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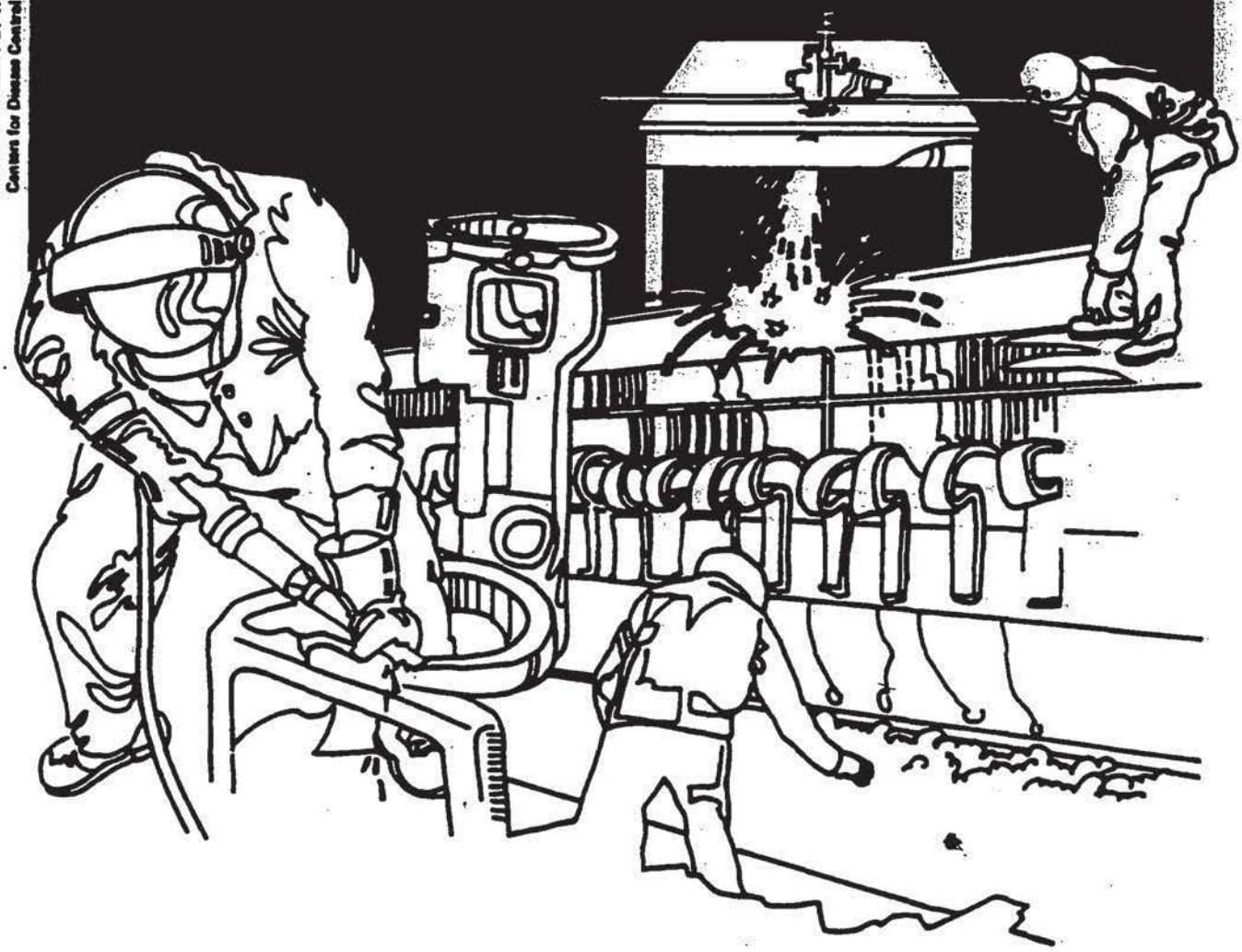

Health Hazard Evaluation Report

HETA 84-395-1583
ENCINITAS FLORAL COMPANY
ENCINITAS, CALIFORNIA

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.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

MAY 1985
ENCINITAS FLORAL COMPANY
ENCINITAS, CALIFORNIA

Molly Joel Coye, M.D.
Pierre L. Belanger, I.H.

