SUMMARY OF ILLNESSES AND INJURIES DUE TO OCCUPATIONAL EXPOSURE TO PESTICIDES OF GROUND APPLICATORS REPORTED BY PHYSICIANS IN 1983

by

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SUMMARY

There were 178 cases of occupational illness and injury due to exposure to pesticides reported for ground applicators in 1983. This group of workers involves those who apply dusts or sprays by application equipment mounted on vehicles operating on the ground, plus those individuals who perform tasks associated with these applications. Of the 178 cases reported, there were 80 systemic illnesses, 48 eye injuries, 44 skin injuries, and six eye and skin injuries. When these same 178 incidents were examined for their pesticide exposure/illness relationship, 28 were found to be "Unlikely," 56 were judged "Possible," 50 were found to be "Probable," and 44 were "Definite." There were 18 more cases reported for this work category this year than were reported in 1982.

The pesticides containing dinitrophenol, glyphosate, propargite, paraquat and parathion were associated with 46% of illnesses and injuries where the identity of the pesticide was reported. Parathion was responsible for the greatest number of systemic illnesses. Propargite and glyphosate were responsible for the most eye and the most skin injuries, as well as being the pesticides most often reported to cause any kind of illness or injury to ground applicators. Exposures in this work category alone resulted in 15 estimated days of hospitalization and 280 estimated days of disability. Hospitalization was down from 42 days in 1982 while the total of days of disability was up from 216.

INTRODUCTION

Under Section 2950 of the California Health and Safety Code, each injury or illness that occurs in the State and may potentially be pesticide-related is required to be reported by the attending physician to the local County Health Department within 24 hours. In turn, county health officials must report the incident to the local County Agricultural Commissioner, the State Department of Food and Agriculture, and the State Department of Health Services. The incident is then investigated by the local County Agricultural Commissioners' staff and the resulting report is submitted to the California Department of Food and Agriculture's (CDFA) Worker Health and Safety Unit for evaluation and classification.

Based on input from State and County agencies, physicians, and available toxicological and medical data, the Worker Health and Safety Unit evaluates each pesticide-related incident and places it within a system of classification based on work activity and illness type. Each incident is classified according to the circumstances of exposure and the reported signs and symptoms of disease. Classifications used are "Definite," "Probable," "Possible," and "Unlikely."

In the calendar year 1983, there were 2,537 incidents reported by physicians as potentially pesticide-related illnesses or injuries. Of these, 1,270 had adequate information and were judged to have some degree of likelihood to be both occupationally and pesticide-related. The remainder had inadequate information, were nonoccupational exposures, or were determined, after investigation, not to be related to pesticide exposure.

One hundred seventy-eight of these 1,270 incidents reported by California physicians as potentially pesticide-related were assigned to the "Ground Applicator" classification. Incidents assigned to this work activity classification are those affecting individuals who apply pesticides to agricultural fields or other sites using vehicle-borne application equipment. Eighty of the 178 reported illnesses and injuries were systemic illnesses, which are generally considered more serious than topical injuries. The remainder were classified as topical injuries with 48 affecting the eye, 44 affecting the skin, and six affecting both eye and skin. There were no pesticide-related deaths of ground applicators reported in California in 1983.

When examining these same 178 illnesses and injuries for their relationship to pesticides, 28 were found to have an "Unlikely," 56 were determined to have a "Possible," 50 were judged to have a "Probable," and 44 were determined to have a "Definite" exposure/symptom relationship.

The accompanying discussion is followed by tables reporting illness types and their pesticide relationship (Table 1), causal pesticides (Table 2), and agricultural commodities associated with pesticide illnesses for ground applicators (Table 3). Table 4 presents county of occurrence for 1983 pesticide illnesses and injuries. Information on general pesticide illness statistics for 1983 can be found in HS-1186. Other work activity categories are related in their respective "HS" reports.

DISCUSSION

Twenty-eight episodes of ground applicator illness or injury occurring in 1983 were judged to have an "Unlikely" relationship to pesticide exposure due to an absence of confirmatory evidence required to place the incident in a more positive category. Similarly, there was no conclusive evidence that ruled out a possible pesticide relationship. Two of these cases were eye injuries, six were skin injuries and the remaining 20 were systemic illnesses.

