their staff to review OSHA Program Directive 200-5 (May 26, 1972) and OSHA Management Information System — Field Reporting Manual, Chapter VI, p. VI-2 and VI-3 and to report maritime activities under the following SIC Codes: (1) all longshoring activities — SIC 4460, (2) all shipyard activities — SIC 3730, and (3) all other maritime activities that are not considered either longshoring or shipyard — SIC 1620.

Recent computer runs indicated maritime activity is being reported under the old Standard Industrial Classification numbers, the memorandum noted.

Arbitration

ARBITRATOR RULES EMPLOYEE FIRING WAS JUSTIFIED, NO HAZARD EXISTED

The discharge of an employee who authorized a work stoppage because of an alleged but unproven safety hazard was justified, according to Arbitrator J. Thomas Rimer, Jr.

The case involved *International Chemical Workers Union, Local 832*, and *Thiokol Corporation, Georgia Division*.

The grievant, the chief safety steward for the union, authorized several workers to leave their jobs after a flare fell from a conveyor belt into a hot wax tank and the workers became fearful of an explosion. The company maintained that there was no danger involved and that the steward's action was in violation of the "no strike pledge" in the contract.

The resort to self-help rather than the grievance procedure exposes the employee to discharge if the plant is to operate in an orderly manner, the arbitrator said. The grievant did so here and the discharge was for good cause. The record showed from the grievant's testimony that even he, on the day following the incident, admitted that he had acted improperly, stating that "had he known" the facts, he would not have told the employees to leave their work and go to an evacuation area.

The grievant did not seek the facts at the time but acted on his own, the arbitrator said, based only on the apprehension expressed to him by those without knowledge of the existence or non-existence of a hazardous condition at the hot wax tank. The grievant did not know whether or not the presence of a flare in the hot wax tank represented a hazard and he made no effort to find out before he took action.

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River Shale Oil Corp., which is developing another lease in Colorado. Walter Sanford, of Sun's Dallas office, tells C&EN that the White River group is still thinking about a 100,000 barrel-per-day plant around 1980. However, the final decision on a commercial plant awaits the results of the development program, similar to that of the Rio Blanco group.

A fourth consortium is Paraho Development Corp., involving Sohio and 16 other companies. Harry Pforzheimer, director of the Paraho program, is still optimistic about the future of shale oil development but also believes that things could change quickly if oil prices come down. Most of the shale oil development projects now under way are keyed to an oil price of about \$11 per barrel. If oil prices stay above \$11 per barrel, most developers think they may be able to compete, providing inflation slows down and the Government establishes a clear energy policy.

Concern grows over worker cancer risk

Recent developments underscore the heightening concern over cancer risks that employees face from exposure to some chemicals in their work environment. Ralph Nader's Health Research Group has charged Rohm and Haas Co. with withholding data on lung cancer among its workers from it and from the Government. Twenty-two workers at the firm's plant in Philadelphia have died of lung cancer so far, apparently from bis-chloromethyl ether exposure. Meanwhile, Dow Chemical has learned from an Italian scientist that vinylidene chloride apparently causes a liver cancer in rats.

Among the Nader group's charges are that by 1967 Rohm and Haas knew the ether compound caused cancer in animals and that a statistically significant number of human lung cancer cases had occurred. But workers were not informed of these results until 1971, and then only of the animal data. The allegations, however, "grossly distort the facts and leave a false and misleading impression concerning Rohm and Haas' actions and attitudes," says Vincent L. Gregory, Jr., the firm's president.

Rohm and Haas took the primary initiative to uncover the cancer hazard, Mr. Gregory adds. Animal tests were run and outside experts consulted. And Rohm and Haas

workers were given various medical tests.

Nevertheless, the company held as late as 1971 that "a scientifically convincing case" for the ether compound's carcinogenicity to humans had not been made. However, it shut down operations and modified its plant in 1971 so that workers' exposure to the chemical was limited.



Gregory: grossly distort the facts

ed. In July 1974, though, a "significantly higher" mortality rate was found among workers exposed to chloromethyl methyl ether (an intermediate for anion exchange resins of which bis-chloromethyl ether is a by-product) than in workers not exposed or in a comparable Philadelphia population.

There are indications—from what a Dow spokesman describes as preliminary information—that vinylidene chloride is carcinogenic to rats in inhalation studies in concentrations of 100 to 200 p.p.m. in air. The findings were obtained by Prof. P. L. Viola of Regins Elena Institute for Cancer Research in Rome. Dow has notified U.S. regulatory agencies of the early results, although its own studies—still 18 months from completion—show no toxic effects at this time. Workers at Dow are exposed to less than 10 p.p.m. of the chemical.