I. SUMMARY

On April 4, 1984, the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate possible worker exposure to Temik and other pesticides while working in the nursery at Encinitas Floral Co., Encinitas, California.

On June 14, 1984, NIOSH investigators conducted an initial walk-through survey at the Saxony and Sanford divisions of Encinitas Floral Company. NIOSH industrial hygiene and medical officers met with representatives of the employer and of the United Farm Workers Union AFL-CIO, which represents the workers at Encinitas Floral Co. to review the chemicals used and the schedule and method of application.

During the week of July 24, 1984, the NIOSH staff conducted a follow-up site visit. The industrial hygienist conducted a walk-through inspection of all growing, storage, pesticide mixing and loading, and other work areas. The pesticide application was observed at both divisions. Pesticide applicators were interviewed regarding training, work practices and use of personal protective equipment. The medical officer interviewed chemical applicators and other workers employed in the cultivation of the plants regarding their concerns about potential pesticide exposures and related symptoms. Also, the medical officer conducted patch testing for chrysanthemum sensitization on 40 workers at the Saxony division.

Based on the industrial hygienist's interviews and observations of work practices, deficiencies were observed at both facilities and primarily consisted of a lack of understanding regarding the proper use and care of personal protective equipment. Neither facilities had a formal respiratory protection program and defective respirators were found at both facilities. Employees who do dipping of plant cuttings and complain of dermatitis are not wearing protective gloves. Employees working in the soil mixing and packaging area complained of respiratory and eye irritation. Also, workers who handle chemicals in the adjacent work area do not wear the proper protective equipment. Employees who do packaging of plants in the aisle way between the houses complained about the exhaust odors emanating from recently sprayed houses. The ventilation system for the houses is partially exhausted to the aisle way at a height of 3-4 feet above the ground. Also, there was a large inventory of unused pesticides in the chemical storage area.

At the Saxony facility, worker interviews revealed skin irritation in association with handling certain plants and chemicals used for dipping plants and while debuttoning of plants while plant is still wet. A major complaint was the escape of Temik vapors from a recently sprayed house into adjacent houses.

At the Sanford facility, the most frequent injuries and illnesses are eye irritation caused by the juice of plants squirting onto workers eyes while cutting flowers and dermatitis. Many workers become sensitized to the pothos, dieffenbachia, and white butterfly plants.

Based on observation of pesticide application and medical evaluation of neurologic and dermatologic symptoms among the employees, NIOSH investigators concluded that a health hazard existed at Encinitas Floral Co. due to the episodic exposure of workers to aldicarb (Temik) applied in adjacent houses, to mixtures of other pesticides in dips and spray applications, to plants which are potent sensitizers, and to deficiencies in the protective equipment, training and work practices of pesticide applicators. Recommendations for the improvement of these deficiencies, for changes in ventilation during aldicarb application, and for improvements in worker education are made in Section VIII.

KEY WORDS: SIC 0721, aldicarb, nurseries, dermatitis, neurologic symptoms, enclosed spaces, agriculture, pesticides, chrysanthemums

II. INTRODUCTION

In April, 1984, the National Institute for Occupational Safety and Health (NIOSH) received a confidential request for a health hazard evaluation on behalf of the nursery and greenhouse workers at Encinitas Floral Co., Encinitas, California. Nursery workers were concerned about their potential exposures to Temik and various other pesticides used in the cultivation of commercial plants.

On June, 14, 1984 NIOSH investigators conducted an initial environmental and medical survey at Encinitas Floral Co.. During the week of July 24, 1984 a follow-up environmental and medical survey was conducted. The general findings of the investigators were presented to the company and union representatives at the end of the survey. In addition, guidelines relating to respiratory protection were sent to the company representatives. The results of the skin patch tests to determine sensitization to the chrysanthemum flower were reported to the workers when the patch test was read.

III. BACKGROUND

The cultivation of plants for commercial sale in most nurseries involves the use of agricultural chemicals at many stages: in the preparation of the bed, in treatment of the seedlings, of roots as the seedlings are transplanted, of soil and of the growing plants. The chemicals used may include herbicides, insecticides, fungicides, growth regulators. Because many growing houses are completely or partially enclosed, chemicals applied may remain in the air or on the foliage for longer than after application to open fields, and rates of environmental decay may be significantly altered.