In four of these "Unlikely" cases, signs and symptoms that were present were more likely due to upper respiratory infections, in the opinions of attending physicians. However, the possibility of pesticide illness could not be completely eliminated. Colds, pharyngitis and tonsillitis were reported as other possible causes. Two additional illnesses could possibly be attributed to allergies rather than pesticides. One may have been attributable to allergic rhinitis. The second was termed more likely to be either an allergic reaction or Pityriasis Rosea; lesions of the skin with a probable viral origin.

Four of these same 28 "Unlikely" incidents showed no significant pesticide exposure, leading county investigators to the conclusion that the reported illness or injury was probably not pesticide-related. In one case, a physician was doing a routine check on a worker's cholinesterase levels when test results were returned with low levels. This worker had not been exposed to pesticides at any recent time. In a second case, the driver of an application rig developed skin irritation while applying malathion, but in the report by the county investigator, the applicator stated that there was little possibility of pesticide exposure since the windows of the truck he was driving were tightly closed. The applicator could see spray mist on the outside but felt no spray touch his skin inside the cab.

In five "Unlikely" cases, applicators reported symptoms often seen when cholinesterase depression has also occurred, but in each case, laboratory tests revealed normal cholinesterase levels. Typical was the case of the worker who was applying parathion. Even though he was provided with safety equipment, the applicator became nauseated in the evening and went to a local hospital. Cholinesterase tests were run twice, but in both cases serum cholinesterase was within normal limits and RBC cholinesterase was high. In the opinion of his physician, there was no physical evidence of organophosphate poisoning, but again, the possibility of pesticide illness could not be completely ruled out.

The remaining eighteen cases in the "Unlikely" classification can also be attributed to causes other than pesticides. One illness was possibly gastroenteritis with an unspecific cause. In another, the physician felt that physical trauma may have caused symptoms in an applicator who had been applying zineb. He had reportedly fallen from his tractor a few weeks prior to using the fungicide, injuring his back and stomach. One remaining case was highly unusual. A research assistant at a University of California campus had been using experimental pesticides for the past 15 years when he suddenly lost the hearing in his left ear. Although the applicator consistently wore protective clothing and equipment, the county investigator felt that in this case where no specific cause could be found, there was still the possibility of pesticide injury. In a final case in the "Unlikely"

classification, an individual applying Azodrin developed headache, weakness, nausea, shakiness and shortness of breath even though he wore protective equipment while applying this insecticide. He was advised by his physician to avoid smoking cigarettes and to refrain from drinking alcohol.

In summary, there were 28 incidents of ground applicator illness or injury that were classified as "Unlikely." Six involved Toxicity Category I pesticides. Two involved Category IIs and eight involved Category IIIs. In twelve cases the type of pesticide was not reported. At least 47 workdays were reported lost in this classification. This was due, in part, to one case where 35 days were lost when an individual developed eye irritation after applying Kocide, even though his doctor felt his eye irritation was due to dust particles rather than pesticides. There were no reported days of hospitalization in this classification.

Of the four specific categories of illness or injury types, systemic illnesses are almost always the most serious. For 1983, there were 80 reported incidents of pesticide-related systemic illness, 20 of which were judged unlikely to be pesticide-related and have been discussed previously. The remaining 60 had stronger pesticide/illness relationships (30 "Possible," 22 "Probable," 8 "Definite").

The most life-threatening episode reported this year involved the systemic illness of an applicator using a combination of mevinphos and methomyl (both Toxicity Category I insecticides) on lettuce. The applicator became ill during the application, was seen by a physician and was sent home. The following day his illness became worse and he was transported to a hospital by ambulance and reported by the attendants and a second physician as "very ill". He was treated with atropine and stayed in the hospital for seven days. He was off work for an additional 14 days after his release from the hospital. The employer in this case was found in violation of three aspects of the California Administrative Code: (1. no safety equipment was issued to the applicator, (2. the applicator was not given safety training, and (3. the applicator was not supplied with a closed system for mixing mevinphos.

In August, a physician in the southern San Joaquin Valley discovered eight ground applicators with depressed cholinesterase levels during routine health evaluations of employees of a pesticide application firm. While no one pesticide was responsible for these cases, and no signs or symptoms other than RBC and plasma cholinesterase depression below normal ranges were seen, considerable time was lost from regular duties. On the doctor's recommendation, these applicators were not to use cholinesterase-inhibiting pesticides again until cholinesterase levels returned to normal. As a result, 128 workdays were lost. An investigation of this episode found that the firm was in violation of both federal and state pesticide laws and regulations by failing to provide proper medical supervision, a closed mixing and loading system, and label required safety equipment.

