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OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Aldicarb - Review of Pesticide Poisoning Incident Data¹

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The following data bases have been consulted for the poisoning incident data on the active ingredient aldicarb (PC Code: 098301):

- 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.
- 2) Poison Control Centers - as the result of Data-Call-Ins issued in 1993, OPP received Poison Control Center data covering the years 1985 through 1992 for 28 organophosphate and carbamate chemicals. Most of the national Poison Control Centers (PCCs) participate in a national data collection system, the Toxic Exposure Surveillance

¹ This review updates an August 17, 1994 memorandum titled Review of Aldicarb Poisoning Data and Proposed Mitigation Measures for the Acute Worker Risk Strategy from Ruth Allen to Jack Housenger.

System which obtains data from 70 centers at hospitals or universities. PCCs provide telephone consultation for individuals and health care providers on suspected poisonings, involving drugs, household products, pesticides, etc.

3) 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 hospital are provided.

4) National Pesticide Telecommunications Network (NPTN) - NPTN is a toll-free information service supported by OPP. A ranking of the top 200 active ingredients for which telephone calls were received during calendar years 1984-1991, inclusive has been prepared. The total number of calls was tabulated for the categories humans, animals, calls, incidents and others.

ALDICARB REVIEW

I. IDS

As of March 19, 1996, there were 91 IDS reports of adverse effects. Twenty-six (26) incidents involved 62 humans; 60 had systemic symptoms compatible with carbamate poisoning and 2 had other symptoms. Only 10 cases of occupational exposure to aldicarb were reported; failure to use protective equipment was noted in 5 cases. In one report from 1994, a truck loaded with Temik® brand aldicarb crashed and burned near Dallas, Texas. The driver was killed. Approximately 5,000 people were evacuated and 100 reported to hospital but none were treated for poisoning.

Among the non-occupational exposures is a report from Ireland of 29 people being hospitalized following consumption of cucumbers that had been treated with aldicarb. Other cases of ingestion of aldicarb include two cases in which people consumed fruit (watermelons and cantaloupe) on which aldicarb was misused. Two cases were suspected intentional poisonings. In one case from 1995, a family of six in Odessa, Texas, became acutely ill after eating homemade catfish soup; four were hospitalized. A sample of the soup contained 340 ppm of aldicarb. In another case from 1993, a patient (sex not stated) developed clinical signs shortly after eating dinner. The patient's cholinesterase level was 6% of normal 6 hours after onset of symptoms; aldicarb residues were detected in the blood 15 hours after onset. The physician in charge of the case speculated that the incident might have been a deliberate poisoning. Two additional cases involved suicide attempts and one

was a possible insurance fraud.

Fifty-three (53) incidents involved domestic animals. Table 1 details the findings of these cases.

Table 1: Incidents of Aldicarb Poisonings in Domestic Animals Reported to IDS

Species	No. Involved	No. of Deaths	No. Recovered	No. Intentional Poisonings
Dog	150	139	11	140
Cat	12	12	-	12
Cow	28	24	4	-
Sheep*	270	270	-	-

* 270 of 1600 sheep died when they grazed at the site of improper application and disposal of aldicarb

The above figures are estimates of number of animals involved. In some reports, only an approximation was provided. The incidents of intentional poisonings of animals, especially dogs, appear to be concentrated in the Southeast, but some reports have also been received from Washington, Idaho, Ohio and New Hampshire. Some of the incidents involve the death of a single animal but others describe the killing of large numbers of dogs. In Treutlin County, Georgia, 11 dogs died after consuming hot dogs laced with aldicarb. These animals were part of a fox hunt and it is suspected that an anti-hunting individual was responsible. In another case, a resident of Arkansas was apprehended with pork laced with aldicarb. He is believed to be responsible for the death of 15-20 dogs and cats. A January 30, 1996 letter from Dennis Edwards, the Product Manager for this chemical, to Rhone-Poulenc Ag Company inquired about what measures the company will take to investigate these intentional poisonings and to mitigate the illegal use of aldicarb. The letter suggested that the registrant attempt to uncover the source of the chemical in these cases. (There was one IDS report of aldicarb being repackaged for use as a rat bait in Brazil.) To date, no response from the registrant has been received.

There were 12 reports of ecological effects which were referred to EFED. Two involved the use of aldicarb to bait wildlife.