There are no re-entry periods specified by the EPA for application in enclosed areas such as nurseries, mushroom plants, or poultry barns; re-entry periods established for field crops are interpreted by many agricultural agencies to apply equally to enclosed areas. Workers may be in the same general area or growing house while a chemical is being applied, or they may enter soon enough after application to detect an odor or a residue on the plants themselves. At Encinitas Floral Co., the workers were concerned about the adequacy of protection afforded them by the work and re-entry practices associated with chemical applications. Because of the particular characteristics of agricultural pesticide use in enclosed spaces, and the lack of research regarding these potential hazards, NIOSH conducted an extensive evaluation of worker health and safety in these nurseries.

A further problem common to agricultural work in nurseries is the high prevalence of sensitization to plants, resulting in difficulty in distinguishing between plants and chemicals as the causes of allergic contact dermatitis among the workers.

Encinitas Floral Company was established in 1955 and consists of two divisions: the Saxony and the Sanford facility. Each facility has a ranch manager who is responsible for the daily operation at that facility.

Saxony Division

The Saxony division consists of 16 acres of blooming flowers. The nursery staff is primarily Hispanic, with little turnover, and totals about 60 workers. At the time of this study there were 57 workers (36 women and 21 men). Employees work from 7:00 am -4:30 pm five days a week.

At the Saxony facility, chrysanthemums are grown all year and poinsettias are grown in season. About 95 percent of the pesticide application is done by in-house workers (applicators) who are trained by the grower. There were two applicators plus a lead person. One applicator had 3 years of experience and the other was being trained on the job. The lead person had 7 years experience. Workers are given a training pamphlet which is written in both english and spanish to study after which they are quizzed by the grower. Applicators blood cholinesterase levels are done by the company clinic once when they begin work as an applicator.

Pesticide application is planned on a day by day basis. The grower usually measures and mixes pesticides in a five gallon bucket which is then poured into the spray rig. In his absence, the lead applicator will measure and mix the pesticide. The chemical is sprayed out so that none is left. Prior to spraying pesticides in the houses, the doors are posted with signs indicating the time and date the house was sprayed, and the chemical used. Houses with three entrances may have two of the doors locked to prevent access. Workers are usually allowed to re-enter the houses when the chemical is dry or settled (4-6 hours). Once the spraying is complete, the ventilation fans are turned on to accelerate the drying period. A list of chemicals with their frequency of application is provided in Table 1.

Applicators are provided personal protective equipment which consists of rubber boots, full rain suits with bonnet, face shield or goggles, rubber gloves and a half mask respirator. Respirator cartridges are replaced every 8 hours, and replacements are available from the grower. It should be noted that workers are not given any formal respirator training and workers are not fit tested. After applying the chemicals, workers are required to wash their protective equipment and hang them up in their lockers. Afterwards, workers are required to shower.

The remaining 5 percent of chemical application is done by a pesticide contractor. The contractor walks through the houses with the grower or

ranch manager to determine which chemical will be applied to the plants. The spraying is always done on Saturdays when everyone is gone, thus there is always a 24 hour re-entry period. The pesticides applied by the contractor include: Dursban and Pounce; in the past PenCap, Orthene, and Dipel were applied.

Table 1
Saxony Division
Frequency of Application

Chemical	Frequency Interval
Subdue	twice per crop at beginning
Benlate	twice per crop at beginning
Pentac	twice per crop as needed
Dipel	dip plants once at beginning of crop and twice a week thereafter
B-9	dip plants once at beginning of crop and twice a week thereafter.
Temik*	once at beginning of crop
Phosphoric acid	weekly
Orthene	weekly
Pounce	weekly to 3 weeks before crop matures
Dursban	weekly to 3 weeks before crop matures
Morestan	twice at beginning of crop
Lesan	twice per crop, poinsettias only
Round-up	outside growing houses every 2 months

* Temik is normally used on Saturday and occasionally during week.

It should be noted that steam is used to sterilize all soil beds as opposed to methyl bromide.

There are three irrigators and 3 alternates. They apply Benlate, Lesan, Subdue, and phosphoric acid. These workers use a respirator when they apply Subdue because of the chemical odor.

