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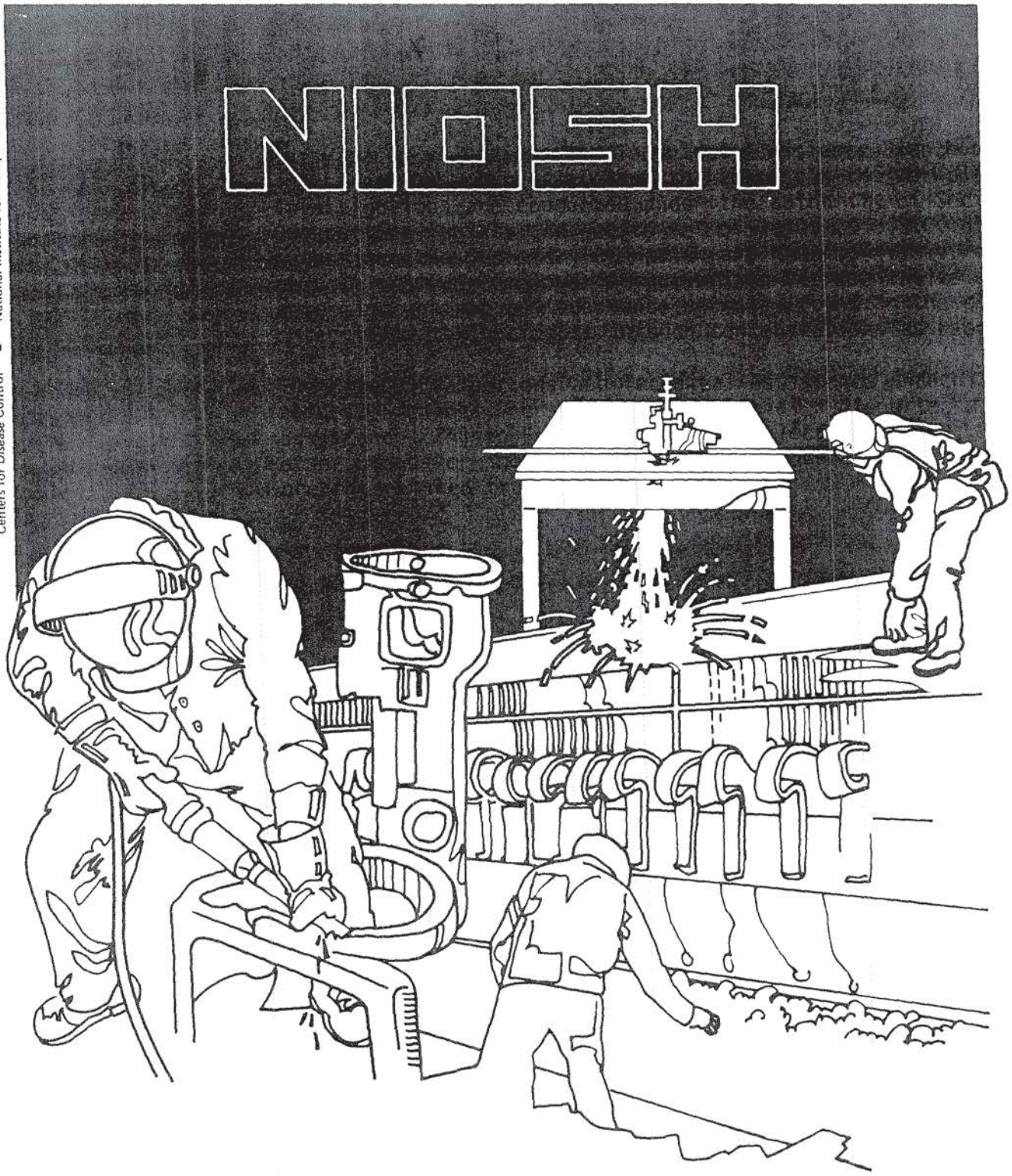

Health Hazard Evaluation Report

HETA 81-329-1049
NYASCO PRODUCTS, INC.
LONG ISLAND CITY, NEW YORK

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HETA 81-329-1049
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NYASCO PRODUCTS, INC.
LONG ISLAND CITY, NEW YORK

NIOSH INVESTIGATOR:
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I. SUMMARY

In June, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation from NYASCO Products, Inc., 3006 31st Street, Long Island City (Queens), New York, 11102. The request stated that two employees of NYASCO had persistent "allergy reactions" following the application of an insecticide in the basement of the building which houses the firm. The insecticide was identified as "Formula 707 #76 Roach Spray" which contains diazinon and allethrin as its active ingredients. Both of these compounds are degradable, that is they decompose and/or react with the environment, so that little of these chemicals are present a few weeks after their application. The insecticides were applied to the basement area of the building in April, 1981. A survey was conducted by the New York State Department of Environmental Conservation in May 1981, and trace amounts of the ingredients were found to be present in the basement but not in the NYASCO area of the building.

