



CHEMICAL MANUFACTURERS ASSOCIATION

June 28, 1988

BY TELECOPIER

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Reference: NIOSH Criteria Documents Exerpts

Attached are exerpts from the NIOSH criteria document where references are made to the articles by Kozik and Brzozowski that you requested.

Sincerely,

A handwritten signature in cursive script, appearing to read "Henry J. Sauer".

Henry J. Sauer
Manager
Ethylene Dichloride Program

cc: Ethylene Dichloride Panel



SL 068030

criteria for a recommended standard

**OCCUPATIONAL EXPOSURE
TO
ETHYLENE DICHLORIDE
(1,2-DICHLOROETHANE)**



U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

Center for Disease Control

National Institute for Occupational Safety and Health

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MANUFACTURED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
1000 EAST 17TH AVENUE, DENVER, CO. 80202

CRITERIA DOCUMENT: RECOMMENDATIONS FOR AN OCCUPATIONAL
EXPOSURE STANDARD FOR ETHYLENE DICHLORIDE (1,2 DICHLOROETHANE)

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hematopoietic system. He proposed to study the effect of a protective diet containing high levels of sulfhydryl groups on the health of the Barisol plant workers. By the time of this recommendation, the concentrations of ethylene dichloride in the workplace had been partially controlled but were still above permissible levels, and the entire crew had been replaced. For 6 months, 16 men and one woman had a diet supplemented with 5 mg methionine, choline, and 40 mg vitamin C. Nine of the workers were employed in the centrifuge room and 8 in other locations for an average of 8-12 months. Consequences of the dietary change are not apparent

→ In 1954, Brzozowski et al [104] reported the work practices and health status of agricultural workers using ethylene dichloride as a fumigant in Poland and stated that skin absorption of ethylene dichloride was primarily responsible for producing symptoms such as nausea, weakness, and abdominal pain. It was reported that ethylene dichloride was brought to the fields in barrels and poured by hand into buckets. The worker handling the bucket had his face extremely close to the barrel during pouring and was therefore exposed to a high concentration. Workers then carried the open buckets to the place of application, meanwhile spilling quantities of the insecticide on their clothes and shoes. These clothes, often soaked with ethylene dichloride, were not changed. The actual application involved pouring the ethylene dichloride into a series of holes. Furthermore, the authors [104] stated that the workers used ethylene dichloride to wash their skin. This seems to confirm that skin absorption probably was as significant a contribution to exposure as inhalation.

An environmental sample representative of the working zone was collected in an unstated medium by midget impingers and analyzed by a modification of the alkaline hydrolysis method. Since the workers did not stay at one location for a sufficient amount of time to collect an entire sample, the collection apparatus was moved from place to place following the workers. Consequently, one environmental sample was collected from 10 locations. The concentration was found to be 4 ppm (16 mg/cu m). Because of the practical difficulties of sample collection, conditions were simulated in the laboratory and air was sampled and analyzed, resulting in concentrations of about 14.5-15 ppm (58-60 mg/cu m). A sample taken during the pouring of ethylene dichloride into buckets, considered to be the maximum exposure of a worker, was found to have 60 ppm ethylene dichloride. [104]

To establish the health status of the workers, the following investigations were performed: medical examinations, patch tests to detect sensitization, urinalyses and tests of liver function. Blood counts were also performed but the data were not reported. [104]

Among 118 workers using ethylene dichloride, signs and symptoms were reported in 90 persons, the most common being conjunctival congestion (82 of the workers), weakness (54), reddening of the pharynx (50), bronchial symptoms (43), metallic taste in the mouth (40), headache (39), dermatographism (37), nausea (31), cough (30), liver pain (29), burning sensation of the conjunctiva (24), tachycardia (21), and dyspnea after effort (21). [104]

The amounts of ethylene dichloride found in the urine of workers were not reported, but it was stated that ethylene dichloride was excreted very

fast, and that the amounts excreted did not correlate with the appearance of clinical symptoms. The Quick test for hippuric acid was used to measure liver function, and significantly abnormal findings were reported to occur in 40 of 56 investigations. Further detail was not reported. To determine skin sensitization, a piece of gauze was soaked in a 0.1% solution of ethylene dichloride in alcohol and was taped to the arm. The result was read after 40 hours, and in all cases the tests were negative. The same test was repeated using a 50% solution of ethylene dichloride in soybean oil and the results were again negative. [104]

The authors [104] concluded that the poor work practices including the spilling of ethylene dichloride on clothes and skin contributed significantly to the workers' exposure. They recommended the use of protective clothing and correction of work practices to decrease the exposure by skin absorption.

