



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

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

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MEMORANDUM

SUBJECT: Review of Triflularin Incident Reports
DP Barcode D300064, Chemical#036101

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BACKGROUND

The following data bases have been consulted for the poisoning incident data on the active ingredient Triflularin (PC Code: 036101):

- 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. Reports submitted to the Incident Data System represent anecdotal reports or allegations only, unless otherwise stated. Typically no conclusions can be drawn implicating the pesticide as a cause of any of the reported health effects. Nevertheless, sometimes with enough cases and/or enough documentation risk mitigation measures may be suggested.
- 2) Poison Control Centers - as the result of a data purchase by EPA, OPP received Poison

Control Center data covering the years 1993 through 1998 for all pesticides. Most of the national Poison Control Centers (PCCs) participate in a national data collection system, the Toxic Exposure Surveillance System which obtains data from about 65-70 centers at hospitals and universities. PCCs provide telephone consultation for individuals and health care providers on suspected poisonings, involving drugs, household products, pesticides, etc.

3) California Department of Pesticide Regulation - 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.

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 human incidents, animal incidents, calls for information, and others.

TRIFLULARIN REVIEW

I. Incident Data System

Incident#865-1

A pesticide incident occurred in 1994, when a thirty-three year old man ingested two to three ounces of the product. The man was taken to the emergency room three to four hours later and he reported nausea, vomiting, dizziness, and increased salivation. No further information on the disposition of the case was reported.

Incident#1263-3

A pesticide incident occurred in 1994, when an individual reported pruritus, rash, dermal irritation and pain. No further information on the disposition of the case was reported.

Incident#1327-1

A pesticide incident occurred in 1994, when an adult male farmer used the product for an unknown number of years. The farmer reported chronic fatigue, brain fog, nasal congestion, episodes of anger and screaming outbreaks, and bursitis. No further information on the disposition of the case was reported.

Incident#2796-53

A pesticide incident occurred in 1994, when the product was applied to a field adjacent to an individual's home. The product then drifted onto the individual's property. Specific symptoms were not mentioned. No further information on the disposition of the case was reported.

Incident#2796-86

A pesticide incident occurred in 1994, when crops were sprayed with the product. An individual directly over-sprayed reported nausea and headaches. No further information on the disposition of the case was reported.

Incident#3462-1

A pesticide incident occurred in 1996, when a fifty-two year old man's back was exposed to the product. He did not immediately report burning of his skin at the time. Later, the man reported burning skin on his back whenever he sweats. No further information on the disposition of the case was reported.

Incident#3710-1

A pesticide incident occurred in 1996, when a farmer applied a large amount of the product for the first time. The farmer reported a headache and nausea. No further information on the disposition of the case was reported.

Incident#4143-1

A pesticide incident occurred in 1996, when a woman applied the product to her garden and some of it got on her skin underneath the gloves she was wearing. Two weeks later, she reported dry and red skin on her hand. No further information on the disposition of the case was reported.

Incident#5311-1

A pesticide incident occurred in 1991, when an individual was exposed to the product in a formulation facility. Specific symptoms were not mentioned, but subject did receive unspecified treatment. No further information on the disposition of the case was reported.

Incident#7587-156

A pesticide incident occurred in 1996, when a thirty-four year old man, who is a lawn care specialist, treated a lawn with the product. The product blew into his face and mouth. Twenty minutes later he reported vomiting and was taken to a clinic for an examination. No further information on the disposition of the case was reported.

Incident#7703-1

A pesticide incident occurred in 1998, when an individual reported ascending myelopathy. A physician treated the patient but it was not known how the individual was exposed to a discontinued product. No further information on the disposition of the case was reported.

Incident#8097-1

A pesticide incident occurred in 1997, when two fifty-five gallon drums of the product leaked in the back of a truck trailer. The driver, who did not wear personal protective equipment, assisted with cleaning up the material and reported skin and eye irritation. No further information

on the disposition of the case was reported.

Incident#8518-1

A pesticide incident occurred in 1999, when a fifty-seven year old man applied the product with a spreader. He reported a rash and was later treated by a physician. No further information on the disposition of the case was reported.

Incident#10413-5

A pesticide incident occurred in 2000, when a seventy-nine year old man applied the product and reported loss of muscle control and memory loss. Onset of symptoms was delayed 2-3 weeks after the application and are unlikely to be related. No further information on the disposition of the case was reported.

