HETA 99-0030-2759
Helena Chemical Company
West Helena, Arkansas

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PREFACE

The Hazard Evaluations and Technical Assistance Branch of the National Institute for Occupational Safety and Health (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, technical and consultative assistance 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. Mention of company names or products does not constitute endorsement by NIOSH.

ACKNOWLEDGMENTS AND AVAILABILITY OF REPORT

This report was prepared by Joel McCullough, M.D., M.P.H., M.S., and Joshua Harney, M.S., of the Hazard Evaluations and Technical Assistance Branch, Division of Surveillance, Hazard Evaluations and Field Studies (DSHEFS). Analytical support was provided by Ardith Grote, Division of Physical Science and Engineering (DPSE). Desktop publishing was performed by Patricia McGraw. Review and preparation for printing were performed by Penny Arthur.

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

Evaluation of Helena Chemical Company

In February of 1999, NIOSH representatives conducted a health hazard evaluation at the Helena Chemical Company. We looked into employee concerns about the relationship between health problems and pesticide exposure.

What NIOSH Did

We interviewed 23 workers and asked them about health concerns related to chemicals at work.

We tested the air in the Super Tin packaging area to find out how much of the Super Tin was in the air.

We reviewed programs for respiratory protection and for informing workers of the chemicals that they work with.

What NIOSH Found

Most of the workers we interviewed had no health concerns related to chemicals at work.

Most of the reported health problems occurred more than 10 years ago.

We found no evidence of lasting health problems from working with chemicals in the workers we interviewed.

If used properly, respirators used can lower exposure.

What Helena Chemical Company Managers Can Do

Routine personal air sampling should be done in areas where respirators are used.

Workers should be told about how chemicals they work with may affect their health, and about how to protect themselves.

Create a safety committee that includes hourly workers and management.

Contract with a doctor who could learn about the exposures in the workplace. This doctor can then better determine if health problems are related to work.

What the Helena Chemical Company Employees Can Do

Workers who have health concerns related to the workplace should report these concerns to company.

Workers should attend training (if offered) to learn about the chemicals they work with.

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National Institute for Occupational Safety and Health
NIOSH

Health Hazard Evaluation Report 99-0030-2759
Helena Chemical Company
West Helena, Arkansas
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SUMMARY

On November 13, 1998, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation (HHE) from employees of Helena Chemical Company (HCC) in West Helena, Arkansas. This request concerned possible health effects related to exposure to pesticides produced at the plant. The requestors health concerns included "low blood counts," respiratory problems, visual problems, allergies, and nerve damage.

An industrial hygiene and medical evaluation was conducted on February 23 – 24, 1999. Area monitoring for airborne organotins was conducted, as were reviews of the written respiratory protection program, hazard communication programs, and training records. Medical interviews were also conducted.

NIOSH investigators interviewed 23 HCC employees. Most employees reported that they had no symptoms or health concerns related to their workplace exposures. Nine employees reported symptoms or health concerns which they related to various past exposures they had in the workplace, but most of the symptoms occurred more than 10 years ago when more toxic pesticides were formulated at HCC. Few workers, however, reported any symptoms or health condition that they related to exposures they received in the workplace within the last 2 years. These symptoms were upper respiratory tract irritation. The pesticides most associated with their reported symptoms were Super Tin® (triphenyltin hydroxide), methyl parathion, and Demon® (a pyrethroid). Most of the symptoms reported occurred more than 10 years ago.

Nine area air samples were collected for organotins (triphenyltin hydroxide) from three locations: inside the Super Tin packaging room atop the bagging box, inside the Super Tin room on the conveyor line, and outside the Super Tin room near the conveyor pass-through. Super Tin was not detected outside the packaging room. Three air samples collected within the Super Tin room yielded triphenyltin hydroxide concentrations in excess of the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL), the NIOSH Recommended Exposure Limit (REL®), and the American Conference of Governmental Industrial Hygienists (ACGIH®) Threshold Limit Value (TLV®) of 0.1 mg/m^3 measured as a time-weighted average. This indicates that workers may be over-exposed if these concentrations are uniform within the work area and continue for an entire work shift. Personal breathing zone sampling should be conducted in the Super Tin packaging area to document personal exposures to triphenyltin hydroxide, and any recommendations for reducing exposures should be made based on these results and not solely on the area air samples collected during this HHE