On August 19, 1981, a representative of NIOSH collected samples for the determination of airborne insecticides (allethrin and diazinon) in the NYASCO facility. No insecticides were detected upon analysis.

NYASCO is a distribution center for industrial clothing. Much of this clothing is made of "permanent press" fabric which is treated with a formaldehyde containing resin. The odor of formaldehyde was apparent upon entering the premises. Concentrations of 1 to 1.5 parts per million of formaldehyde per million parts of air (ppm) were determined to be present throughout the NYASCO facility and an adjoining retail clothing store, using direct reading detector tubes as the detection media. Analysis of bulk samples of fabrics indicated the formaldehyde content to be between 190 and 710 parts per million (by weight). Analysis of chromotropic acid treated charcoal samples indicated that airborne formaldehyde concentrations were between 0.1 and 0.6 ppm. NIOSH recommends that exposure to formaldehyde be handled as a potential carcinogen and that exposure be reduced to the lowest feasible limit.

The symptoms of at least one of the employees (dermagraphism) could be caused by exposure to formaldehyde. Since the general office work performed at NYASCO involves little direct contact with the treated fabrics, the most energy conserving method to achieve this would be through the relocation of the office inside an enclosure, with tempered air supplied from an outdoor source. As an alternative, the ventilation of the entire NYASCO area might be increased to achieve the same results.

Keywords: SIC 7218 (Work Clothing Supply Service) formaldehyde, diazinon, allethrin, dermographism.

II. INTRODUCTION

In June, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation from the management of NYASCO Products, Inc., 3006 31st Street, Long Island City, New York 11102, to investigate possible causes of persistent "allergy reactions" which were believed to be related to exposure to insecticides. Diazinon and allethrin were applied to the basement area in April, 1981. These insecticides have a short active life and were not found to be present in the NYASCO area during a survey by the New York State Department of Environmental Conservation in May, 1981. On August 19th, a NIOSH representative visited the NYASCO facilities and collected samples for the insecticides. Because the odor of formaldehyde was evident, environmental sampling for airborne formaldehyde vapor also was conducted. An interim report on the survey was sent to NYASCO Products, Inc. on September 4, 1981.

III. BACKGROUND

NYASCO Products, Inc. supplies work clothing to local industrial firms. It is housed in the rear of a retail store which sells sports and work clothing. Both of these facilities are approximately 45' x 30' with 15' high ceilings. There is an open doorway between the two rooms. NYASCO has two employees--the manager and his associate. Their duties are mainly billing and shipping of work clothing. The manager has worked for the firm at this site for over 25 years, the associate for 18 years, the clerk in the retail store for 20 years. The facility is supplied heat by the building management during cold weather, but has its own 10,000 BTU air conditioning units, one for each area. Almost all of the space in both rooms is devoted to display and storage of merchandise. No "chemicals" are used in either area. The NYASCO office area is located in an aisle amid floor to ceiling stacks of the work clothing. The office equipment consists of two typewriters and a check embossing machine. No duplicators are located at this facility.

During the winter of '80/'81, NYASCO experienced a mosquito infestation. The basement of the building (a former bowling alley) is in bad repair, with several large pools of stagnant water. The building's heating source is located in the basement with the result that the basement is always hot and humid. According to NYASCO's manager, the building's superintendent fumigated the basement in April 1981, by dumping several gallons of "Formula 707 #76 Roach Spray" throughout the basement area. The active ingredients in the roach spray are diazinon and allethrin. The carrier is petroleum distillate (identified by the manufacturer as a kerosene type mixture, which comprises about 99% of the total product). The manager further stated that several gallons of bleach were dumped into the pools of water in an effort to kill the mosquito larvae.

Within a few days of the fumigation, one employee of NYASCO developed tingling and itching sensations of his hands, neck and legs. His physician advised him that he had an allergy and treated him with cortisone and an anti-histaminic agent. The symptoms persist. The other employee became light-headed, had blurred vision and broke out in a hive-like rash. This employee still has a type of urticaria (hives) known as dermographism--linear weals that are produced by a light stroking of the skin. The weals appear whenever he brushes against a surface and disappear within a few minutes. He currently is being treated with an anti-histaminic agent. This employee stated that he has had episodes of hives in the past, usually during periods of emotional stress, that he has not had an episode of hives for about two years and that he is not under any known stresses at present. The clerk in the retail store has not developed any symptoms.