Other than the training for pesticide applicators, the rest of the workers do not receive any education regarding the potential health hazards of the agricultural chemicals used, or for the potential for plant related dermatitis.

Sanford Division

The Sanford division consists of 6 acres of foilage. Staffing at this facility is primarily Hispanic and totals 36 (23 women and 13 men). Employees work from 7:00 am - 4:30 pm five days a week.

At the Sanford facility, house plants are grown from seedlings and cuttings. A wide range of plants are grown, including ivy, dieffenbachia, ferns, pothos, maranta, schefflera, white butterfly, and ficus.

The ranch manager decides which chemicals will be used and the schedule for application. Training of the applicators is the responsibility of the head supervisor. There are two applicators and one additional worker is currently being trained. Training consists of reading a booklet (available in Spanish and English), reviewing it with employee, and explaining to applicators to read all labels. Applicators are responsible for posting all houses after spraying has been completed.

Applicators are provided personal protective equipment which consists of rubber boots, full rain suits, face shield or goggles, rubber gloves and a half mask respirator. Respirator cartridges are replaced when worker believes it is necessary and these are available from the supervisor. It should be noted that workers are not given any formal respirator training and workers are not fit tested. Workers are required to maintain their protective equipment which are stored in a shed adjacent to the pesticide storage area.

A list of the chemicals used and their frequency of application is provided in Table 2. Additionally, some of the other chemicals used include fertilizers such as calcium nitrate, ammonium nitrate, potassium nitrate, phosphoric acid (75%), chelated iron, soluble micronutrients, calcium oxalate and carbonate, and gypsum.

It was reported that applicators apply Temik (granular formulation) by hand using a cotton glove, and it is watered into the soil afterward.

Table 2
Sanford Division
Frequency of Application

Chemical	Frequency Interval
Pounce	Every 2 months
Pentac	3-4 weeks
Chlordane	2-3 times per year
Subdue	weekly
Benlate	weekly
B-9	bi-weekly
Dipel	2-3 times per year
Round-up	every 3 weeks
Vydate	every 4-6 weeks
Temik	infrequently during the week
Captan	dip for cuttings
Benlate	dip for cuttings
Milban	dip for cuttings
Agromyacin	dip for cuttings

In addition, the pesticide application firm sprays Temik each week, as well as many of the other chemicals.

Other than the training for the applicators, the rest of the workers do not receive any education regarding the potential health hazards of the agricultural chemicals used, or for the potential for plant-related dermatitis.

IV. DESIGN AND METHODS

A. Environmental

During the initial and follow-up survey, NIOSH conducted a walk through survey of the growing, storage, chemical mixing and loading areas. The pesticide applicators were interviewed, the pesticide application process was observed, protective equipment was inspected to determine the condition and workers general work practices were observed.

B. Medical

Workers were interviewed for symptoms potentially associated with exposure to agricultural chemicals employed or plants cultivated at this worksite; the interviews emphasized neurologic and dermatologic effects. Dermatologic examinations of the face, neck, forearms and hands were conducted on all workers interviewed; several workers reported dermatitis of the feet and the feet were examined as well. A patch test for sensitization to

chrysanthemum foliage was offered to all employees at Saxony. Informed consent was obtained from participating workers. Chrysanthemum leaves from plants in the growing houses were washed and dried. The skin of the upper forearm was prepared with alcohol swabs and dried with sterile cotton. A 2 centimeter cutting of leaf was crushed and applied directly to the skin, and covered with a sterile bandage. The patch was removed and the skin reaction recorded at 48 hours after initial application.

V. EVALUATION CRITERIA

A. Environmental

As a guide to the evaluation of the hazards posed by workplace exposures. NIOSH field staff employ environmental evaluation criteria for 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 life time without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects if 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 evaluation 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 Criteria Documents and recommendations, 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLV's), and 3) the U.S. Department of Labor (OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLV's usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures at various industries where the agents are used; the NIOSH-recommended standards, by contrast, are based solely on concerns relating to the prevention of occupational disease. In evaluating the exposure levels and the

recommendations for reducing these levels found in this report, it should be noted that industry is legally required to meet only those levels specified by an OSHA standard.