Shell seeks okay to burn wastes at sea

Tests using a ship to incinerate chemical wastes as an alternative to ocean dumping could take place if the Environmental Protection Agency approves permits for Shell Chemical. The company wants to dispose of some 16,800 metric tons of organic chlorides and other wastes by burning them 130 miles out in the Gulf of Mexico.

Shell stopped dumping the waste in the Gulf last November in compliance with EPA requirements. Du Pont also had stopped dumping

waste in the Gulf pending a hearing on an application to renew dumping held in Pensacola, Fla. (C&EN, July 29, page 5).

EPA administrator Russell E. Train on Oct. 3 turned down the recent Du Pont application. At press time, Du Pont was studying unspecified recourses open to it to handle the waste.

Just a day later, a hearing on the Shell proposal, held in Houston, saw an unusual alliance of EPA, the National Wildlife Federation, and Shell combine to push the plan. It involves incineration of the waste on board the ship *Vulcanus*, owned by a Dutch company, Ocean Combustion Services, a subsidiary of Hansa Lines.

The *Vulcanus*, which for some time has been used in European waters to dispose of wastes by burning, is equipped to burn waste at temperatures ranging from 1400° to 1650° C. Because of the high caloric value of the organic chlorides and other materials in the Shell wastes, little auxiliary fuel is expected to be needed to maintain the temperature at or above 1400° C., according to an EPA evaluation of the ship's capabilities.

If the permit is approved, an initial batch of 4200 metric tons of the waste will be carried to the burning site in the Gulf about 105 nautical miles south of Galveston, Tex. The burning rate would be 20 metric tons an hour. Hydrogen chloride produced during burning would disperse in the atmosphere and eventually fall into the ocean where carbonates would neutralize it. During the burning operation, extensive testing of biological effects, possible pH changes, and combustion efficiency (more than 99.75% is required) would be carried out. The other 12,600 metric tons of waste stored by Shell could be burned later at a new site to be designated by EPA.

Support for the proposal at the hearing came from many sources including a local Congressman and other government officials. Kenneth S. Kamlet of the National Wildlife Federation, which often has opposed EPA ocean dumping plans, advocated giving the proposal a chance because of the nearly 3.5 million tons of waste dumped in the Gulf and nearly 4 million tons dumped in the Atlantic during 1973. Opposition came from Texas and Louisiana state officials and some local officials. Their views were chiefly that they had not had time to study the plans or that tests using obviously harmless materials could not be made first.

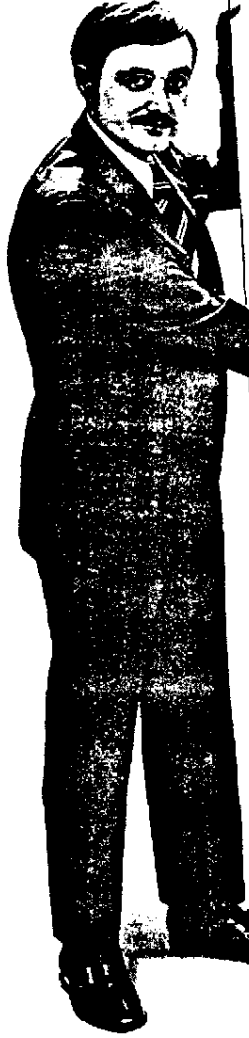
UPL 20170

BULLETIN 31973
(Supersedes 21373)

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PRODUCT DATA/ PRICES



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- Ammonium Bifluoride
- Ammonium Fluoborate
- Barium Fluoride
- Boron Trifluoride Complexes
- Boron Trifluoride Monoethylamine
- Cadmium Fluoborate
- Chromium Fluoride
- Copper Fluoborate
- Fluoboric Acid
- Fluotitanic Acid
- Frosting Mixtures
- Lead Fluoborate
- Lithium Fluoride
- Magnesium Fluoborate
- Nickel Fluoborate
- Potassium Bifluoride
- Potassium Fluoborate
- Potassium Fluoride
- Potassium Titanium Fluoride
- Sodium Fluoborate
- Tin Fluoborate
- Zinc Fluoborate

AMMONIUM BIFLUORIDE FLAKE

PRICES

Size	Price	Size	Price
10 lb. bags (19 pellets)	\$25.00	72 lb. open minimum	\$80.00
10 lb. bags (19 pellets)	\$25.00	10-72 bags	\$80.00
10 lb. bags (19 pellets)	\$25.00		