In May 1981, a representative of the New York State Department of Environmental Conservation, Bureau of Pesticides collected swab samples in the basement and NYASCO areas of the building. No trace of the insecticides were found in the NYASCO area (limit of detection not specified). The following concentrations, expressed in parts per million (ppm), of the insecticides were found in the basement areas: allethrin, 0.46 ppm; diazinon, 1.1 and 0.06; DDT, 2.29 and 0.08; and DDE (a metabolite of DDT), 0.77 and 0.01. DDT was not an ingredient of the insecticide compound applied in April, 1981, and the amounts found in the basement areas are trace residues from some past application.

IV. EVALUATION DESIGN AND METHODS

It was determined that the proper collection media for the insecticides diazinon and allethrin was a combination of commercially available "chromosorb" tubes and "AA" filters in series. Due to a difficulty in obtaining the sampling tubes because of a strike at the manufacturer, the industrial hygiene survey could not be performed until August 19th.

Upon arrival at the facility, the odor of formaldehyde was evident throughout the NYASCO area. Determinations of airborne formaldehyde concentrations were made using detector tubes as the sampling media. Concentrations of airborne formaldehyde ranged between 1 and 1.5 parts per million parts of air throughout both the NYASCO area and in the retail store. After preparing the equipment for sampling the insecticides, the NIOSH representative obtained chromatropic treated charcoal sampling tubes to verify the concentrations of airborne formaldehyde. The formaldehyde samples were collected that afternoon.

V. EVALUATION CRITERIA

The Poison Control Center (PCC) of the Medical University of South Carolina was contacted for toxicological information concerning exposure

to the insecticides. According to a representative of the PCC, the dizziness and blurred vision experienced by one of the employees of NYASCO is consistent with the effects of exposure to diazinon and/or to the petroleum distillate dispersant which commonly is used as the carrier for these types of insecticides. The itchy skin experienced by the manager of NYASCO is consistent with the possible effects of exposure to allethrin. The representative stressed that both diazinon and allethrin are biologically short lived insecticides. They rapidly react with the environment so that little of either chemical could be expected to persist several weeks after application. While the extent of exposure to the insecticides durring and immediately following their application cannot be determined, he doubted that any exposure to the pesticides would continue months after their application. During NIOSH's visit to the facility in August, an inspection of the basement area confirmed the fact that allethrin and diazinon have short active lives--the basement was reinfested with mosquitoes.

The PCC representative knew of no cases linking exposure to the insecticides with the dermographism experienced by the NYASCO employee. Accordıng to a NIOSH dermatologist, formaldehyde is a skin irritant which may cause cells to release histamine from tissue mast cells and from circulating basal cells, producing dermographism.

Diazinon

O,O-diethyl-O-(2-isopropyl-4-methyl-6-pyrimidinyl) phosphorothioate, commonly known as diazinon, is an organophosphate chemical used as an insecticide for roaches, flies and other pests. Organophosphate insecticides are cholinesterase inhibitors, or conversely, allow the accumulation of acetylcholine in the body. Cholinesterase is an enzyme which allows the relaxation of muscles. In large doses, organophosphate insecticides may cause paralysis, usually of the respiratory system. Organophosphates are absorbed through the skin, respiratory and gastrointestinal tracts. Absorption by the skin tends to be slow in comparison to other insecticides. Diazinon is considered to be relatively less toxic in comparison to other organophosphates.

The signs and symptoms of organophosphate poisoning in man usually are secondary to cholinesterase inhibition. The usual symptoms may include: headache, giddiness, nervousness, blurred vision, weakness, nausea, cramps and diarrhea. Signs include: sweating, miosis, tearing, salivation, muscular twitching and vomiting. In occupational exposure to organophosphates, symptoms usually are delayed from 4 to 12 hours after the last contact with the agent[1].

No exposure limit has been set for diazinon.

Allethrin

2,2-dimethyl-3-(2-methyl-1-propenyl)-,2-methyl-4-oxo-3-(2-propenyl)-2-cyclopenten-1-yl-cyclopropanecarboxylic acid ester, commonly known as

allethrin, is a synthetic analog of pyrethrum, a naturally occurring pesticide. It is absorbed through the respiratory and gastrointestinal tracts, and to a slight degree through the skin. Its pharmacologic action is that of paralysis, usually of the respiratory system. This insecticide is probably among the least toxic to man of all insecticides currently in use. Illness in man has most frequently resulted from the allergenic properties of the material rather than direct toxicity.

The most common manifestation of allethrin poisioning in man is dermatitis, consisting of mild redness and itching. The allergenic symptoms include sneezing and stuffiness. Recovery from the effects of exposure to allethrin is usually complete[2].