II. Poison Control Center Data

Aldicarb was one of 28 chemicals for which poison control center data were requested. The following text and statistics are taken from an analysis of these data; see December 5, 1994 memo from Jerome Blondell to Joshua First.

The 28 chemicals were ranked using three types of measures: (1) number and percent occupational and non-occupational adult exposures reported to PCCs requiring treatment, hospitalization, displaying symptoms, or serious life-threatening effects; (2)

California data for handlers and field workers comparing number of agricultural poisonings to reported applications; and (3) ratios of poisonings and hospitalization for PCC cases to estimated pounds reported in agriculture for pesticides used primarily in agriculture. Based on these criteria, aldicarb was judged fifth among the 28 pesticides. It did not score in the top 25% for percentage measures of occupational PCC cases, but did score in the top 25% for non-occupational cases (Table 2). It was responsible for the highest ratio of handler poisoning per 1,000 applications in California whether mixed exposures were included or not (Table 3). Aldicarb's ratio of occupational PCC exposures and poisonings to estimated pounds in use ranked fifth (Table 4). Additionally, aldicarb had the highest reported percentages of symptoms and life-threatening exposures among children under age 6 (Table 5).

A. Occupational and Non-occupational Exposure

There were a total of 595 aldicarb cases in the PCC data base. Of these, 143 cases were occupational exposure; 121 (85%) involved exposure to aldicarb alone and 22 (15%) involved exposure to multiple chemicals, including aldicarb. There were a total of 320 adult non-occupational exposures; 303 (90%) involved this chemical alone and 17 (5%) were attributed to multiple chemicals.²

In this analysis, four measures of hazard were developed based on the Poison Control Center data, as listed below.

1. Percent of all accidental cases that were seen in or referred to a health care facility (HCF).
2. Percent of these cases (seen in or referred to HCF) that were admitted for medical care.
3. Percent of cases reporting symptoms based on just those cases where the medical outcome could be determined.
4. Percent of those cases that had a major medical outcome which could be defined as life-threatening or resulting in permanent disability.

Exposure to aldicarb alone or in combination with other chemicals was evaluated for each of these categories, giving a total of 8 measures. A ranking of the 28 chemicals was done based on these measures with the lowest number being the most frequently implicated in adverse effects. Table 2 presents the analyses for occupational and non-occupational exposures. The number in parentheses is the median score for that category. The superscript following the asterisk denotes the ranking of the chemical in the list of top 25% for that category.

² Workers who were indirectly exposed (not handlers) were classified as non-occupational cases.

Table 2: Measures of Risk From Occupational and Non-occupational Exposure to Aldicarb^a

	Occupational Exposure	Non-occupational Exposure
Percent Seen in HCF		
Single chemical exposure	64.5 (68.2)	37.0 (44.0)
Multiple chemical exposure	67.1 (69.8)	38.8 (46.1)
Percent Hospitalized		
Single chemical exposure	19.2 (12.2)	20.5* ³ (9.9)
Multiple chemical exposure	16.7 (14.3)	20.2* ⁴ (12.6)
Percent with Symptoms		
Single chemical exposure	87.3 (85.8)	85.2* ⁴ (74.0)
Multiple chemical exposure	88.6 (85.8)	85.6* ⁶ (75.2)
Percent with Life-threatening Symptoms		
Single chemical exposure	1.4* ⁷ (0.0)	0.5* ⁵ (0.0)
Multiple chemical exposure	1.1 (0.5)	0.9* ⁶ (0.05)

^a Extracted from Tables 2, 3, 5 and 6 in December 5, 1994 memo from Jerome Blondell to Joshua First; number in parentheses is median score for that category

* Top 25% of chemicals are ranked with a superscript of 1 to 7

B. Ratios of poisoning - California Data

The incidence of **systemic poisoning cases** in agricultural workers reported to the California was compared to the number of applications of aldicarb. Those calculations with the median score for a total of 29 pesticides are presented in the Table 3 below.

