U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 78-113-589

HOPKINS AGRICULTURAL CHEMICAL CO.
ATLANTA, ILLINOIS

APRIL 1979

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) on January 9-11, 1979, at the Hopkins Agricultural Chemical Company in Atlanta, Illinois. Breathing zone and general area samples were taken for Counter (R) 15-G insecticide, respirable particulates, total particulates, and respirable free silica. All of the samples were well below the evaluation criteria. Observation of work practices and protective equipment, individual worker interviews by the industrial hygienist, and review of the company's routine cholinesterase monitoring also suggested that there were no general health problems connected with this work place. Although working conditions found at the time of this evaluation did not constitute a health hazard to the workers, recommendations have been offered at the end of this report to further improve the work environment.

II. DISTRIBUTION AND AVAILABILITY

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After ninety (90) days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati, Ohio address.

Copies of this report have been sent to:

a) Hopkins Agricultural Chemical Co.

b) Requesters

c) U. S. Department of Labor - Region V

d) NIOSH - Region V

For the purpose of informing the 10-20 affected employees, copies of the report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970 29 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by 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 National Institute for Occupational Safety and Health received a request from an authorized representative of employees regarding exposure to Counter (R) 15-G insecticide at the Hopkins Agricultural Chemical Co. in Atlanta, Illinois.

The possibility of a health hazard existing at this plant was first called to NIOSH's attention by the Occupational Safety and Health Administration (OSHA) Region V - Peoria Area Office on June 21, 1978. They supplied NIOSH with a limited amount of data on "Counter 15-G (R)" and copies of the company's red cell and plasma cholinesterase monitoring data for the past year. The laboratory data was reviewed by the NIOSH physician and additional data on the toxic effects of terbufos, the active ingredient, obtained by telephoning active researchers of the product. It was established that terbufos was a potent cholinesterase inhibitor (of about the same toxicity as parathion). The monitoring data showed individually consistent, normal levels* of both red cell and plasma cholinesterase levels. The laboratory performing the tests was duly licensed by the state of Illinois, and was approved for Medicare payments. These findings were communicated to OSHA by telephone.

IV. HEALTH HAZARD EVALUATION

A. Plant Process

The company is basically a mixing operation, where organophosphates are mixed with inert ingredients to form soil insecticides. Counter(R) 15-G insecticide is made by spraying terbufos (s-[[(1,1-dimethylethyl) thio] methyl] 0,0-diethyl phosphorodithioate) onto clay which is contained in a rotary mixing drum. After mixing, the insecticide is screened for size and then placed into a hopper for dispensing into 20 and 50 pound bags. The bagging and sealing parts of the operation were partially enclosed and local exhaust ventilated. Smoke tube testing revealed that turbulence from a ceiling mounted heating unit was defeating some of the capture efficiency of the bagging local exhaust system.

B. Evaluation Design

An initial survey was conducted on January 9, 1979. The NIOSH Regional

*Normal for laboratory performing tests.

Industrial Hygienists made a complete walk through of the plant, accompanied by management representatives. Twenty-one employees were given nondirected interviews to determine if they had experienced health problems as a result of their work place exposure.

On January 10, 1979, an environmental survey of the plant was conducted by NIOSH investigators. Personal breathing zone and general area atmospheric samples were taken for Counter (R) 15-G insecticide, respirable particulates, total particulates, and respirable free silica.

A closing conference was held on January 11, 1979, to inform the plant manager of future actions (interim reports, final report, etc.) to be taken by the NIOSH investigators.

Interim Report #1 was submitted to the requesters and plant management on January 25, 1979, to provide them with information concerning actions taken to date, preliminary results, future actions, and recommendations.

C. Evaluation Methods

Atmospheric samples for Counter (R) 15-G insecticide were collected on 37mm diameter glass fiber filters held in a closed face cassette attached via tygon tubing to battery operated air sampling pumps operating at a flow rate of 1.5 liters per minute. Samples were analyzed by gas chromatography.

Respirable particulate and respirable free silica were collected on a 37mm diameter low ashing type of polyvinyl chloride filter. The sampling train consisted of a filter, 10 millimeter nylon cyclone size selective sampler, and a battery powered air sampling pump operating at 1.7 liters per minute. The weight of the samples were determined by subtracting the pre-sampling weight from the post-sampling weight of the filter. Analysis for free silica was performed using X-ray diffraction.

Total particulate samples were collected on 37mm diameter polyvinyl chloride copolymer filters attached to a battery operated air sampling pump operating at a flow rate of approximately 2.0 liters per minute. The weight of the samples were determined by subtracting the pre-sampling weight from the post-sampling weight of the filter.

D. Evaluation Criteria

In order that workers may better understand the potential health hazards associated with the chemical substances evaluated during this study, the following discussion is provided.

Counter(R) 15-G insecticide -- overexposure to organophosphate pesticides(4) of this type can cause nausea, headache, giddiness, vertigo, and weakness. Also, there can be loss of muscle coordination, slurring of speech, twitching of muscles, excessive muscous production leading to runny nose and excessive saliva. There can be some chest tightness. In severe cases death occurs from respiratory arrest. It is usual to monitor workers exposed to the organophosphate pesticides by determinations

of red cell and plasma cholinesterase levels. If these should begin to drop, this would indicate a continuing overexposure and require remedial action. As organophosphate pesticides can be absorbed by inhalation, ingestion, or skin contact, good work practices are essential. The formulators of the pesticide (American Cyanamid) recommend that no worker be exposed to a concentration greater than 0.05 milligrams per cubic meter of air determined as a time-weighted average (TWA). There is no OSHA standard.