In another serious incident, an applicator was working with mevinphos and disulfoton when one of the spray nozzles became clogged. After he had removed his gloves and begun to work on the nozzle, it cleared suddenly soaking his hands with the chemicals. When he explained the accident to his supervisor, he was taken directly to the hospital where his signs and symptoms of illness included vomiting and pinpoint pupils. Treatment in

this case consisted of injections of 2-PAM and atropine. The individual spent two days in the hospital, but took only two additional days off work.

A ground applicator treating corn with the insecticide methomyl collapsed and was found by his foreman. The foreman immediately rushed the individual to a local emergency room with a label from the material he was using. His clothing was soaked with the pesticide and he was treated at the hospital with atropine for the following signs and symptoms: vomiting, shortness of breath, salivating, and pinpoint pupils. He had not been wearing protective clothing or equipment. A Notice of Violation was issued to the employer for failing to file a Notice of Intent to apply methomyl and for allowing an application of a Category I pesticide without proper safety equipment.

Two additional incidents of systemic illness were serious enough to cause ground applicators to lose five days each from work. In the first incident, the applicator was raising the spray boom on his tractor to make a turn and was sprayed with a mixture of mevinphos, methomyl, metalaxyl and maneb when the spray valve did not shut off the nozzles. He washed his face immediately and proceeded with the application. At home after work he took a bath but soon began to sweat. He vomited twice, realized how sick he might be and went to a hospital. Blood tests showed low cholinesterase levels compared with previous tests. In the second incident, an applicator developed a burning sensation in his chest and stomach cramps after working with propargite. He was furnished with coveralls, goggles, and a respirator but he did not wear his respirator even after he was warned to do so.

Several reasons were given as causes for exposures serious enough to cause systemic illness, the most common of which was not wearing proper protective equipment. This resulted in at least eleven systemic illness cases this year. In seven additional cases, illnesses occurred even though protective equipment was reportedly used, which may reflect poorly fitting equipment, inadequate equipment or equipment not designed for pesticide protection. Four applicators reported removing their protective equipment, such as gloves or respirators, momentarily or intermittently allowing dermal exposure to the hands or inhalation exposure to occur. Three individuals admitted using their equipment incorrectly; one wore coveralls with the sleeves rolled up. In one incident the applicator reported that the wind blew spray back onto him, although proper protective clothing and equipment should have eliminated this illness.

In at least two instances, employers were directly responsible for the occurrence of systemic illnesses in ground applicators. One employer failed to provide not only protective equipment, but also a system for closed mixing and loading of a Category I material. In this case the applicator was hospitalized. In a second case, an applicator was not supplied with protective clothing resulting in his exposure to a mixture of two Category II insecticides. In the first case, the employer was found in violation of pesticide regulations. In the second, the employer was given a written warning.

Twenty-five of the pesticides responsible for ground applicator systemic illnesses reported in 1983 were insecticides or acaricides. Of the remaining 35, ten were herbicides, leaving 25 where class of pesticide was not reported. Emulsifiable concentrates and liquids were each reported to be formulations involved in eight instances. Wettable powders, soluble

powders and dusts were also reported. Twenty-one pesticides were in Toxicity Category I, six were in Category II, four were Category III and in 29 cases Toxicity Category was unavailable. Ground applicators seeing physicians for systemic illnesses accounted for at least 187 days lost from work and 15 days of hospitalization.

There were 48 incidents of eye injury reported for ground applicators in 1983 including seven classed as "Possible," 13 "Probable," 26 "Definite," and two "Unlikely." Again, "Unlikely" cases have been discussed previously. Twelve of the remaining 46 incidents involved Category I pesticides, 11 involved Category IIs, another 13 involved Category IIIs, and in 10 cases, the causal pesticide was not reported. Formulations that were responsible for more than one injury case included liquids (12), wettable powders (11), and emulsifiable concentrates (6). Twenty of the causal pesticides reported were herbicides, 11 were insecticides/acaricides and four were fungicides. The three pesticides most often reported as causing eye injury were propargite, glyphosate, and paraquat.