Table 3: Systemic Poisonings/1,000 Applications in Selected Agricultural Workers Exposed to Aldicarb in California^a

Pesticide	Number of Appl.	Poisonings/1,000 Appl. (N) Primary Pesticide Only			Poisonings/1,000 Appl. (N) Multiple Pesticide Exposure		
		Handlers	Field Workers	Total	Handlers	Field Workers	Total
Aldicarb	24,828	.76 (19)	.20 (5)	.97 (24)	.80 (20)	.24 (6)	1.05 (26)
Median		.21	.20	.41	.44	.50	1.02

^a Extracted from Table 7 in December 5, 1994 memo from Jerome Blondell to Joshua First; number in parentheses is the observed number of poisoned cases.

C. Ratios of poisoning - U.S. Poison Control Data

Active registrations for aldicarb are for agriculture use exclusively. Ratios of the number of occupational poison control center exposures to the reported pounds of the chemical used were calculated. The results for aldicarb and the median for the 15 chemicals included in the analysis are presented in the Table 4 below.

Table 4: Ratios of Aldicarb Poisonings (PCC Data) to Reported Use^a

Pesticide	Exposure Per Use	Poisonings Per Use	Health Care Referral Per Use	Hospital Admitted Cases Per Use
Aldicarb	.040* ⁵	.022* ⁵	.027	.004
Median	.033	.013	.027	.004

^a Extracted from Table 9 in the December 5, 1994 memo from Jerome Blondell to Joshua First

* Top 33% of chemicals are ranked with a superscript of 1 to 5

D. Exposure in Children

A separate analysis of the number of exposures in children five years of age and under from 1985-1992 was conducted. For aldicarb, there were 65 incidents; 55 (85%) involved exposure to aldicarb alone, while 10 (15%) involved exposure to multiple chemicals including aldicarb. These cases were also categorized using the above eight measures for 17 chemicals used for occupational and non-occupational exposure. (Chemicals with less than 25 accidental exposures were omitted from the analysis.) The results appear in Table 5 below. The superscript number denotes the ranking on a list of the top 4 chemicals. The percentage in brackets is the median for that category.

Table 5: Measures of Risk in Children Exposed to Aldicarb^a

	Aldicarb Alone	Aldicarb in Combination
Percent Seen in HCF	30.9* ⁴ [21.0]	32.3* ⁴ [20.9]
Percent Hospitalized	17.6* ⁴ [13.3]	23.8* ¹ [13.2]
Percent w/ Symptoms	60.0* ¹ [18.8]	60.5* ¹ [19.0]
Percent w/ Life-Threatening Symptoms (Number of Cases)	5.7 (2)* ¹ [0.2]	7.0 (3)* ¹ [0.2]

^a Extracted from Tables A3 and A4 in December 5, 1994 memo from Jerome Blondell to Joshua First; number of cases in parentheses; median score for that category in brackets

* Top four chemicals are ranked with a superscript of 1 to 4

Only two agricultural chemicals, aldicarb and carbofuran, were associated with 50 or more exposures each among preschool children. An average of 8 and 7 children per year had access to aldicarb and carbofuran, respectively.

II. California Data - 1982 through 1992

Detailed descriptions of 48 cases submitted to the California Pesticide Illness Surveillance Program were reviewed. The majority (91%) of the cases involved systemic illnesses; the number per year was fairly consistent, except for 1991 and 1992. Table 6 presents the types of illness reported by year.

Table 6: Types of Illnesses Reported as a Result of Aldicarb Exposure in California, 1982-1992

Year	Illness Type			Total
	Systemic	Eye	Skin	
1982	8	-	1	9
1983	10*	-	-	10
1984	5	-	2	7
1985	3	-	-	3
1986	2	-	-	2
1987	6**	1	-	7
1988	2	-	-	2
1989	3	-	-	3
1990	5	-	-	5
1991	-	-	-	0
1992	-	-	-	0
Total	44	1	3	48

* Includes four members of one family that ate squash contaminated with aldicarb

** Includes four members of one family that ate watermelon contaminated with aldicarb

The data were also tabulated by exposure category; see Table 7 below.