Incident#10831-11

A pesticide incident occurred in 2000, when a thirty-six year old woman, who has a history of asthma, reported respiratory irritation and shortness of breath. She was later treated by a physician. The woman's neighbor applied the product on an area of the lawn that is common to both houses. No further information on the disposition of the case was reported.

Incident#12362-107

A pesticide incident occurred in 2001, when an individual used the product and reported blood in their stool. No further information on the disposition of the case was reported.

Incident#12937-6

A pesticide incident occurred in 2002, when a forty-nine year old woman reported eye irritation and pain, lacrimation, diaphoresis, chills, photophobia, and malaise. The product was applied to a field adjacent to her home and drifted 20 feet. No further information on the disposition of the case was reported.

Incident#12937-16

A pesticide incident occurred in 2002, when a fifty-seven year old woman reported hives, welts, and shortness of breath. The woman touched tools that had the product on them. No further information on the disposition of the case was reported.

Incident#13059-8

A pesticide incident occurred in 2002, when a man reported shortness of breath, dizziness, fever, and chest tightness. The man adjusted the applicator and some of it got into his face. He went to the emergency room and was treated by a physician. No further information on the disposition of the case was reported.

Incident#13241-12

A pesticide incident occurred in 2002, when a forty-nine year old woman reported eye and skin irritation and pain, malaise, and diaphoresis. The woman was accidentally sprayed with the product. No further information on the disposition of the case was reported.

Incident#13879-1

A pesticide incident occurred in 2002, when a woman reported seizures and upper respiratory problems. The property next to the woman's home was sprayed with the product. No further information on the disposition of the case was reported.

Incident#13890-1

A pesticide incident occurred in 2003, when a twenty-five year old woman reported swollen lips and edema. The product blew into the woman's face. No further information on the disposition of the case was reported.

Incident#13890-2

A pesticide incident occurred in 2003, when a nine year old girl reported nausea, hives, and welts a day after the product was applied to a lawn. No further information on the disposition of the case was reported.

Incident#13890-3

A pesticide incident occurred in 2003, when a seventy-six year old man, who did not wear gloves, reported pruritus and a rash after he spread the product with his left hand. No further information on the disposition of the case was reported.

Incident#14100-1

A pesticide incident occurred in 2003, when a thirty-four year old woman reported hives and welts after using the product. The woman was treated by a physician. No further information on the disposition of the case was reported.

Incident#14198-93

A pesticide incident occurred in 2003, when a woman used the product and reported itchy skin and difficulty breathing. No further information on the disposition of the case was reported.

Incident#14199-1

A pesticide incident occurred in 2003, when a woman reported a rash. The woman was working in her flower garden. She then spread the product with her hands into the soil and used them to wipe off her forehead. No further information on the disposition of the case was reported.

Incident#14199-2

A pesticide incident occurred in 2003, when a man, who did not wear gloves, reported numbness, diarrhea, dizziness, headaches, and nausea. No further information on the disposition of the case was reported.

Incident#14273-1

A pesticide incident occurred in 2003, when a fifty-five year old woman reported hives and welts after using the product. The woman worked in her garden for several hours. No further information on the disposition of the case was reported.

Incident#14389-1

A pesticide incident occurred in 2003, when a woman reported numbness in her left hand. The woman used the product while working in her garden for about seven to ten days. No further information on the disposition of the case was reported.

Of the 30 incidents listed above, nine involved hives, swelling, itching, shortness of breath, or asthma suggesting that trifluralin may cause an allergic reaction or asthmatic reaction in susceptible individuals. The other most common complaints were dermal effects such as rash.

II. Poison Control Center Data - 1993 through 1998

Results for the years 1993 through 1998 are presented below for occupational cases, non-occupational involving adults and older children, and for children under age six. Cases involving exposures to multiple products and cases with unrelated medical outcome are excluded. Tables 1-4 present the hazard information for trifluralin compared with all other pesticides on six measures: percent with symptoms, percent with moderate, major, or fatal outcome, percent with major or fatal outcome, percent of exposed cases seen in a health care facility, and percent hospitalized and percent seen in a critical care facility. Table 1 reports the number of cases on which the data derived in Tables 2-4 are based. Table 2 presents this information for occupational cases, Table 3 for non-occupational cases involving adults and older children (six years or older), and Table 4 for children under age six.

