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16. Abstract (Limit: 200 words)

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) on February 26, 1980, at the Agricultural Stabilization and Conservation Service (ASCS) office, Kingwood, WV. This survey was conducted to investigate complaints of eye and nasal irritation, as well as general discomfort from exposure to solvent vapors invading the ASCS office area.

ASCS office personnel were exposed to perchloroethylene (PCE) vapors generated in the Patriot Coal Co. Float-and-Sink Testing laboratory which is located in an adjacent room of the same building. Although the laboratory was not performing float-and-sink tests at the time the survey was conducted, PCE vapor concentrations in the ASCS office were measured at 20 parts per million (ppm).

A comprehensive industrial hygiene survey was conducted at the Patriot Coal Co. laboratory. Recommendations to control the PCE vapors have been made to the company through a formal report. The control measures recommended should eliminate the ASCS office personnel's exposure to PCE.

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
MORGANTOWN, WEST VIRGINIA

HAZARD EVALUATION AND TECHNICAL ASSISTANCE
REPORT NO. ~~M-HA-80-105-TA~~
M-HHE-80-105-TA
AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE
KINGWOOD, WEST VIRGINIA

JUNE 1980

I. SUMMARY

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) on February 26, 1980, at the Agricultural Stabilization and Conservation Service (ASCS) office, Kingwood, West Virginia. This survey was conducted to investigate compliants of eye and nasal irritation, as well as general discomfort from exposure to solvent vapors invading the ASCS office area.

ASCS office personnel were exposed to perchloroethylene (PCE) vapors generated in the Patriot Coal Company Float-and-Sink Testing laboratory which is located in an adjacent room of the same building. Although the laboratory was not performing float-and-sink tests at the time the survey was conducted, PCE vapor concentrations in the ASCS office were measured at 20 parts per million (ppm).

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II. TOXICITY AND EVALUATION CRITERIA

Human Toxicity

"Clinical evidence accumulated over the years clearly demonstrates that tetrachloroethylene (perchloroethylene) is toxic to the liver and kidneys in humans. Liver impairment has been noted in cases of exposure to tetrachloroethylene as evidenced by abnormal liver

function tests. Also, toxic chemical hepatitis, and enlargement of the liver and spleen have been associated with exposure to tetrachloroethylene. Tetrachloroethylene vapor is irritating to the eyes and upper respiratory tract, and may cause frontal sinus congestion and headache. Direct contact with skin can cause burns, blistering, and erythema due to the "degreasing" effect of tetrachloroethylene on the skin. Over a period of time this can result in extreme skin dryness with cracking and associated infection.

Altered physiological and behavioral responses observed in subjects exposed to tetrachloroethylene include vague nonspecific complaints generally attributed to Central Nervous System (CNS) depression. These symptoms include vertigo, impaired memory, confusion, fatigue, drowsiness, irritability, loss of appetite, nausea and vomiting. Motor coordination following tetrachloroethylene exposure requires additional mental effort, which along with memory impairment and fatigue have important implications for worker safety. Various disturbances of the peripheral nervous system such as tremors and numbness have also been associated with exposure to tetrachloroethylene. Excessive absorption of tetrachloroethylene can cause severe depression of the CNS leading to coma; ultimately death may occur from respiratory paralysis or circulatory failure.

Tetrachloroethylene is most commonly absorbed through the lungs and can be absorbed from the intestines if ingested. The skin is a less important absorption site. Physical exercise can significantly increase the amount of tetrachloroethylene absorbed through the lungs because of greater respiration and increased blood flow.

Metabolism and elimination of tetrachloroethylene is relatively slow. It is deposited in body fat and the biologic halflife of tetrachloroethylene in man is estimated at six days." [1]

In 1976 NIOSH recommended that the environmental limit for PCE be a 10-hour, 40-hour work week TWA concentration of 50 ppm with a 15-minute ceiling value of 100 ppm. These limits, it was believed, would prevent neurologic effects as well as eye and respiratory tract irritation. No evidence of liver damage at or near the recommended limit had been reported [1]. Table 1 contains a summary of the Federal standards, NIOSH recommended limits and the health effects considered in their establishment.