Table 7: Activity Categories for Aldicarb Exposure in California, 1982-1992^a

Year	Exposure Category				
	Mix/Load	Appl.	Residue	Non-occ.	Other
1982	1	5	2	-	1
1983	2	2	1	5	-
1984	1	2	2	-	2
1985	2	-	-	1	-
1986	-	2	-	-	-
1987	1	-	1	4	1
1988	-	2	-	-	-
1989	1	2	-	-	-
1990	3	1	-	-	-
Total	11	16	6	10	5

^a Years 1991 and 1992 had no poisoning reports

Mix/Load = mixer/loader; Appl. = applicator; non-occ. = non-occupational

The highest number of incidents were in applicators of aldicarb. It was noted on 10 incident reports that protective equipment was not used; five reports indicated that the worker had not received safety training. The absence of cases for 1991 and 1992 could possibly be explained by several risk mitigation measures imposed by California. Application rates were reduced in 1991 for cotton, sugar beets, dried beans and citrus. (Preplant treatment on cotton accounts for 79% of all pounds of aldicarb used.) In addition, since February 28, 1992, positive displacement (PD) equipment has been required for citrus.

Eight of the ten cases of non-occupational exposure involved ingestion of food contaminated with aldicarb. One near fatal case occurred in a child playing in a field where a Gandy box on a tractor was full of Temik®. The ground nearby was contaminated with aldicarb granules. Ingestion of the granules was suspected.

IV. NPTN

On the list of the top 200 chemicals for which NPTN received calls from 1984-1991, inclusively, aldicarb ranked 45th. During this time period, there were 534 calls reporting 114 incidents involving 86 humans and 24 animals.

V. CONCLUSIONS

1. As of March 19, 1996, there were 91 IDS reports of adverse effects. Twenty-six (26) incidents involved 62 humans; 60 had systemic symptoms compatible with carbamate poisoning and 2 had other symptoms. Only 10 cases of occupational exposure to aldicarb were reported; failure to use protective equipment was noted in 5 cases. Ingestion of aldicarb on food, suspected intentional poisonings, suicide attempts account for the majority of the non-occupational exposures.

Fifty-three (53) incidents involved domestic animals. Intentional poisonings through baiting food with aldicarb have been responsible for the death of approximately 139 dogs and 12 cats. The majority of these incidents occurred in the Southeast. The Registration Division recently issued a letter advising the registrant to investigate these cases to determine the source of the chemical.

2. Poison Control Center data from 1985 through 1992 on aldicarb were reviewed as part of a Data-Call-In for 28 organophosphate and carbamate pesticides. The chemicals were ranked using three types of measures: (1) number and percent occupational and non-occupational adult exposures reported to PCCs requiring treatment, hospitalization, displaying symptoms, or serious life-threatening effects; (2) California data for handlers and field workers comparing number of agricultural poisonings to reported applications; and (3) ratios of poisonings and hospitalization for PCC cases to estimated pounds reported in agriculture for pesticides used primarily in agriculture. Based on these criteria, aldicarb was judged fifth among the 28 pesticides. It did not score in the top 25% for percentage measures of occupational PCC cases, but did score in the top 25% for non-occupational cases (Table 2). It was responsible for the highest ratio of handler poisoning per 1,000 applications in California whether mixed exposures were included or not (Table 3). Aldicarb's ratio of occupational PCC exposures and poisonings to estimated pounds in use ranked fifth (Table 4). Additionally, aldicarb had the highest reported percentages of symptoms and life-threatening exposures among children under age 6 (Table 5).

3. Detailed descriptions of cases submitted to the California Pesticide Illness Surveillance Program were reviewed. The majority of the 48 cases involving exposure to aldicarb alone reported systemic illnesses. The highest number of incidents were in applicators. Failure to use safety equipment or to provide safety training was noted on many of the reports of occupational exposure. There were some reports of non-occupational exposure via ingestion of contaminated food. The absence of any cases in 1991 and 1992 could possibly be due to risk mitigation measures imposed by California, including application rate reductions and improved equipment.

4. On the list of the top 200 chemicals for which NPTN received calls from 1984-1991, inclusively, aldicarb ranked 45th. During this time period, there were 534 calls reporting 114 incidents involving 86 humans and 24 animals.

VI. RECOMMENDATIONS

1. Regulatory restrictions to prevent acute poisoning by aldicarb should be in accordance with the provisions of the Acute Worker Risk Strategy.

2. Risk mitigation measures to reduce the accessibility of aldicarb to children should be explored.

3. The registrant should investigate the sources of aldicarb used in intentional poisonings of domestic animals and propose methods to reduce its availability for these purposes.

CC: Correspondence file
Chemical file
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