The most common causes of eye injury to ground applicators were wind blowing dusts or liquids into the applicator's eyes and hose failure, causing liquids under pressure to spray uncontrollably. These two causes alone account for 25 cases. Other causes reported include splash during cleaning, moving or loading of application equipment, unexpected drift, and wiping or rubbing eyes with contaminated hands or clothing.

The most serious eye injury reported in 1983, based on time lost from work, involved an applicator who may have wiped his glove which was contaminated with diuron across his eyes. Efforts to rinse the herbicide from his eyes by both the applicator and his physician were hampered by the sticking agent mixed with the pesticide. This individual was not hospitalized but did lose six days from work. In a second serious incident, an applicator using propargite for three consecutive days developed corneal abrasion in both eyes, resulting in five days lost from work. Neither of these individuals used eye protection, and in all but four other cases of eye injury in this work category, eye protecting equipment was not worn.

Of the 44 cases of skin injury reported in 1983, 18 were classified as "Possible," 13 "Probable," seven "Definite," and six "Unlikely." Four of these incidents involved Toxicity Category I pesticides, 17 were due to Category IIs, eight involved Category IIIs and in the remaining nine incidents (excluding those classified as "Unlikely") the pesticide was not reported. Fourteen of the causal pesticides were herbicides, eight were insecticides/acaricides, and seven were fungicides. Formulations of importance included liquids, wettable powders, and emulsifiable concentrates. Pesticides that were responsible in more than one case included various formulations of glyphosate, propargite, captan, dinitrophenol, sulfur, and 2,4-D.

Skin injuries that were reported were described as rashes, contact dermatitis, or chemical burns. In 12 of these 38 likely cases of skin injury, protective clothing or equipment was not being used. In many cases, either protective equipment was not a label requirement or the equipment was removed to do repair work, often resulting in rashes or chemical burns to the hands or face. In 21 cases, protective clothing or equipment was reportedly being used, but skin injury still occurred. The most common

injury locations were the face/neck area and the region of the arms and hands, with several cases each. In the remaining cases, injury occurred to the body or legs.

The most serious case of skin injury reported in 1983 involved the applicator using glyphosate who was drenched when a hose on the application equipment burst resulting in chemical dermatitis on the individual's back. Two days of work were lost in this incident. At least five workdays were lost overall for skin injuries. There was no hospitalization required for ground applicators with skin injury in 1983.

There were six cases of combination eye/skin injury in 1983 (one "Possible," two "Probable," three "Definite"), up by four over last year. Five of the six were attributable to insecticides or insecticide/acaricides. Three were Category III materials, one was a Category II material and one was a Category I. Three injuries resulted from propargite, and one each from carbaryl, chlorobenzilate, and Vendex/fenvalerate in combination. Pesticide formulations responsible for eye/skin injury included emulsifiable concentrates and wettable powders.

There were no days of hospitalization in this classification; however, there was a total of ten days lost from work. This time was lost by one individual who developed redness in and around his eyes after applying propargite. This individual had moved shortly after the incident and could not be interviewed by county staff, so that circumstances of exposure are unknown. No one case of eye/skin injury reported this year caused serious or permanent adverse health effects.

CONCLUSIONS

Illnesses and injuries to ground applicators occur primarily at the time of the initial pesticide application so that the employment of better protective measures including the provision of better information, education, and supervision might reduce the number of cases seen each year. It is recognized that some of the most effective pesticides are also some of the most toxic to the humans that use them. Even so, the use of chemicals of lower toxicity to humans should be encouraged whenever feasible. In addition, study of the reported incidents for 1983 reveals that several employers and employees need to give more attention to the use of proper protective clothing and equipment. Poorly-fitting respirators that allow pesticide fumes and vapors to bypass the filters, loose goggles, and improperly worn face-shields that allow splashed or sprayed material to reach the eyes, and improperly sized coveralls, gloves, and boots that allow skin injury at the wrist, the nape of the neck, and the lower leg need attention. Perhaps the least expensive and quickest way to prevent some ground applicator illnesses and injuries is to improve the training of workers regarding safe work practices and proper personal hygiene. Ultimately, each individual who works with pesticides must also take considerable responsibility for himself or herself to comply with the safe-use information provided and available.