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

B. Adverse Health Effects

Because of the great variety of pesticides used at Encinitas Floral Company, as in most nurseries, the following discussion of the potential toxic effects of exposure is simplified. The pesticides are listed in Table A, with their EPA Category indicating relative acute toxicity. Absorption of pesticides under field conditions is primarily dermal (skin), although inhalation during spray applications may occur.

It should be remembered that in addition to the acute effects mentioned below, many pesticides and/or their hydrocarbon vehicles may cause dermatitis (direct irritant and in some cases allergic contact). A more detailed discussion of the health effects of pesticides may be found in references (2) and (3).

1. Organophosphate Pesticides

Organophosphate insecticides produce their effect by inhibition of acetylcholinesterase at cholinergic synapses, resulting in an exaggeration of the muscarinic, nicotinic and central nervous system actions of acetylcholine. Diagnosis of acute organophosphate poisoning is made by a history of exposure and clinical signs and symptoms, and may be confirmed by response to a test dose of atropine; treatment should not await laboratory confirmation. For moderate exposure, symptoms include headache, dizziness, weakness, nausea and vomiting, eyelid and skin fasciculations, miosis and blurred vision, and sweating. More toxic exposures may cause abdominal cramps, muscular tremors, dyspnea, and ultimately death from respiratory paralysis.

Confirmation by laboratory analysis depends upon demonstration of depressed levels of plasma or erythrocyte (red blood cell, RBC) cholinesterase activity. Plasma (serum) cholinesterase is more

labile than RBC cholinesterase; it is generated in the liver and therefore may be affected by any factor or disease process which interferes with liver function. RBC cholinesterase, because it is analogous to the enzyme active in nerve tissue, is the preferred index of toxicologic effect.

Chronic exposure to organophosphates over a prolonged time period may result in extreme inhibition of cholinesterases in the absence of symptoms; on the other hand, a more rapid but smaller inhibition may provoke moderate but disabling symptoms, and symptoms may occur in the absence of detectable inhibition (3). Workers who are re-exposed to organophosphates before cholinesterase regeneration is complete are at greater risk of poisoning because their threshold is depressed.

2. Carbamate Pesticides

The symptoms and mechanism of action of carbamate pesticides are similar to those of organophosphate pesticides, with the exception that carbamate pesticides are much more rapidly inactivated in the human body. As a result, carbamate poisonings are usually of much shorter duration, and cholinesterase measurements are often unreliable as a means of diagnosis because the levels regenerate so rapidly. Nevertheless, excessive exposure to carbamates in the absence of prompt recognition and treatment can be serious and even life-threatening.

3. Permethrin Pesticides

The permethrins are of very low toxicity, and are not well absorbed through the skin. No symptoms other than dermatitis have been reported among workers evaluated after moderate exposure.

4. Fungicides

The category of fungicides includes many distinct chemical families. Among those used at Encinitas Floral Co., the only recognized acute health effects at low levels of exposure are dermatitis, including irritant and allergic contact dermatitis. Benomyl has been associated with reproductive effects in animal tests.

5. Herbicides

Like fungicides, herbicides include a wide variety of chemicals. Of those used at Encinitas Floral Co., skin, eye, nose and throat irritation is a common health effect.

6. Growth Regulators

Although these plant hormones have been used for many years, no symptoms other than mild skin irritation have been reported, and there are no known long-term health problems known to be associated with their use.

C. Medical

As noted above in V-1, many of the pesticides used at Encinitas Floral Co. are potential dermatologic irritants and/or sensitizers; low level acute and chronic exposure to some are also associated with non-specific central nervous system effects. Evaluation of the workers' reported symptoms sought to correlate these symptoms with the potential for and timing of exposure to these chemicals. As also noted in V-1, many of the plants cultivated at the two divisions are also irritants and sensitizers. As it was impractical to test for the wide variety of chemicals used at both divisions, and the large number of potentially sensitizing plants cultivated at Sanford, this evaluation sought to determine the likelihood that sensitization to chrysanthemums represented a major portion of reported dermatitis at Saxony.