Four area air samples indicate that over a 2-3 hr. period, the airborne concentration of Super Tin ranged from 0.04 to 0.4 mg/m^3 even though the packaging machine is fully enclosed and exhausted. Workers in the Super Tin packaging room wore powered air purifying respirators with loose-fitting hoods, which have an assigned protection

factor of 25. All air sample results were below the maximum use concentration (upper limit of exposure above which the respirator should not be used) for this work environment.

Our evaluation found no evidence of a health hazard. Environmental sampling in the Super Tin packaging room, however, indicates that over-exposure may occur if appropriate personal protective equipment is not used properly.

KEYWORDS: SIC: 2879 (Pesticides and Agricultural Chemicals, Not Elsewhere Classified) pesticides production, organotin, tin, Super Tin®, organophosphates, respiratory protection, organochlorines.

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INTRODUCTION

On November 13, 1998, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation (HHE) from employees of Helena Chemical Company (HCC) in West Helena, Arkansas. This request concerned possible health effects related to exposure to pesticides at the plant, including toxaphene, arsenic, DDT, DDE, Azodrin®, Lorsban®, and paraquat. Reported health concerns included "low blood counts," respiratory problems, visual problems, allergies, and nerve damage.

In response to this request, NIOSH investigators conducted a site visit on February 23–24, 1999. This included area monitoring for airborne organotins, as well as reviews of the written respiratory protection and hazard communication programs and training records. Confidential medical interviews were also conducted.

BACKGROUND

Helena Chemical Company is owned by Maribeni America Corporation of New York, New York. This plant began operation in 1957. There are approximately 150 workers, with 100 year-round workers; the remainder are seasonal. Most seasonal employees work from January through July, when production is at its highest level. The facility receives intermediate and finished products and then, through a series of mechanical processes, produces pesticides to meet customer specifications.

On January 17, 1995, investigators from the Arkansas Department of Health (ADH) conducted a site visit at HCC. The investigation consisted of a walk-through inspection of the plant and worker interviews. None of the employees interviewed complained of any health conditions which they believed were related to their workplace exposures. Number of employees interviewed, the method of selection of employees to be interviewed, and whether the interviews were confidential were not reported. ADH investigators reported that the employees wore appropriate personal protective equipment (PPE). ADH investigators concluded that they found no evidence that HCC injured its employees or the environment from excess chemical exposure.

In 1995, the ADH conducted a cancer mortality investigation in Phillips County, the county in which HCC is located. This was prompted by concerns about the cancer rate among employees of HCC. The ADH concluded that there was no evidence of elevated cancer rates among African-Americans in Phillips County. African-Americans comprise most of the workforce at HCC. Also, the ADH Division of Vital Records was asked to review the death certificates of 11 individuals whose deaths were alleged to be related to employment at HCC. The death certificates of three were not found. Six of the remaining eight were employed at HCC. The cause of death for four was listed as myocardial infarction, carcinoma of the colon and acute leukemia accounted for the remaining two. Of the two people listed and not employed by HCC, the causes of death were myocardial infarction and complications from diabetes. ADH concluded that these deaths were not related to employment at HCC.

Other previous investigations at HCC included investigations by the Occupational Safety and Health Administration (OSHA) in August 1994 and August 1995. On these inspections, OSHA found no violations at the plant. OSHA also reviewed the Log and Summary of Occupational Injuries and Illnesses. These logs showed that most reportable cases were traumas, such as strains, sprains, lacerations, and burns. There were no reports of pesticide poisoning in the logs. In 1998, another OSHA inspection occurred. HCC was cited for malfunctioning shower and eyewash stations, and for incomplete information on the OSHA 200 log.