Rosenbaum [88] reported that in 100 factory workers exposed to ethylene dichloride for 6 months to 5 years at concentrations not in excess of 25 ppm (0.1 mg/liter), there were no changes in the blood or internal organ functions. However in a number of workers, there were nervous system functional disturbances of varying intensity. These disturbances included what was called heightened lability of the autonomic nervous system, diffuse red-dermographism, muscular torus, bradycardia, increased hidrosis, and frequent complaints about fatigability, irritability, and sleeplessness. Information about the method of measuring ethylene dichloride was not given in the report.

The health of workers chronically exposed to ethylene dichloride in the Russian aircraft industry was studied for the years 1951-1955 and

reported in 1957 by Kozik. [105] The workers of concern comprised a large group employed in the shop where soft tanks were produced. Most of the workers in this shop were gluers who assembled the metal forms and attached rubber parts to them. A small number worked inside the completed tanks to disassemble the forms. Rubber sheets were spread on tables situated in 4 rows and the metal forms were placed along the tables. During application of the glue to the large rubber sheets, ethylene dichloride, the solvent for the glue, was emitted to the air. The exit ducts of the ventilation system were located in the floor between the rows of tables and metal forms.

About 500 ethylene dichloride measurements were reported to have been taken for various purposes. The data for 3 operations in the shop are presented in Table XII-3 and summarized in Figures XI-1 and XI-2. Although the sampling and analytical methods were not mentioned, the design of the study and the extensiveness of the data presentation lend credibility to the study.

During application of the glue to the rubber sheets, concentrations of 5-40 ppm were reported. The author [105] reported that concentrations of 22-40 ppm were maintained for 5-6 minutes, after which they decreased to 17-22 ppm as the glue dried, and by the end of drying to 7.5-10 ppm, in 15 minutes. The gluing was done in the 1st half of the shift and the dried sheets were placed on the forms in the 2nd half. The author estimated that the array of ethylene dichloride concentrations reported for the gluing and drying operations occurred during 70-75% of the time. It can be estimated, from the data presented, that about 44% of the total exposure occurred during the gluing operations (Figure XII-2) when the TWA concentration was

about 28 ppm during application of the glue, and about 16 ppm when the glue was drying. During the 2nd half of the shift when other operations were performed, the ethylene dichloride concentration was about 11 ppm, and for the total shift the TWA was about 15 ppm.

A study was made of morbidity and temporary loss of working capacity in the group of workers engaged in the production of soft tanks and in the entire factory for the years 1951-1955. The morbidity indices are presented in Table III-2.

TABLE III-2
MORBIDITY AND LOST WORKDAYS OF WORKERS EXPOSED TO ETHYLENE DICHLORIDE
(Rates/100 Workers)

Year		Total Morbidity		Acute Gastro-intestinal Disorders		Neuritis and Radiculitis		Other Diseases	
		Plant	Shop	Plant	Shop	Plant	Shop	Plant	Shop
1951	Cases	120.2	159.8	5.1	11.6	5.2	13.0	34.4	43.2
	Days	995.8	1445.5	19.3	43.5	59.9	127.0	354.2	541.8
1952	Cases	124.0	137.6	4.2	5.7	5.0	9.7	34.0	40.8
	Days	960.9	996.0	15.1	23.1	44.8	94.5	335.2	378.7
1953	Cases	135.6	163.9	14.4	6.2	7.5	16.5	35.3	53.5
	Days	1040.8	1236.5	15.6	19.1	67.3	146.0	338.3	524.0
1954	Cases	150.7	191.8	5.3	9.6	7.9	16.7	40.8	63.8
	Days	1175.9	1563.2	19.3	31.8	73.8	182.8	386.4	596.2
1955	Cases	127.6	176.6	3.6	5.0	5.9	10.3	37.9	63.3
	Days	978.4	1462.4	12.1	15.3	51.1	90.2	345.7	640.5