Table 1. Number of trifluralin exposures reported to the Toxic Exposure Surveillance System (AAPCC), number with determined outcome, number seen in a health care facility for occupational and non-occupational cases (adults and children six years and older) and for children under six years of age only, 1993-1998 .

Subgroup	Exposures	Outcome determined	Seen in Health Care Facility
Occupational: adults and older children	46	33	26
Non-occupational: adults and older children	90	56	27
Children under age six	64	35	4

Table 2. Comparison between trifluralin and all pesticides for percent cases with symptomatic outcome (SYM), moderate or more severe outcome (MOD), life-threatening or fatal outcome (LIFE-TH), seen in a health care facility (HCF), hospitalized (HOSP), or seen in an intensive care unit (ICU) reported to Poison Control Centers, 1993-1998 for occupational cases only.

Pesticide	SYM*	MOD*	LIFE-TH*	HCF*	HOSP*	ICU*
trifluralin	72.7%	9.1%	0.0%	56.5%	0.0%	0.0%
All Pesticides	86.0%	18.8%	0.621%	47.0%	6.08%	2.36%
Ratio	0.84	0.48	0.0	1.20	0.0	0.0

* Symptomatic cases based on those cases with a minor, moderate, major, or fatal medical outcome. Denominator for SYM, MOD, and LIFE-TH is the total cases where medical outcome was determined. Denominator for HCF is all exposures. Denominator for HOSP and ICU is all cases seen in a health care facility.

Table 3. Comparison between trifluralin and all pesticides for percent cases with symptomatic outcome (SYM), moderate or more severe outcome (MOD), life-threatening or fatal outcome (LIFE-TH), seen in a health care facility (HCF), hospitalized (HOSP), or seen in an intensive care unit (ICU) reported to Poison Control Centers, 1993-1998 for non-occupational cases involving adults and older children.

Pesticide	SYM*	MOD*	LIFE-TH*	HCF*	HOSP*	ICU*
trifluralin	76.8%	16.1%	0.0%	30.0%	0.0%	0.0%
All Pesticides	68.5%	10.5%	0.359%	16.5%	6.24%	2.67%
Ratio	1.12	1.53	0.0	1.82	0.0	0.0

* Symptomatic cases based on those cases with a minor, moderate, major, or fatal medical outcome. Denominator for SYM, MOD, and LIFE-TH is the total cases where medical outcome was determined. Denominator for HCF is all exposures. Denominator for HOSP and ICU is all cases seen in a health care facility.

Table 4. Comparison between trifluralin and all pesticides for percent cases with symptomatic outcome (SYM), moderate or more severe outcome (MOD), life-threatening or fatal outcome (LIFE-TH), seen in a health care facility (HCF), hospitalized (HOSP), or seen in an intensive care unit (ICU) for adults and children six years and older reported to Poison Control Centers, 1993-1998 for children under six years old.

Pesticide	SYM*	MOD*	LIFE-TH*	HCF*	HOSP*	ICU*
trifluralin	11.4%	2.86%	0.0%	6.25%	25.0%	0.0%
All Pesticides	21.8%	1.40%	0.120%	16.4%	4.78%	1.36%
Ratio	0.52	2.04	0.0	0.38	5.23	0.0

* Symptomatic cases based on those cases with a minor, moderate, major, or fatal medical outcome. Denominator for SYM, MOD, and LIFE-TH is the total cases where medical outcome

was determined. Denominator for HCF is all exposures. Denominator for HOSP and ICU is all cases seen in a health care facility.

In general, trifluralin is less likely to cause minor, moderate, or life-threatening symptoms than other pesticides except among non-occupational cases where moderate effects are more likely. There were no major or life-threatening cases or cases requiring hospitalization or intensive care except for one case involving a child that was hospitalized. The one case that was hospitalized involved an ingestion in a 2 year old that did not develop any symptoms. It appears likely this case was kept in the hospital overnight for observation. Symptoms most commonly reported in ten or more individuals were eye irritation/pain (25 reports), nausea (16 reports), vomiting (13 reports), and skin irritation/pain (10 reports). Of the symptomatic cases, one-quarter involved exposure to residue rather than direct spray or spill.