VI. RESULTS AND DISCUSSION

1. Environmental

Saxony Division

Interviews with two applicators revealed that employees did not have a clear understanding how the respirator should be worn or maintained. Both workers were using the right type of equipment, i.e. a half-mask pesticide respirator which consists of an organic vapor cartridge and pre-filter. However, the inhalation valve in one of the respirators had pieces of the valve cut out in order to decrease the resistance to breathing. Additionally, the straps were so over extended that they were tide together in order for the respirator to remain on the workers face. The respirator was replaced when the condition of the respirator was brought to the attention of a supervisor, however, this condition should have been noticed earlier. Workers reported that they had not received any formal respirator training i.e. they were not taught how to properly inspect, clean and maintain their respirator. Furthermore, none of the workers had been fit tested.

Workers reported that the signs posted outside the entrances of the rooms did not contain all the necessary information such as the date and time of application, name of chemical, and date and time for safe re-entry.

Applicators washed all of their protective equipment; however, they did not know how to properly hang the protective equipment afterward to assure the garments dried properly.

Workers who use protective gloves for handling chemicals are not washing gloves and turning them inside and out to properly air dry.

Workers who come in contact with copper sulfate, which is used to spray the growing beds, reported skin irritation.

In the dipping area, some of the workers complained of dermatitis. A protective glove is provided, but the workers indicated that it is different from what was used before and that it does not work as well.

The ventilation system for the houses exhausts air to the center aisle between the buildings. As a result, recently sprayed houses exhaust the room air at approximately breathing zone height along the aisle way where plants are packed and prepared for shipment. Several workers complained about these pesticide exposures.

Employees working in the soil mixing area complained about exposure to dust and powders as they are poured into the steam injected mixing hopper. The hot steam forces the powders outwards as powders are being loaded into the hopper causing workers eye and nasal irritation. Workers were not using protective goggles or glasses

Employees who work in the chemical storage shed adjacent to the soil mixing area do not wear protective gloves, respirator and goggles when handling some of the caustic fertilizers and other chemicals.

Sanford Division

Interviews with the applicators revealed that employees did not understand how the respirator should be maintained. Inspection of two respirators which were stored in the locker revealed one respirator to be new and recently washed, and the other respirator was dirty and it was missing the inhalation valves. Also, the outside locker area was not air tight, thus there was considerable sand and dust in the locker and in the respirators.

The chemical storage area is well controlled and clean, however, several chemicals (e.g. Lindane, dimethoate, formaldehyde, toxaphene, and methyl carbamate) were stored in the shed which had not been used in several years and which were reported to no longer be used at the nursery.

Applicators apply Temik (a granular formulation) wearing a cotton glove. Sweating and humidity allows the Temik to dissolve and causes skin irritation (and presumably may be absorbed).

2. MEDICAL

Saxony:

Medical care is provided at a clinic two blocks away. No specific physician is assigned to care for the workers at Saxony. No pre-employment or periodic medical examinations are performed, except for cholinesterase baselines obtained on pesticide applicators. The telephone numbers for the clinic and the Poison Control Center for San Diego were prominantly posted in the manager's office.

The most frequent work-related injuries reported to the nursery managers are musculoskeletal injuries (twisted angles, tendonitis from lifting heavy pots); no pesticide-related illnesses have been reported.

During interviews with the workers, skin irritation was reported in association with the handling of poinsettias, white butterfly plants, the Subdue and Lesan drench, copper sulfate, the combination of Dursban, Orthene and Pounce used for aphids on full-growth plants, the mixture of B-9, Dipel and Pentac used for dipping plants, debuttoning of plants when still wet with B-9 . Severe desquamation was reported by some workers handling copper sulfate. Workers demonstrated dried and erythematous skin on palms and fingers, with occasional cases of moderate desquamation or small vesicles.

A major complaint reported by many workers was the escape of Temik vapors from the house in which it had been applied into adjacent houses and the central walkway, particularly when the fans are turned on to ventilate the house in which it had been applied. Workers complained of headache, nausea, loss of appetite, vomiting, weakness and dizziness shortly after noticing the fumes. The problem had been common in the past, but spraying of Temik during the week had been reduced recently.