In the past, HCC formulated and packaged a wide range of dry and wet pesticides. They do not synthesize any pesticides. These products ranged from EPA Toxicity Class I to Class IV, and represented various families of compounds,

including organotin, organophosphates, organic arsenical, organonitrogen, and organochlorine.[1] In recent years, the number of pesticides and the percentage that are Toxicity Class I or II have been reduced. Many of the chemicals listed in the HHE request to which workers may have been exposed are no longer formulated by HCC, including paraformaldehyde [not formulated after 1992], captan [1998], Azodrin [1989], Lorsban [1986], paraquat [1990], and dichlorodiphenyltrichloroethane (DDT). During the site visit the following products were being formulated (Toxicity Class in parentheses): Aero Dyne-Amic® (I), Super Tin (I), Amdro® (III), Cycocel® (III), Orbit® (III), Procure® (III), Quest® (non-toxic), Agridex® (non-toxic), and crop oil concentrate (non-toxic).[2]

HCC formulates and packages products for other pesticide companies. In most formulations, a technical solution is mixed with other additives that make it easier for the end-user to apply in the field. Wet products, like Aero Dyne-Amic, are formulated by mixing "inert" liquids like vegetable oils with a technical solution from the manufacturer. In the case of dry products, like the ant insecticide Amdro, a powdered substrate [corn grits, in this case] is blended with the technical solution and the product is milled [to assure uniform granule size], packaged, sealed, and boxed for shipment. Other products, like the fungicide Super Tin, are brought in from the manufacturer and may only undergo physical processing, like milling, and then packaging for shipment to the retailer.

METHODS

Medical

Confidential medical interviews were conducted with employees of HCC. Interviewed employees were chosen randomly by NIOSH investigators from a personnel list supplied by the company. The employees interviewed encompassed different job titles throughout the plant. In addition, several workers were interviewed by telephone because they preferred being interviewed outside the workplace. Workers were asked about personal health concerns, symptoms, or medical conditions which they believe to be related to their workplace exposures. The purpose of the interviews was to determine if the workers had health concerns that could be related to workplace exposures, as well as to determine if and how work practices may have contributed to the exposures. In addition to the medical interviews, a NIOSH investigator reviewed the OSHA 200 Logs and Summary of Injury and Illness for the previous 5 years.

Industrial Hygiene

The industrial hygiene evaluation consisted of a walk-through inspection to become familiar with the process areas and to observe HCC health and safety practices, review the written hazard communication program and training records, and to review of the respiratory protection program and training records. Area air samples were collected in the Super Tin production area to qualitatively assess the effectiveness of engineering controls and to determine whether personal sampling would be needed in the future. Nine area air samples were collected from three locations: inside the Super Tin packaging room atop the bagging box, inside the Super Tin room on the conveyor line, and outside the Super Tin room near the conveyor pass-through. At each location, two organic vapor samplers [OVS] and one 37-mm cassette with a mixed cellulose ester [MCE] filter were used. All samples were analyzed for tin according to NIOSH Method #7300,[3] modified for microwave digestion. The OVS samplers contain two collection media: a quartz filter and a chemical sorbent bed. Because vapor phase was not anticipated in the Super Tin packaging area, only the quartz filters were analyzed.

The sample flow rate for the 37-mm cassette samples, containing MCE filters, was 2 liters per minute (Lpm). The filters were analyzed for elemental tin using a Thermo Jarrell ICAP 61-E inductively coupled plasma emission spectrometer controlled by ThermoSpec software. The results for triphenyltin hydroxide, the active agent in Super Tin, were calculated based on the mass balance. For elemental tin, the limit of detection (LOD) and limit

of quantification (LOQ) were 1 and 4 µg/filter, respectively. Based on the average sampling volume of 350 L, the corresponding minimum detectable concentration (MDC) and minimum quantifiable concentration (MQC) were 2.9 and 11.4 µg/m^3, respectively. For triphenyltin hydroxide, the LOD was 3 µg/filter and the LOQ was 10 µg/filter. The MDC and MQC were therefore 8.6 µg/m^3 and 28.6 µg/m^3 respectively, based on the average sampling volume of 350 L.