III. California Data - 1982 through 2001

Detailed descriptions of 77 cases submitted to the California Pesticide Illness Surveillance Program (1982-2001) were reviewed. In 57 of these cases, trifluralin was used alone or was judged to be responsible for the health effects. Only cases with a definite, probable or possible relationship were reviewed. Trifluralin ranked 72nd as a cause of systemic poisoning in California based on data for 1982 through 2001. Table 1 presents the types of illnesses reported by year. Table 2 gives the total number of workers that took time off work as a result of their illness and how many were hospitalized and for how long.

Table 1. Cases Due to Trifluralin in California Reported by Type of Illness and Year, 1982-2001.

Year	Illness Type					Total
	Systemic ^a	Eye	Skin	Respiratory ^b	Combination ^c	
1982	1	-	1	-	-	2
1983	-	2	1	-	-	3
1984	1	1	-	-	1	3
1985	1	2	1	-	-	4
1986	1	-	1	-	-	2
1987	1	1	1	-	-	3
1988	1	-	3	-	-	4
1989	2	-	1	-	-	3

Year	Illness Type					
	Systemic ^a	Eye	Skin	Respiratory ^b	Combination ^c	Total
1990	-	2	2	-	-	4
1991	-	-	1	-	-	1
1992	-	1	1	-	-	2
1993	1	-	1	-	-	2
1994	2	1	1	-	-	4
1995	8	1	2	-	-	11
1996	-	1	1	-	-	2
1997	1	1	1	-	-	3
1998	-	-	-	-	-	-
1999	-	-	2	-	-	2
2000	2	-	-	-	-	2
2001	-	-	-	-	-	-
Total	22	13	21	-	1	57

^a Category includes cases where skin, eye, or respiratory effects were also reported.

^b Category not used until 1990. Prior respiratory cases classified as systemic.

^c Category includes combined irritative effects to eye, skin, and respiratory system.

Table 2. Number of Persons Disabled (taking time off work) or Hospitalized for Indicated Number of Days After Trifluralin Exposure in California, 1982-2001.

Time period	Number of Persons Disabled	Number of Persons Hospitalized
One day	8	-
Two days	7	-
3-5 days	2	-
6-10 days	1	-
more than 10 days	1	-
Unknown	2	-

Indefinite	-	-
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A variety of worker activities were associated with exposure to trifluralin as illustrated in Table 3 below.

Table 3. Illnesses by Activity Categories for Trifluralin Exposure in California, 1982-2001

Activity Category	Illness Category					
	Systemic ^a	Eye	Skin	Respiratory ^b	Combination ^c	Total
Applicator	4	5	11	-	-	20
Field Worker	8	2	2	-	-	12
Mixer/Loader	4	3	3	-	1	11
Other	1	2	3	-	-	6
Routine Indoor	2	-	-	-	-	2
Unknown	3	1	2	-	-	6
Total	22	13	21	-	1	57

^a Category includes cases where skin, eye, or respiratory effects were also reported.

^b Category not used until 1990. Prior respiratory cases classified as systemic.

^c Category includes combined irritative effects to eye, skin, and respiratory system.

According to Table 3, handlers (applicators and mixer/loaders) were associated with more exposures than any other category. These illnesses included symptoms of conjunctivitis, swollen arms, hand, and face and a rash, eye irritation, tearing and red eyes, headache, skin irritation, and abdominal pain. Effects to the skin, such as burning, itching, rash, appeared to be the most prevalent problems from exposure to trifluralin.

IV. National Pesticide Information Center

On the list of the top 200 chemicals for which NPIC received calls from 1984-1991 inclusively, trifluralin was ranked 53rd with 75 incidents in humans reported and 17 in animals (mostly pets).

V. Scientific Literature

Pentel et al. (1994) reported on a sixty-one year old man, who was a laboratory supervisor at a chemical pesticide company since 1951, that was patch tested for trifluralin along with eight other pesticides. The man had a positive reaction to trifluralin. Exposure to this chemical caused him to have allergic contact dermatitis.

VI. Conclusion

Based on California data and the Incident Data System, it appears that the majority of cases involved skin and eye illnesses. Poison Control Center data would tend to support these results, dermal and ocular effects were some of the most common effects reported.

VII. Recommendations

Appropriate protective clothing to protect the skin and eyes of applicators is recommended.

References

Pentel MT, Andreozzi, RJ, Marks, JG. 1994. Allergic contact dermatitis from the herbicides trifluralin and benefin. *Journal of the American Academy of Dermatology*. 31(6):1057-1058.

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