A Permissible Exposure Limit for pyrethrum (and by analogy for allethrin) of 5 milligrams per cubic meter of air (mg/M^3) has been set by the Occupational Safety and Health Administration (OSHA)[3].

Formaldehyde

Formaldehyde has many industrial and commercial applications. Its relevancy to this situation is that formaldehyde is found in and outgassed by many permanent press fabrics.

Formaldehyde is irritating to the eyes, nose and throat; it may cause burning sensations, pulmonary irritation, coughing, nausea, vomiting and dermatitis.

OSHA has established a Permissible Exposure limit for airborne formaldehyde of 3 parts per million parts of air (ppm), with a 5 ppm ceiling and a 10 ppm peak, never to be exceeded[3]. In 1977, NIOSH recommended an exposure standard of 0.8 ppm as a ceiling limit for a 30 minute time period, mainly to avoid irritation in exposed persons[4]. In 1981, NIOSH recommended that exposure to airborne formaldehyde be handled as a potential carcinogen, and that occupational exposure be reduced to the lowest feasible limit[5].

VI. RESULTS AND DISCUSSION

As expected from the information supplied by the Poison Control Center representative (that the insecticides were biologically short lived) and in confirmation with the findings of the previous survey performed by representatives of the New York State Department of Environmental Control, airborne concentrations of diazinon and allethrin were not detected (limit of detection = 0.5 mg/M^3).

Airborne concentrations of formaldehyde were determined to be present by two methods of survey. Concentrations of airborne formaldehyde were 1 to 1.5 ppm throughout the NYASCO area and the retail store area using detector tubes as the sampling medium. Using chromatropic treated

charcoal sampling tubes as the sampling media, the concentrations of airborne formaldehyde ranged from 0.1 to 0.6 ppm. The detector tube sampling method has not been certified for accuracy by NIOSH, and should be considered only an approximation of the true concentration of airborne formaldehyde. The four samples of permanent press fabrics were determined to contain formaldehyde ranging from 190 to 710 ppm (latent formaldehyde method of analysis), identifying the fabrics as probable sources of the airborne formaldehyde.

VII. CONCLUSIONS

Although no concentration of airborne diazinon and allethrin were determined at the time of the survey, the possibility of an over exposure to these insecticides cannot be ruled out, considering the sudden appearance of symptoms consistent to those of exposure to these insecticides immediately following fumigation, and the disappearance of at least some of the symptoms (dizziness, blurred vision) since then. The continuation of the itchiness experienced by one employee cannot be explained by the results of the survey and the literature reports of the effects of exposure to the insecticides or to formaldehyde. The continuing dermographism of the associate may be caused or exacerbated by continued exposure to airborne formaldehyde.

VIII. RECOMMENDATIONS

1. The office area of NYASCO is located amid stacks of work clothing made of permanent press clothing containing formaldehyde resin and outgassing formaldehyde vapor. In view of the possibility that the dermographism of an employee may be caused or affected by exposure to formaldehyde, and in consideration of the recent findings that formaldehyde should be treated as a potential cancer-causing substance, NIOSH recommends that exposure to formaldehyde be reduced to the lowest feasible limit. This can best be achieved by the creation of an office area separate from the formaldehyde containing fabrics. This separate office area should be supplied with tempered air from an outside source. As an alternative, consideration should be given to increasing the ventilation rate of the entire NYASCO area as a method of achieving reduced formaldehyde exposures.

2. Considering the appearance of symptoms consistant to those of exposure to allethrin and diazinon following the application of the insecticide, and the abatement of some of the symptoms within a short time, the possibility exists that the employees of NYASCO were affected by exposure to the insecticides. NIOSH recommends that any future application of insecticides be performed with caution, in accordance with the application directions, and that the application be done over the weekend, when NYASCO personnel are not present.

IX. REFERENCES

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X. AUTHORSHIP AND ACKNOWLEDGEMENT

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XI. DISTRIBUTION AND AVAILABILITY OF REPORT

For the purpose of informing affected employees, this report should promptly be posted for at least 30 days in a prominent place(s) near where exposed employees work.

Copies of this report will be available from NIOSH, Division of Standards Development & Technology Transfer, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio, 45226, for 90 days. Thereafter, copies will be available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22151. Information regarding its availability from NTIS can be obtained from the NIOSH Publications Office at the Cincinnati address.

Copies of this report have been sent to:

1. NYASCO N.Y., N.Y.
2. U. S. Department of Labor, OSHA, Region II Office, N.Y., N.Y.
3. U. S. Department of Health & Human Services, NIOSH, Region II Office, N.Y., N.Y.
4. New York State Department of Health, Albany, N.Y.