The six area samples collected using OVS tubes used a sampling flow rate of 1 Lpm. These samples were analyzed as above, but the ICP used was a Fisons ACCURIS model. For elemental tin, the LOD and LOQ were 2 and 7 µg/filter, respectively. Based on the average sampling volume of 180 L, the corresponding MDC and MQC were 11.1 and 38.9 µg/m^3, respectively. For triphenyltin hydroxide, the LOD was 6 µg/filter and the LOQ was 20 µg/filter. The MDC and MQC were therefore 33.3 µg/m^3 and 111.1 µg/m^3 respectively, based on the average sampling volume of 175 L.

EVALUATION CRITERIA

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for the assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects even though their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy). In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increase the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: (1) NIOSH Recommended Exposure Limits (RELs),[4] (2) the American Conference of Governmental Industrial Hygienists' (ACGIH®) Threshold Limit Values (TLVs®),[5] and (3) the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs).[6] Employers are encouraged to follow the OSHA limits, the NIOSH RELs, the ACGIH TLVs, or whichever are the more protective criterion.

OSHA requires an employer to furnish employees a place of employment that is free from recognized hazards that are causing or are likely to cause death or serious physical harm.[7] Thus, employers should understand that not all hazardous chemicals have specific OSHA exposure limits such as PELs and STELs. An employer is still required by OSHA to protect their employees from hazards, even in the absence of a specific OSHA PEL.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8-to-10-hour workday. Some substances have recommended short-term exposure limits (STEL) or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from higher exposures over the short-term.

Organotin

Organotin compounds are formulated as wettable and flowable powders for use mainly as fungicides to control blights on field crops and orchard trees.

Organotin compounds are a group of compounds which have at least one covalent carbon-tin bond that are used commercially as stabilizers in polymers, as biocides, and as catalysts. There are a large number of different compounds in this class which have a variety of toxic effects. The most toxic organic tin compounds are the trialkyl tins, followed by the dialkyl and monoalkyl tin compounds, with the ethyl derivative in each group being reported as the most toxic.[8]

Organotin compounds are irritating to the eyes, respiratory tract, and skin, and some can cause cerebral edema, hepatic necrosis, and produce central nervous system or cardiovascular effects.[9] Organotins are probably absorbed to a limited extent by the skin and gastrointestinal tract. Manifestations of toxicity are due principally to effects on the central nervous system: headache, nausea, vomiting, dizziness, and sometimes convulsions and loss of consciousness. Photophobia and mental disturbances can occur. Epigastric pain is reported, even in poisoning by inhalation. Elevation of blood sugar, sufficient to cause glycosuria, has occurred in some cases.[10] The phenyltin fungicides, such as Super Tin, are less toxic than ethyltin compounds, which have caused cerebral edema, neurological damage, and death in severely poisoned individuals who were exposed dermally to a medicinal compound of this type. No deaths and very few poisonings have been reported as a result of occupational exposures to phenyltin compounds.[11]

It may be most appropriate to compare the air sampling data for triphenyltin hydroxide (Super Tin) to the occupational exposure limits for organotins, measured as tin, while noting the fact that the analytical method used (NIOSH sampling method 5504, 'Organotins'[12]) was not validated for this particular compound. Triphenyltin hydroxide proved to be difficult to analyze, resisting aggressive digestion more vigorously than other organotins. NIOSH, OSHA, and ACGIH exposure criteria for organic tin compounds are identical: 0.1 mg/m^3, TWA measured as tin. The OSHA and ACGIH criteria are based on an 8-hr. per day, 40 hr. work week, while the NIOSH criterion is based on work days up to ten hours, for a 40 hr. work week. A 15-minute STEL of 0.2 mg/m^3 for organic tin compounds (measured as tin) is also recommended by ACGIH to prevent acute symptoms such as headache, respiratory irritation, and nausea.[4] The TLV also includes a skin notation, indicating that skin absorption is a possible route of exposure.