THE HARSHAW CHEMICAL COMPANY
Division of Kewanee Oil Company
1845 East 97th Street • Cleveland, Ohio 44106 • Phone 216-721-8300

I'd like to receive Harshaw technical literature on:

- ☐ AMMONIUM BIFLUORIDE
- ☐ AMMONIUM FLUOBORATE
- ☐ BARIUM FLUORIDE
- ☐ BORON FLUORIDE COMPLEXES
- ☐ BORON TRIFLUORIDE MONOETHYLAMINE
- ☐ CADMIUM FLUOBORATE
- ☐ CHROMIUM FLUORIDE
- ☐ COPPER FLUOBORATE
- ☐ FLUOBORIC ACID
- ☐ FLUOTITANIC ACID
- ☐ GLASS FROSTING MIXTURES
- ☐ HYDROFLUORIC ACID ANHYDROUS
- ☐ HYDROFLUORIC ACID AQUEOUS
- ☐ HYDROFLUOSILICIC ACID
- ☐ LEAD FLUOBORATE
- ☐ MAGNESIUM FLUOBORATE
- ☐ NICKEL FLUOBORATE
- ☐ POTASSIUM BIFLUORIDE
- ☐ POTASSIUM FLUOBORATE
- ☐ POTASSIUM FLUORIDE
- ☐ POTASSIUM TITANIUM FLUORIDE
- ☐ SODIUM FLUOBORATE
- ☐ TIN FLUOBORATE
- ☐ ZINC FLUOBORATE

URL 20171

Just ask Harshaw

Physical and chemical properties, principal uses, handling precautions, packaging, freight classifications, shipping regulations, etc., are included in the data sheets listed here. To get the sheets you want, check the boxes, fill in your name and address, and mail to Harshaw. We'll be glad to send them.



HARSHAW

The Harshaw Chemical Company, Division of Kewanee Oil Company,
1945 East 97th Street, Cleveland, Ohio 44106. Phone (216) 721-8300.

Name _____

Company _____

Address _____

City _____

State _____ Zip _____

Painesville



MANUFACTURING CHEMISTS ASSOCIATION

1825 CONNECTICUT AVENUE, N.W. WASHINGTON, D.C. 20009 (202) 483-6126

Dr. W. Herrero

October 2, 1974

TO: Public Relations Committee; PRC Publicity Subcommittee
Vinyl Chloride Research Participants

SUBJECT: News Release on Vinyl Chloride Standard and Editorial on Toxic Substances Legislation

Enclosed for your information is yesterday's news release on the Occupational Safety and Health Administration's vinyl chloride standard, which is receiving wide-spread media pick-up, and a recent Washington Post editorial on toxic substances legislation.

The Wall Street Journal two-part series on VC/PVC began today and the Fortune article is in the October issue, now being circulated.

URL 20172

SPECIAL ATTENTION

MCA learned today that European research on vinylidene chloride -- a liquid used principally as a copolymer in the production of saran -- has shown similar test results as vinyl chloride.

It was reported to MCA that both the U. S. and British governments were notified of the research by individual companies in each country.

RECEIVED

OCT 7 1974

MEDICAL
DEPARTMENT

Sincerely,

Rich Brewitt

Richard F. Blewitt
Manager of Press Relations



MANUFACTURING CHEMISTS ASSOCIATION

1825 CONNECTICUT AVENUE, N. W.

WASHINGTON, D. C. 20009

FOR RELEASE

RECEIVED

For Immediate Release

JAN 15 1975

CONTACT:

MEDICAL Richard F. Blewitt
DEPARTMENT (202) 483-6126, ext. 282

WASHINGTON, D. C. -- The Manufacturing Chemists Association (MCA) will administer research dealing with occupational health aspects of styrene and vinylidene chloride monomer (VDCM).

Twelve companies will sponsor the research on styrene -- a liquid monomer, one of the most widely used in the production of plastics. Thirteen companies will fund the work on VDCM -- a liquid monomer used principally in the production of plastic wrappings.

Contractual arrangements and program protocols are not final, but the individual projects are expected to cover such animal testing as: ingestion, vapor inhalation, fetal development, toxicity and metabolism.

Both programs are designed to provide additional scientific information on which to base safeguards to protect employee health. To date, styrene has not been linked with any health hazard. Preliminary VDCM research in Europe has caused the producers to feel there is a need for further tests.

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MCA-3870
1/10/74

URL 20173