Crystalline Silica -- The primary health effects associated with inhalation of free silica is a form of pneumoconiosis (dusty lung) termed silicosis. As the silicon dioxide is deposited into the lungs, the silica stimulates production of fibrotic nodules. The nodules in turn compress the alveoli (air sacs) thereby decreasing the lung function and producing restrictive type pulmonary disease. NIOSH recommends an exposure limit of 50 micrograms of free silica per cubic meter of air (TWA). (1) The OSHA standard is derived by dividing 10 mg/M^3 by the % Quartz + 2.(2)

Respirable Particulate -- The ACGIH recommends a TLV of 5 milligrams per cubic meter of air. (3) The OSHA standard is the same. (2)

Total Particulate -- The ACGIH recommends a TLV of 10 milligrams per cubic meter. (3) The OSHA standard is 15 milligrams per cubic meter.of air (3) The OSHA standard is 15 milligrams per cubic meter of air. (2)

E. Evaluation Results

Results from the personal breathing zone and area samples collected are shown in Tables 1-3. All of the samples collected over the full work shift (approximately 8 hours) produced results which were well below the evaluation criteria for the substances analyzed. Good work practices were being utilized at the plant which contributed to the low airborne concentrations found.

Only five of the sixteen employees interviewed by the NIOSH industrial hygienist talked of a possible job-related problem. Of these one was unrelated to terbuphos and a second was a one-time-only splash. Of the other three the only one with clearly defined symptoms had complicating medical problems antidating his employment. Cholinesterase levels were available on 41 workers dated between September 21, 1977 and June 2, 1978. Ten workers had only one determination during this period, but the rest had up to ten determinations done on a fairly regular schedule. Red cell levels varied from 0.58 to 1.00 (laboratory normals 0.5 to 1.0 PH Units), and serum levels varied from 5.4 to 9.1 (laboratory normals 3.0 to 8.0 units). In all cases the individual's results showed very little variation from test date to test date.

F. Recommendations

1) Enclose local exhaust ventilation hoods as much as possible. This will increase the ventilation system efficiency and eliminate problems with cross-drafts.

2) Use personal protective equipment to avoid accidental oral and eye exposure.

3) Continue cholinesterase monitoring program.

V. REFERENCES

(1) NIOSH Recommended Standard for Occupational Exposure to Crystalline Silica, NIOSH, Cincinnati, Ohio (1974)

(2) Federal Register, Volume 39, No. 125, Title 29, Code of Federal Regulations, Part 1910, July 1977.

(3) American Conference of Governmental Industrial Hygienists: Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended changes for 1978, Cincinnati, Ohio, (1978).

(4) M.M. Gleason, R.E. Goslin, H.C. Hodge, and R.P. Smith, Clinical Toxicology of Commercial Products, 3rd Ed. The Williams and Williams Co., Baltimore, 1969

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RHE 78-113
Hopkins Agricultural Chemical Co.
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TABLE 1
RESULTS OF ENVIRONMENTAL SAMPLING ON JANUARY 10, 1979
FOR COUNTER 15-G INSECTICIDE

Job/Location	Sample Number	Time of Sample	Counter 15-G (mg/M^3)	Type of Sample
Mixer	GF-1	07:56-15:00	0.007	BZ
Forklift Driver	GF-2	07:49-15:01	0.002	BZ
Stacker	GF-3	07:51-14:59	0.004	BZ
Bagging and Sealing	GF-4	07:43-14:59	0.011	BZ
Mixer Operator Area	GF-6	07:44-14:52	0.002	GA
Stacker	GF-7	07:31-14:47	0.004	BZ
Bagging Area	GF-8	07:42-14:50	0.005	GA
Bagging and Sealing	GF-9	07:33-14:51	0.006	BZ

NIOSH Limit of Detection (mg/sample)	0.00005
Evaluation Criteria (mg/M^3)	0.05

mg/M^3 = milligrams of substance per cubic meter of air
BZ = breathing zone
GA = general area

RHE 78-113
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TABLE 2

RESULTS OF ENVIRONMENTAL SAMPLING ON JANUARY 10, 1979
FOR RESPIRABLE PARTICULATES AND FREE SILICA

Job/Location	Sample Number	Time of Sample	Respirable Particulate (mg/M^3)	Respirable Quartz (mg/M^3)	Respirable Cristobalite (mg/M^3)	Type of Sample
Stacker	FW-3309	07:46-14:58	0.66	*	*	BZ
Stacker	FW-3304	07:53-14:58	0.72	*	*	BZ
Stacker	FW-3311	07:40-14:48	0.46	*	*	BZ
Forklift Driver	FW-3305	07:38-14:50	0.49	*	*	BZ
NIOSH Limit of Detection(mg/sample)			0.01	0.03	0.03	
Evaluation Criteria (mg/M^3)			5.0	0.05	0.05	

mg/M^3 = milligrams of substance per cubic meter of air
BZ = breathing zone
* = below the NIOSH limit of detection

RHE 78-113
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TABLE 3

RESULTS OF ENVIRONMENTAL SAMPLING ON JANUARY 10, 1979
FOR TOTAL PARTICULATES

Job/Location	Sample Number	Time of Sample	Total Particulates (mg/M^3)	Type of Sample
Stacker	D-1704	07:45-15:04	2.2	BZ
Stacker	D-1741	07:37-14:48	1.2	BZ

NIOSH Limit of Detection (mg/sample	0.01
Evaluation Criteria (mg/M^3)	10.0

mg/M^3 = milligrams of substance per cubic meter of air
BZ = breathing zone