Respiratory Protection

The OSHA respiratory protection standard states that preventing atmospheric contamination of the workplace "shall be accomplished as far as possible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used pursuant to this section."[13] NIOSH provides guidance for selecting an appropriate respirator in *Guide to Industrial Respiratory Protection*.[14] One important aspect of a respiratory protection program is to ensure that a respirator adequately protects its wearer at the contaminant concentrations encountered.

To select a respirator for use in a particular task, the contaminant concentration that will be encountered should be known. When this information is available, the minimum needed level of protection can be determined by dividing the highest exposure measurement by the most conservative occupational exposure limit. One can then choose a type of respirator that has a protection factor equal to or exceeding this minimum level of protection. Eye protection in the form of respirators with full facepieces, helmets, or hoods is required for routine exposures to airborne contaminants that cause any eye irritation.[15]

To help determine the appropriateness of a particular respirator for a given exposure, each class of respirator is given an "assigned protection factor" (APF).[15] The APF is the expected level of protection that would be provided by a properly functioning respirator when properly fitted to and worn by a trained user. When one multiplies a respirator's APF by the most protective occupational

exposure limit (REL, PEL, or TLV, etc.) for the contaminant of concern, a "maximum use concentration" (MUC) is generated. The MUC serves as the upper limit of exposure above which the respirator should not be used (i.e. APF X REL = MUC). In the case of organotin exposure while using a powered air purifying respirator with a loose fitting facepiece and continuous flow (APF=25), the MUC would be 2.5 mg/m^3 (25 APF * 0.1 mg/m^3 = 2.5 mg/m^3).

RESULTS

Medical

Medical interviews were obtained from 23 employees of HCC. The average length of employment of those interviewed was 19 years (range: 2-31 years). Of these 23 employees, 14 reported that they had no symptoms or health concerns related to their workplace exposures. The remaining 9 employees reported symptoms or health concerns which they related to various exposures they had in the workplace. Most of the symptoms, however, occurred more than 10 years ago. Few workers reported any symptoms or health condition that they related to exposures they received in the workplace within the last 2 years. Two workers reported current intermittent irritation of their upper respiratory tract by two separate products, Terrachlor® (disulfoton) and Ramrod® (dalapon). The pesticides most associated with their reported symptoms were Super Tin (triphenyltin hydroxide), methyl parathion, and Demon® (cypermethrin), a pyrethroid.

Several workers reported that management was not concerned with their health, and they felt intimidated about expressing these concerns. Management, on the other hand, felt that the workers were free to express their concerns without any repercussions.

Industrial Hygiene

The Super Tin packaging operation is in a negatively pressurized room, with a conveyor line that carries sealed finished packages out of the room to the warehouse where they are boxed, wrapped, and prepared for shipment. Usually three or four workers work in this room each shift, while two to four work in the warehouse stacking the boxes on pallets, wrapping them, and preparing the pallets of boxes for shipment.

The Super Tin powder is fed from its bulk storage tank or blending container into an enclosed, exhausted, plexiglass cabinet and pumped into small plastic bags which are then sealed while still within the cabinet. The plastic bags are then mechanically dropped into paper bags that are labeled with the appropriate toxicity information. The bags are visually inspected, closed, and passed down the conveyor out of the room and into the warehouse where they are boxed for shipment. Workers inside the room are required by management to wear respiratory protection. During this HHE, all workers wore powered air-purifying respirators with high efficiency particulate air HEPA filter cartridges and loose fitting hoods.

Air sampling results can be found in Table I. Triphenyltin hydroxide was not detected outside the Super Tin packaging room. One MCE filter air sample collected within the Super Tin room, and both OVS samples atop the bag box, yielded concentrations in excess of 0.1 mg/m^3. This indicates that workers may potentially be over-exposed if these concentrations are uniform throughout the work area and continue for an entire work shift. Five of the nine samples had concentrations lower than the minimum level of quantitation.

The written respiratory protection and hazard communication programs revealed that each program addressed all the major elements of the OSHA respiratory protection and hazard communication standards, respectively.[13,16] Employee training attendance sign-in sheets indicated that workers have been trained on each topic in the past year. Employees in the Super Tin

area were observed correctly using the respirators supplied to them.