Patch testing for sensitization to chrysanthemum foliage was carried out for a total of 40 workers. On examination 36 hours after application of the patches, 2 workers were found to have moderate erythema and itching at the site of application. Ten workers reported that the patches had fallen off after approximately 24 hours, but exhibited no signs of sensitization, and 2 workers did not return for examination. Only a few of the workers reported problems in association with the handling of the white butterfly plant; patch testing was not conducted. It was concluded that

allergic contact dermatitis is not the predominant cause of reported dermatitis among the workers at Saxony. Direct contact irritation due to the pesticide dips and applications to soil and plants, in combination with the wet work and continuous contact with earth, was most consistent with the pattern of symptoms reported. It is possible that one or more of the pesticides have provoked sensitization in some of the workers as well; further investigation of this possibility would require more extensive patch testing than was feasible in this evaluation.

The lack of worker education regarding the potential for pesticide-plant-related health effects creates a great deal of concern on the part of the workers. Each division has a daily pesticide application schedule; providing access to these schedules for the worker representatives (shop stewards or health and safety committee members) would allow the representatives to answer questions from the workers, identify potential problems and eliminate unnecessary concern.

Sanford:

Medical care is provided by a clinic located 5 minutes from the nursery by freeway. No specific physician is assigned to care for the workers at Saxony. No pre-employment or periodic medical examinations are performed, except for cholinesterase baselines obtained on pesticide applicators.

The most frequent injuries and illnesses reported to the nursery management are eye irritation caused by the juice of plants squirting into the workers' eyes while they are cutting the flowers, and caused by the drying and irritating compounds in the fertilizer mix during soil preparation, and dermatitis. Many workers become sensitized to the plants cultivated at Sanford, particularly the pothos, dieffenbachia, and white butterfly.

Interviews with the workers revealed the following problems:

1. Throat irritation, rhinitis, and skin irritation (ears, face, neck, upper torso) due to aerosols of plant juices, especially from the 'marvo' and pothos plants.
2. Dermatitis of the feet, primarily due to the heat and humidity of the working conditions, with secondary fungal infections in many cases. Workers demonstrated extensive areas of irritation, cracked soles and minor ulcerations, with some cases of notable desquamation.
3. Contact irritation of the hands when planting dipped seedlings.
4. Pin-point pattern of depigmentation on the hands of 3 workers and face and throat of one worker, reportedly due to work with grape ivy. The workers stated that the first symptoms were erythema and itching over several weeks, resolving with depigmentation.

5. Skin irritation due to B-9.
6. Headaches due to visual distortion by the safety glasses.
7. Eye irritation associated with the white butterfly plant.
8. Severe skin irritation and occasional chemical burns from handling Temik granules.

Many workers demonstrated dried and erythematous skin on palms and fingers, with frequent cases of moderate desquamation or small vesicles. Several workers had marked erythema, drying and desquamation of the ears. A pin-point pattern of depigmentation was noted on the hands of 3 workers and face and throat of one worker, reportedly due to work with grape ivy. One worker had severe desquamation of the palms and fingers with fissures and blisters.

Many of the plants cultivated at Sanford, as well as many of the pesticides (notably captan) used for dipping or treatment of growing plants are both irritant and may cause sensitization. For workers who have already developed sensitization to one or more of the plants at Sanford, little relief can be offered. In cases in which it is not clear whether the offending agent is a plant or a chemical, patch testing may be helpful in determining what must be avoided. The use of face shields, goggles, gloves and other protective equipment intended to prevent exposure to pesticides will actually create more severe problems by holding the plant pollen, juice or other parts against the skin or eyes.

For workers experiencing problems primarily due to the heat and humidity of the work, the use of talcum powder and cotton glove liners or socks under light plastic long-sleeved gloves and high rubber boots may be of help. Permeable shoes worn because of the heat are probably less comfortable than impermeable boots worn with adequately absorbent lining socks and powder.

The applicators expressed a desire to know what their cholinesterase results were and what these results meant for their health.

The lack of worker education regarding the potential for pesticide-plant-related health effects creates a great deal of concern on the part of the workers. Each division has a daily pesticide application schedule; providing access to these schedules for the worker representatives (shop stewards or health and safety committee members) would allow the representatives to answer questions from the workers, identify potential problems and forestall unnecessary concern.