From Kozik [105]

For each disease category considered, total morbidity, acute gastrointestinal disorders, neuritis, radiculitis, and other diseases, the indices of both cases of morbidity/100 workers and days of temporary loss of working capacity/100 workers were greater in the soft-tank shop than throughout the factory in each year, except cases of acute gastrointestinal disorders in 1953. Diseases of the muscles, tendons, and ganglia were considered by Kozik [105] to be associated with the many repetitive motions the workers had to make when applying the glue.

Eighty-three of the gluers were examined by the Department of Occupational Diseases of the Central Institute for Postgraduate Medicine. Diseases of the liver and bile ducts were found in 19 of the workers, neurotic conditions were found in 13, autonomic dystonia in 11, asthenic conditions in 5, and goiter and hyperthyroidism in 10 workers. Visual-motor reactions at the beginning and end of the working day were studied for 14 days in 17 gluers and 10 control machinists from the mechanical shop. The author stated that simple reaction, a complicated light differentiation reaction, and modifications of a complicated reaction were used; details of the tests were not given. The average values of the speeds of reaction were reported to have shown no substantial differences in the 2 groups before and after work. However, in the case of the complicated reaction, the majority of gluers made errors compared to no errors by the machinists. With the modified complicated reaction, 4 of 10 machinists made errors, but only at the end of the workday. Errors were committed by 15 of 17 gluers and the errors were committed both before and after work.

CHEMICAL MANUFACTURERS ASSOCIATION

Record of Conference Call

of the

Ethylene Dichloride Program Panel

Date: Thursday, June 23, 1988

Time: 9:00 a.m.

Participants

Susan Hearn, Chairperson	Dow Chemical Company
Loren Anderson	PPG Industries, Incorporated
Thomas Grumbles	Vista Chemical Company
Robert Hinderer	BF Goodrich Company
Thomas Robinson	Vulcan Materials Company
Nannette Simon	Occidental Chemical Corporation
Henry Sauer	CMA

Panel Activities

- 1.0 Recommended Response to OSHA Z Tables Revision. The group discussed the proposed changes to the Threshold Limit Values (TLVs) for EDC. NIOSH (1978) has concluded that EDC should be considered a potential human carcinogen and has recommended 1 ppm 10 hour TWA and 2 ppm 15-minutes short-term limits.

Recommended literature references include:

- The NIOSH criteria for a Recommended Standard
- NIOSH Special Hazard Review of EDC (1978)
- Klaunig, J. E., et al., Environmental Health Perspectives Vol. 69 (pp 89-95), 1986 (A drinking water study)
- Foreign references in the F. R. Notice: Kozik (1957) and Brzozowski (1954).

On motion, duly made and seconded, the Panel unanimously voted to respond to the proposed rule. Ms. Hearn and Mr. Hinderer volunteered to work on draft comments. Members are planning to attend a June 29 meeting of the Vinyl Institute in Baton Rouge, LA to coordinate recommended comments with the response of this group. Draft comments will be distributed to the Panel for review prior to the July 8 deadline. General comments are also being developed

by the Hazard Assessment Task Group of the CMA Health and Safety Committee.

It was recommended that the Panel consider support for reducing the current OSHA standard of 50 ppm, 8 hour TWA to the ACGIH adopted value of 10 ppm, 8 hour TWA.

- 2.0 HAPS Follow-up Plans. Members were reminded to send EDC data required under SARA Section 313 to CMA.
- 3.0 Panel Membership. It was recommended that the following other known EDC producers be invited to join the Panel: Borden, Inc., Formosa Plastics Corporation, and Georgia Gulf Corporation.

The call was concluded at 10:00 a.m.



Henry J. Sauer
Manager
Ethylene Dichloride Program

Subject to Approval
June 27, 1988