DISCUSSION

The medical interviews indicate that over-exposure to pesticides may have occured in the past (more than 10 years ago); workers reported symptoms consistent with over-exposure to the specific pesticides that they named. The majority of the interviewed workers reported that they had no symptoms or health conditions which they related to current workplace exposures.

The medical interviews indicate that symptoms related to current exposure levels to pesticides are infrequent. The decrease in work-related symptoms and health concerns over the years is likely due to the decreased toxicity of the pesticides being produced at the plant and possibly to improved exposure control measures. None of the interviewed employees reported chronic health conditions that can be attributed to their workplace exposures. Also, in the investigation done by the ADH in 1995, the causes of death among former employees of HCC were heterogeneous and appeared unrelated to workplace exposures.

Area air sample results in the Super Tin bagging room indicate that workers may be exposed to a range of triphenyltin hydroxide concentrations from 'trace' to 0.4 mg/m^3. Area air sampling results are not necessarily accurate predictors of personal breathing zone (PBZ) results. The integrated exposure a worker may receive is likely to vary from the result of an area sample collected at a single fixed location in the same general work area as the worker. This is especially true when there is a wide range of contaminant concentrations within a work area, as in the Super Tin packaging room. Currently HCC uses engineering controls to lower potential exposures to Super Tin. The bagging operation is done in a room that is kept under negative pressure relative to the surrounding warehouse, and the actual bagging is done mechanically inside an evacuated plexiglass box. Our sampling detected no Super Tin escaping from the bagging room, although levels near the bagging enclosure within the packaging room did exceed 0.1 mg/m^3.

To select a respirator for use in a particular task, the contaminant concentration that will be encountered should be known. When this information is available, the minimum needed level of protection needed can be determined by dividing the highest exposure measurement by the most conservative occupational exposure limit. One can then choose a type of respirator that has an assigned protection factor equal to or exceeding this minimum level of protection. Eye protection in the form of respirators with full facepieces, helmets, or hoods is required for routine exposures to airborne contaminants that cause any eye irritation.[15]

Using this method, workers in the Super Tin packaging area should use respirators with assigned protection factors of 4 or higher and that protect against eye irritation, assuming that measurements taken during this HHE are characteristic of the usual work environment. (0.4 mg/m^3 [from Table 1] ÷ 0.1 mg/m^3 [lowest occupational exposure limit] = 4). However, exposures should first be thoroughly characterized so that the minimum level of protection is not underestimated.

Both NIOSH and ANSI list '25' as the APF for powered air purifying respirators with loose fitting facepieces.[15,16] When this APF is multiplied by the REL for organotins, as tin, of 0.1 mg/m^3 the MUC is 2.5 mg/m^3. It would not be appropriate to rely on these respirators to adequately protect workers once the full shift PBZ concentration of triphenyltin hydroxide rose above 2.5 mg/m^3. Assuming exposures do not exceed 2.5 mg/m^3 8-hr. TWA, the respirators are working properly and are worn correctly, they would be suitable because the MUC would be greater than the airborne contaminant level. The continuous flow of air through the facepiece also provides eye protection against the irritant nature of the Super Tin. All air sample results were below the MUC for this work environment over the 2-3 hour period sampled.

CONCLUSIONS

Symptoms related to current pesticide exposure are infrequent. Symptoms appeared to have been more common in the past when workers had potential exposure to more toxic pesticides, such as organophosphates and carbamates. At this time, there is no evidence that the interviewed workers developed chronic illness as a result of pesticide exposures at HCC.

