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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF

PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

Sept 13, 2000

SUBJECT: Review of 1990-1994 poisoning data for aldicarb, azinphosmethyl, carbofuran, methamidophos, and methomyl

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Please find below, the OREB review of:

DP Barcode: _____
Pesticide Chemical Code: 098301, 058001, 090601, 101201, 090301
EPA Reg. No.: various
EPA MRID No.: not applicable

I. INTRODUCTION

Additional data has been requested to update a "Review of Poison Control Center Data Call In" memorandum dated December 5, 1994. This memorandum reviewed both California and Poison Control Center data for 28 organophosphate and carbamate insecticides. Further information about this review can be found in the "Review of Registrant Response to Acute Worker Risk Ranking Meeting July 20, 1995" which is dated May 30, 1996. The present memorandum summarizes the limited available data from the Office of Pesticide Program's (OPP) Incident Data System (IDS) and California data from the Pesticide Illness Surveillance System for five insecticides ranked among the top six in the December 1994 memorandum. The IDS

data comes largely from reports submitted to OPP by registrants and contains all incidents reported since June 1992. The California data covers the years 1990 through 1994.

II. CONCLUSION

All five insecticides appear to have markedly lower ratios of poisoning during the 1990-1994 time period than in 1982-1989. Perhaps a quarter of the decline may be an artifact of increased reporting of applications. The reasons for the rest of the decline are likely a combination of improved labeling and safer work practices and, perhaps, an artifact of under-reporting by physicians.

Conclusions concerning each of the five insecticides are summarized below:

Aldicarb: Misuse of aldicarb on food crops continues to be a serious threat of poisoning. Three incidents one in Ireland and two in the U.S. have been reported to the Incident Data System. Both the IDS and California report cases where maintenance or cleaning of application equipment was performed without proper protective equipment. Half of the six cases in California occurred when a mixer/loader had loaded the granules into a cotton planter.

Azinphosmethyl: Direct overspray of azinphosmethyl on a residential population resulted in 40 cases of mild to moderate poisoning symptoms. California reported four cases involving reentry into a treated field, though apparently each case involved a violation of reentry time restrictions. The unusually low number of reports in the Incident Data System submitted by the registrant (one case) suggests that some incidents that would be deemed reportable by EPA are being withheld.

Carbofuran: Application operations appear to be the principle source of exposure to carbofuran. Most of the cases appear to involve failure to use proper protective equipment. Cleaning and repair of application equipment is also a source of excessive exposures. Field reentry does not appear to be a significant source of poisonings for this insecticide.

Methamidophos: Too few cases of methamidophos have been reported to determine potential risk factors for poisoning. Mixer/loaders that circumvent California's closed system requirements have been poisoned. The unusually low number of reports in the Incident Data System submitted by the registrant (one case) suggests that some incidents that would be deemed reportable by EPA are being withheld.

Methomyl: Application, mixing/loading, and spray drift or reentry appear to be roughly equally involved in undue exposures to

methomyl. Improper use of water soluble bags continues to be a problem and it seems likely that this type of poisoning will decline as workers become more familiar with this type of container. Serious cases occurred when backpack sprayers were left unattended and when methomyl was stored in improper containers. Certification and training programs need to continue to highlight the dangers of this kind of misuse.

III. DETAILED CONSIDERATIONS

The following data bases have been consulted for the poisoning incident data on the active ingredients aldicarb (PC Code: 098301), azinphosmethyl (PC Code: 058001), carbofuran (PC Code: 090601), methamidophos (PC Code: 101201), and methomyl (PC Code: 090301):

1) OPP Incident Data System (IDS) - reports of incidents from various sources, including registrants, other federal and state health and environmental agencies and individual consumers, submitted to OPP since 1992. Most of these cases lack documentation of exposure or health effects. Therefore, none of the cases can be considered confirmed pesticide poisoning unless otherwise stated.

2) California Department of Food and Agriculture (replaced by the Department of Pesticide Regulation in 1991) - California has collected uniform data on suspected pesticide poisonings since 1982. Physicians are required, by statute, to report to their local health officer all occurrences of illness suspected of being related to exposure to pesticides. The majority of the incidents involve workers. Information on exposure (worker activity), type of illness (systemic, eye, skin, eye/skin and respiratory), likelihood of a causal relationship, and number of days off work and in the hospital are provided.

Aldicarb

There were 27 aldicarb incidents involving adverse human effects in the Incident Data System. Six of these cases were intentional/suicide attempts. Three incidents involved illegal use on food crops resulting in poisoning: 29 people in Ireland hospitalized from ingesting contaminated cucumbers; family in Virginia eating contaminated cantaloupe; and 2 people in Alabama eating contaminated watermelon. Five cases occurred when workers were cleaning or performing maintenance duties on equipment in which aldicarb had been used. Another three cases occurred when individuals were digging in dirt without proper protection in soil recently treated with aldicarb. In Texas a truck crashed resulted in a fire. Fortunately, the surrounding population was evacuated and no cases of poisoning related to this major spill were reported.