Recently a study by the National Cancer Institute has indicated that PCE causes liver cancer in laboratory mice. NIOSH revised recommendations now indicate that it would be prudent to handle PCE in the workplace as if it were a human carcinogen [1]. Safe levels of exposure to carcinogens have not been demonstrated, but the probability of cancer development is lowered with decreasing exposure levels. Neither the current Federal standard or the NIOSH

recommended levels for PCE may provide adequate protection from potential carcinogenic effects because they were selected to prevent diseases other than cancer [1]. Thus NIOSH recommends that occupational exposures to PCE be minimized in all ways possible.

Evaluation Criteria

Four sources of criteria are generally used in NIOSH evaluations to assess worker exposure to concentrations of air contaminants in the mining industry: (1) NIOSH criteria for recommended standards; (2) Mine Safety and Health Administration's adoption of the Threshold Limit Values (TLVs) for Coal and for Metal and Nonmetal Mining; (3) other Federal standards and (4) national consensus health standards. NIOSH criteria are generally utilized in assessing worker exposure to potentially hazardous agents except in cases where more current and stringent Federal or consensus standards exist or where sufficient "state of the art" health research information is available and can be applied.

III. METHODS AND DISCUSSION

Measurements of the solvent vapors were made utilizing a direct reading Wilks Miran 1A infrared spectrophotometer calibrated for PCE. Results of the air samples measured at various locations in the ASCS offices revealed an evenly distributed concentration of PCE vapors (approaching 20 ppm). The uniformity of the vapor was believed to be due to a recirculating heating/ventilation system. At the time of the survey the coal lab had not utilized PCE for several hours. This suggests that the ASCS office concentration was higher at some point in time prior to the survey. Employees reported the odor as "unpleasant and sickening". This is noteworthy as the reported odor threshold for PCE is 50 ppm.

IV. RECOMMDENDATIONS

A. Control of the solvent at its generation point should eliminate problems in the ASCS offices. Appropriate recommendations have been made to the company in the form of a formal report by this office.

B. Should the problem reoccur prior to the companies implementation of the recommended controls, ASCS employees should not be required to work in the office until such time as the PCE vapors have been eliminated.

C. Females of childbearing age should be warned of possible congenital abnormalities which may result from exposure to PCE during pregnancy.

V. BIBLIOGRAPHY

1. Tetrachloroethylene, Current Intelligence Bulletin 20, January, 1978, DHEW (NIOSH) Publication No. 78-112.

2. Summary of NIOSH Recommendations for Occupational Health Standards, October, 1978.

VI. AUTHORSHIP AND ACKNOWLEDGMENTS

Report Prepared By:

John T. Jankovic
Industrial Hygienist
Environmental Investigations Branch
Morgantown, West Virginia

Originating Office:

Michael J. Peach III
Team Leader
Mining Health Hazard Evaluations
Environmental Investigations Branch
Morgantown, West Virginia

Survey Assistance:

Thomas Vegella
Industrial Hygienist
Environmental Investigations Branch
Morgantown, West Virginia

Report Typed By:

Karen S. Sanderson
Secretary (Stenography)
Environmental Investigations Branch
Morgantown, West Virginia

TABLE I

SUMMARY OF NIOSH RECOMMENDATIONS FOR OCCUPATIONAL HEALTH STANDARDS
OCTOBER, 1978 [2]

ENVIRONMENTAL SUBSTANCE	MSHA STANDARD	NIOSH RECOMMENDATION FOR ENVIRONMENTAL EXPOSURE LIMIT	HEALTH EFFECT CONSIDERED	COMMENTS
Perchloro-ethylene	100 PPM TWA	50-PPM TWA (339 mg/cu m); 100-PPM ceiling (678 mg/cu m) (15-minute)	Nervous System, heart, respiratory, liver effects	Medical warning of possible congenital abnormalities required; demonstrated animal carcinogen