VII. CONCLUSION

NIOSH concluded that a health hazard existed at Encinitas Floral Company based on: interviews with workers; neurologic and dermatologic symptoms among the workers; and deficiencies in the protective equipment, training, and equipment maintenance programs

VIII. RECOMMENDATIONS

1. The company should institute a formal respirator program in accordance with the Occupational Safety and Health Act (OSHA) requirements outlined in 29 CFR Part 1910.134. The respirators program should include the following: proper respirator selection, training and education of the user, fit testing, maintenance of equipment, proper and adequate storage, periodic inspection, surveillance of work area condition, periodic inspection of program to determine continued effectiveness and medical determination of user.

2. Each person requiring the use of a respirator should have a specific respirator assigned them.

3. Clean lockers should be provided for storing protective equipment after the equipment is washed and allowed to air dry.

4. Workers with dermatitis should wear long sleeved shirts buttoned down to prevent the flowers and the juices from coming in contact with the skin; also employees should be encouraged to wear rubber boots with cotton socks and talc if worker is having foot dermatitis.

5. Workers who do plant dipping should each be provided protective gloves. Either the workers or the company should be required to clean the gloves daily, and an area should be provided to air dry the gloves.

6. Workers who work around growing beds which are sprayed with copper sulfate should wear protective gloves to prevent skin irritation.

7. Employees who work in the soil mixing area should wear protective gloves, goggles or face shield, and a certified respirator to prevent exposures to irritant dusts.

8. Employees who work in the chemical storage shed adjacent to the soil mixing area should wear the proper protective respirator, goggles and gloves when handling some of the caustic or irritant chemicals.

9. It is recommended that periodic brief educational programs on health and safety be presented, allowing the workers the opportunity to voice their concerns and obtain answers, and that simple charts of the relevant chemicals and health effects be posted.

10. It is recommended that copies of spray schedules be provided to worker representatives (shop stewards or health and safety committee members) to allow the representatives to answer questions from the workers, to identify potential problems and to alleviate workers concern.

11. It is recommended that posting of sprayed houses be done in english and spanish and include the following information:, name of chemical, date and hour applied, date and hour to re-enter

12. Applicators who apply granular Temik using a cotton glove should use a different glove to prevent skin irritation.

13. It is recommended that the exhaust ventilation system at the Saxony division be modified to exhaust the air at the roof line as opposed to exhausting in the aisle way where employees are working.

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X. AUTHORSHIP AND ACKNOWLEDGEMENTS

Report Prepared by:

Molly Joel Coye, M.D.
Medical Investigator
NIOSH-Region IX
San Francisco, California

Pierre L. Belanger
Industrial Hygienist
NIOSH-Region IX
San Francisco, California

Originating Office:

Hazard Evaluations and Technical Assistance Branch
Division of Surveillance, Hazard Evaluations, and Field Studies

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IX. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 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 NIOSH, Publication Office, at the Cincinnati address.

Copies of this report have been sent to:

1. United Farm Workers Union, AFL-CIO.
2. Encinitas Floral Company.
3. NIOSH - Region IX.
4. Cal-OSHA.
5. Federal-OSHA.
6. California Department of Food and Agriculture, Sacramento and San Diego Offices.

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

TABLE 1

PESTICIDES USED AT ENCINITAS FLORAL COMPANY

Commercial Name	Use	Chemical Family	Category*
B-9	growth regulator	vitamin	III
Benlate	fungicide	benomyl	III
Captan	fungicide	orthocide	III
chlordane	insecticide	chlor. Hydrocarbon	II
Dipel (Bacillus Thuringienses)	insecticide	biologic control	III
Dursban	insecticide	organophospnate	II
Lesan	fungicide	fenaminousulf	II
Milban	fungicide	dodemorph acetate	I
Morestan	insecticide	oxythioquinox	III
Orthene	insecticide	organophosphate	III
Pencap	insecticide	organophosphate	II
Pentac	miticide	pentachloro-cyclo-pentadiene.	II
Pounce	insecticide	permethrin	I
Roundup	herbicide	glyphosate	II
Subdue	fungicide	alanine methyl ester	I
Temik	insecticide	carbamate	I
Vydate	insecticide	carbamate	I

* EPA Toxicity Categories:

I = DANGER	LD/50	50 mg/kg	(rat)
II = WARNING	LD/50	500 mg/kg	(rat)
III = CAUTION	LD/50	5000 mg/kg	(rat)