Worker exposure to triphenyltin hydroxide in the Super Tin packaging area has not been characterized well in the past at HCC, and typical TWA exposures are unknown. Absent respiratory protection, workers in the Super Tin packaging room may be over-exposed to triphenyltin hydroxide if concentrations are typically in the higher part of the range observed during this survey. According to the OSHA respiratory protection standard, under these conditions, feasible engineering and administrative interventions must be made to decrease exposures when airborne contaminant levels exceed the PEL. If this does not reduce exposures below relevant exposure criteria, then respiratory protection is required. HCC has implemented local exhaust ventilation and enclosure as methods of controlling exposure to airborne contaminants in the Super Tin packaging room, but airborne levels above the bagging enclosure still exceeded 0.1 mg/m^3. This indicates that the engineering controls are not producing the desired reduction of levels to below 0.1 mg/m^3 in all areas of the room. HCC requires workers in this area to use respiratory protection. If properly worn by trained users, the powered air-purifying respirators with loose fitting hoods used in the Super Tin packaging room are adequate while PBZ samples do not exceed the MUC of 2.5 mg/m^3. The written programs and training records reviewed appeared to meet the requirements of their respective OSHA standards.

RECOMMENDATIONS

1. Helena Chemical Company should continue to decrease airborne triphenyltin hydroxide levels in the Super Tin bagging area through more effective local exhaust ventilation and other engineering controls. The first step should be to re-evaluate the current controls to make sure they are performing to design specifications. Should the system be found operating below design expectations, or under-designed for current production rates, potential improvements could include increasing the exhaust ventilation rate within the bagging enclosure.

2. Personal exposure monitoring should be conducted in areas where respiratory protection is used in order to assure that exposures do not exceed the maximum use concentration for the contaminants of concern. To accomplish this, it will be necessary to evaluate 'worst case' conditions as well as typical conditions.

3. Continue annual hazard communication training for all employees. Some of the workers' concerns about workplace exposures to chemicals should be addressed in such a forum. Workers should be made aware of the potential health hazards of different chemicals they work with, how to protect themselves from those potential problems, how to recognize symptoms of exposure, and who to talk to to gain more information about these issues.

4. Workers should make sure they attend health & safety training when it is offered.

5. Communication between management and employees to facilitate exchange of concerns about workplace conditions should be improved. This perhaps could be accomplished with the formation of a health and safety committee that includes hourly employees from various departments of the facility as well as members of management. Such a forum could provide management an additional way to communicate their desire to provide for a safe and healthful workplace, to update employee representatives on what is being done to address prior problems or complaints, and to help workers take a pro-active attitude toward working with management to resolve their concerns.

6. Individual workers who are concerned that their health concerns may be related to workplace exposures should consult their physician. In addition, HCC should contract with a physician (an occupational medicine physician if one is available) who could learn about the processes and exposures and thus provide a more informed evaluation of whether a worker's health problem is work-related.

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TABLE 1
Area Airborne Triphenyltin Hydroxide Concentrations
Helena Chemical Company
West Helena, Arkansas
July 29, 1997
HETA 99-0030

Sample number/filter type	Sampling location	Sampling flow rate (lpm)	Sample time (min.)	Tin (µg/filter)	Triphenyltin hydroxide (µg/filter)	Triphenyltin hydroxide TWA (mg/m^3)	REL, TLV-TWA, PEL (mg/m^3) organic tin, as Sn
HCC-M01/MCE	Outside packaging room, near conveyor	2	163	trace*	trace	trace	0.1
HCC-M02/MCE	Atop bag box	2	183	26	81	0.25	0.1
HCC-M03/MCE	Downstream from bag box, in room	2	179	5.2	16	0.04	0.1
HCC-01/OVS	Atop bag box	1	188	18	57	0.3	0.1
HCC-02/OVS	Atop bag box	1	188	26	82	0.4	0.1
HCC-03/OVS	Downstream from bag box, in room	1	185	trace	trace	trace	0.1
HCC-04/OVS	Downstream from bag box, in room	1	185	trace	trace	trace	0.1
HCC-05/OVS	Outside packaging room, near conveyor	1	164	nd**	nd	nd	0.1
HCC-06/OVS	Outside packaging room, near conveyor	1	164	nd	nd	nd	0.1

*mass fell between the limit of detection and the limit of quantitation for this analytical method, and therefore results are semi-quantitative
** nd amount of analyte 'not detected' above the LOD
Samples were analyzed for Triphenyltin hydroxide as elemental Tin. Results for triphenyltin hydroxide are provided based on the mass balance.

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