TABLE 1

Types of Illnesses and Injuries Reported in 1983 for Ground Applicators Showing Their Pesticide Illness Relationship

Illness Type	Unlikely	Possible	Probable	Definite	Total
Systemic	20	30	22	8	80
Eye	2	7	13	26	48
Skin	6	18	13	7	44
Eye & Skin	0	1	2	3	6
Death	0	0	0	0	0
Total Cases	28	56	50	44	178

TABLE 2

Primary Pesticides Responsible for Ground Applicator Illnesses and Injuries for 1983 According to Illness Type

	Type of Illness				Total
	Systemic	Eye	Skin	Eye/Skin	Cases
2,4-D	0	0	2	0	2
ACEPHATE	1	0	0	0	1
ANTOR	1	0	0	0	1
BACILLUS THURINGIENSIS	0	1	0	0	1
BAYLETON	1	0	0	0	1
CAPTAFOL	0	0	1	0	1
CAPTAN	0	0	3	0	3
CAPTAN/SULFUR	0	1	0	0	1
CARBARYL	3	1	0	1	5
CARZOL	1	0	0	0	1
CHLOROBENZILATE	0	0	0	1	1
CHLORPYRIFOS	1	0	1	0	2
COPPER HYDROXIDE	2	0	0	0	2
COPPER SULFATE	0	1	0	0	1
CRYOLITE	1	0	0	0	1
CYHEXATIN	0	0	2	0	2
DALAPON	0	1	0	0	1
DCNA	0	1	0	0	1
DDVP	1	0	0	0	1
DEMETON	1	0	0	0	1
DIAZINON	0	0	1	0	1
DICOFOL	1	0	0	0	1
DIMETHOATE	1	0	0	0	1
DINITROPHENOL	6	2	3	0	11
DIQUAT	2	0	0	0	2
DISULFOTON	1	0	0	0	1
DIURON	1	2	0	0	3
ENDOTHALL	0	1	0	0	1
FENTHION	1	0	0	0	1
GLYPHOSATE	1	6	6	0	13
MALATHION	0	2	1	0	3
METASYSTOX-R	0	0	1	0	1
METHIDATHION	1	0	0	0	1
METHOMYL	3	0	0	0	3
METHOMYL/MEVINPHOS	3	0	0	0	3
MEVINPHOS	1	0	0	0	1
MONOCROTOPHOS	1	0	0	0	1
NAPHTHALENEACETIC ACID	0	1	0	0	1

(Continued)

	Type of Illness				Total
	Systemic	Eye	Skin	Eye/Skin	Cases
ORYZALIN	1	0	0	0	1
OXYFLUORFEN	0	0	1	0	1
PARAQUAT	4	4	1	0	9
PARATHION	7	2	0	0	9
PHOSALONE	1	0	0	0	1
PROPARGITE	2	6	4	3	15
SIMAZINE	0	1	0	0	1
SULFUR	0	1	3	0	4
TRIFLURALIN	0	2	0	0	2
ZINEB	1	0	0	0	1
ZIRAM	0	0	1	0	1
MISC. COMBINATIONS	8	9	10	1	28
NOT DETERMINED	20	3	3	0	26
Total	80	48	44	6	178

TABLE 3

Commodities and Application Sites Associated with Illnesses and Injuries of Ground Applicators in 1983

Almonds	15	Nursery Stock	1
Apples	1	Olives	1
Avocados	1	Onions	1
Beans	1	Oranges	6
Cauliflower	2	Peaches	3
Celery	1	Pears	2
Citrus	3	Pond	1
Corn	2	Poultry	1
Cotton	5	Prunes	1
Dates	1	Raspberries	1
Ditches	1	Strawberries	1
Grapes	29	Sugar Beets	2
Lemons	4	Tomatoes	3
Lettuce	5	Trees	4
Melons	1	Turf	1
		Walnuts	4
		Weeds	7
		Not Determined	66
		Total	178

TABLE 4

County of Occurrence of Ground
Applicator Illnesses and Injuries for 1983

Butte	1	San Benito	1
Colusa	1	San Bernardino	2
Fresno	23	San Diego	4
Glenn	1	San Joaquin	4
Imperial	3	San Luis Obispo	1
Kern	47	Santa Barbara	10
Kings	4	Santa Cruz	2
Los Angeles	5	Shasta	2
Madera	10	Solano	1
Merced	9	Stanislaus	6
Monterey	5	Tulare	18
Orange	3	Ventura	5
Riverside	4	Yolo	2
Sacramento	3	Yuba	1
		Total	178