California reported 6 cases of systemic poisoning due to aldicarb from 1990 through 1994. One case involved a worker cleaning planting equipment who was possibly exposures to residue left from the year before. Three cases of systemic poisoning occurred when a mixer/loader had loaded aldicarb into cotton seed planters. In one of these three cases a notice of violation was issued for failure to wear protective equipment and lack of training. An applicator riding on the back of a cotton planter developed dizziness, nausea, and upset stomach in a case possibly related to aldicarb exposure. A child playing in a cotton field developed a serious case of poisoning (muscle fasciculations, pinpoint pupils, difficulty breathing, edema) in a definite case that may have involved ingestion of the granules. The child was hospitalized for two days.

Azinphosmethyl

There were only two incidents in the Incident Data System related to adverse human effects from azinphosmethyl. In Louisiana a pilot failed to cutoff spraying when flying over residential property. Approximately 40 cases were reported with mild to moderate symptoms of poisoning. A violation was issued in this case. In a reentry case in Washington State, 25 workers developed itching, rashes, dizziness, and nausea on account of early entry into an orchard that had been sprayed the previous night.

California reported 9 cases of systemic poisoning due to aldicarb from 1990 through 1994 and one possible case of a skin rash in a worker picking pears. Four of the nine cases involved applicators. Cholinesterase tests were available for only one of these cases and was in the normal range. All four cases were considered "possible" in terms of azinphosmethyl causing the reported symptoms. Four case involved exposure to residues in a recently treated field. Two workers thinning peaches were exposed from reentering one day prior to the expiration of the reentry interval. A irrigator and a man operating a mower were also exposed apparently prior to expiration of the reentry interval. In the remaining case a traffic officer responding to a chemical spill was exposed to azinphosmethyl and developed symptoms of headache and salivation.

Carbofuran

Just over 100 carbofuran cases have been reported to the Incident Data System since June 1992. Fifty percent of these cases involved exposure to the applicator during spray operations. Although data were often limited, most cases involved failure to wear proper protective equipment. Another 15% of exposures resulted when workers were cleaning or repairing spray equipment. Eight cases reported exposure when equipment malfunctioned (e.g.,

hose broke) and there were five case related to spray drift. Only one questionable case involved field reentry and exposure to foliar residues.

Handlers were also involved in the majority of cases reported in California from 1990 through 1994. Of the 10 cases, four were applicators and two were mixer/loaders. Nine of the 10 cases involved symptoms consistent with systemic poisoning. Only one case, a field reentry exposure involved a skin reaction which had a questionable relationship to carbofuran. One other systemic case involved field reentry but the symptoms were mostly atypical. Two cases were reported in a manufacturing plant.

Methamidophos

Excluding the cases also reported by California, there was only one methamidophos case reported in the Incident Data System. This is the only case that the registrant has reported. A Italian man intentionally swallowed 45.6 grams of methamidophos in a 200 ml solution (estimated dose = 600 mg/kg) in a suicide attempt. He became comatose with cholinesterase level less than 10 percent of normal, which indicates a life-threatening poisoning. With treatment he recovered, however on day 25 weakness developed in his legs. Tests of nerve conduction velocities, evoked potentials, and neuro-toxic esterase confirmed a chronic case peripheral neuropathy. Other such cases have been reported in the literature.

California reported five cases of poisoning and three cases of skin reactions associated with exposure to methamidophos. Two separate cases involved drift exposure to workers in adjacent fields to where an aerial application took place. A mixer/loader hand poured the product because the closed system was clogged. Another mixer/loader splashed the product on himself when rinsing the containers. A worker unloading his truck was exposed to concentrate fumes and developed dizziness. Three possible cases occurred in two separate incidents when workers developed skin reactions possibly related to chemical exposure.

Methomyl

Most of the cases reported to the Incident Data System occurred in California. To prevent duplication, these case will be discussed in the paragraph below. Outside of California there were 38 cases reported. Applicators were involved in 37% of these cases and mixer/loaders in 24%. Malfunctioning equipment or mishap during transport was involved in 13% of cases. Two possible field reentry-related cases were reported.

California reported a total of 24 systemic illnesses related to occupational methomyl exposure from 1990 through 1995. Two-thirds of these cases occurred in handlers and one-third involved

field workers exposed to spray drift or foliar residues. Eight cases involved applicators, at least four of which did not have proper training or protective equipment. Four cases involved mixer/loaders that either opened a water soluble bag or were exposed from malfunctioning equipment. Two cases involved spray drift and four cases occurred from field reentry (it was noted that 3 of the 4 were early illegal reentry). Two serious cases occurred from accidental ingestion. In a life threatening case the worker drank from a Pepsi bottle that contained 36% methomyl. In the other case the worker accidentally drank from an unmarked container in a greenhouse that was right next to the water container.

In addition to these systemic cases there were seven cases that involved skin, eye or respiratory reactions, principally to dust. Two significant incidents were reported involving young children. In one case three children found a backpack sprayer and drank from it. All were hospitalized for 2-3 days and in one case the symptoms were life-threatening. In another unusual case, a mother had spread methomyl fly bait on the garage floor and sidewalk. After sweeping up the granules, she allowed her 13 month old son to play in the area. He was hospitalized for one day with minor symptoms.

Examination of California Data for Trends

Uniform classification and collection procedures permit analyzing California data for evidence of trends. Table 1 provides a comparison of the ratios (poisoning per 1,000 applications) and number of poisonings for the 1982-89 period with 1990-1995. Both the number of cases reported and the ratio of poisoning per 1,000 applications appear to have gone down markedly. Some of this change may be due to changes in the way applications were reported starting in 1990. In that year all applications had to be reported not just those that were restricted or applied by a commercial applicator. To determine whether an artificial increase in reporting of applications was responsible for the apparent decline another table was prepared. Table two provides the total ratio for agriculturally-related poisonings and the annual number of applications. With the exception of methamidophos, the other four insecticides showed a significant increase in applications ranging from a 19% to two-fold increase. It is not possible to determine whether all of these increases are an artifact of changes in reporting requirements and how much may be a real increase. In any event, it is evident that increase reporting of applications is unlikely to explain all of the decrease in poisoning ratios.

Another possible explanation for the decrease in poisoning ratios might be an overall decline in reporting by physicians. This possibility might be examined by looking at the systemic poisonings reported for other insecticides that had been examined in the December 1994 memorandum. In order to make this comparison it will be necessary to obtain 1990-1994 poisoning data for

agricultural uses only. California's review of the 1994 data should be completed in a couple of months which will make this analysis possible.

It appears that some of the decline in poisoning ratios in California is real. Dupont felt that part of the decline in methomyl cases (noted in their August 16, 1994 review of California data) was due to label changes mandated in 1989, that took effect in 1991. Other changes in labels over this time period should be taken into account when attempting to explain the reasons for the decline.

Table 1. Incidence of Systemic Poisoning Cases Reported to the California Pesticide Illness Surveillance Program 1982 through 1989 compared with 1990 through 1994, Agricultural Worker Poisonings, where the pesticide was considered the primary cause of the poisoning.

PESTICIDE	NUMBER OF APPLICATIONS 1982-89/ 1990-94	POISONINGS/1,000 APPL. (N) 1982 through 1989			POISONINGS/1,000 APPL. (N) 1990 through 1994		
		HANDLERS	FIELD WORKERS	TOTAL	HANDLERS	FIELD WORKERS	TOTAL
ALDICARB	24,828/ 18,460	.76 (19)	.20 (5)	.97 (24)	.27 (5)	.00 (0)	.27 (5)
AZINPHOSMETHYL	50,531/ 40,149	.26 (13)	.77 (39)	1.03 (52)	.10 (4)	.12 (5)	.22 (9)
CARBOFURAN	29,126/ 36,976	.48 (14)	.38 (11)	.86 (25)	.22 (8)	.03 (1)	.24 (9)
METHAMIDOPHOS	52,206/ 32,156	.11 (6)	1.03 (54)	1.15 (60)	.09 (3)	.06 (2)	.16 (5)
METHOMYL	257,304/ 192,146	.23 (59)	.24 (62)	.47 (121)	.08 (16)	.04 (8)	.12 (24)

Table 2. Ratio of Systemic Poisonings to Applications Reported to the California Pesticide Illness Surveillance Program 1982 through 1989 compared with 1990 through 1994, Agricultural Worker Poisonings, where the pesticide was consider the primary cause of the poisoning.

PESTICIDE	Ratio of poisonings/1,000 applications			Mean annual number of applications		
	1982-89	1990-94	Percent change	1982-89	1990-94	Percent change
	ALDICARB	.97	.27	-72%	3104	3692
AZINPHOSMETHYL	1.03	.22	-79%	6316	8030	+27%
CARBOFURAN	.86	.24	-72%	3641	7395	+103%
METHAMIDOPHOS	1.15	.16	-86%	6526	6431	-1%
METHOMYL	.47	.12	-74%	32,163	38,429	+19%

cc: correspondence
aldicarb file
azinphosmethyl file
carbofuran file
methamidophos file
methomyl file
Debbie McCall, RCAB (7509C)