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

9PP

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

DATE: August 23, 1999

SUBJECT: Terbufos Incident Review
DP Barcode D258891, Chemical number 105001

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TERBUFOS INCIDENT REVIEW

The following data bases have been consulted for the poisoning incident data on the active ingredient terbufos (PC Code: 105001):

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.

Incident #628-1

An incident was reported in Colombia in 1993 when a worker applied terbufos by hand in a banana plantation. The worker became ill and was hospitalized. Investigation suggested that the worker may have been exposed to contaminated drinking water despite wearing gloves. No further information on the disposition of this case is available.

Incident #785-1

An incident was reported in Costa Rica in 1993 when a banana worker wanted to prove to his fellow workers that he was unafraid of the granules in the soil and defiantly ate some. He arrived at the hospital unconscious, but hospital workers were not aware of the cause of his illness. He died before appropriate treatment could be given.

Incident #996-1

A suicide was reported in the United States in 1994 when a man voluntarily drank a lethal dose of terbufos to avoid being arrested by the law.

Incident #2399-1

A case was reported in Canada when a worker died from exposure to residue on seeds. The 22 year old farmer planted canola seeds pre-blended with terbufos. Over a two week period he continually would smooth out the seeds with his bear hands. He was also eating sunflower seeds during this time that may have resulted in oral ingestion of terbufos. He was hospitalized but symptoms of organophosphate poisoning were not recognized and he was discharged. Two weeks later upon returning to the hospital, he collapsed and died. Gloves were provided free-of-charge at the seed dealer but were not used, contrary to label directions. No further information on the disposition of this case was available.

Incident #4198-1

An incident was reported in Brazil in 1996 when a 25 year old sugar cane worker was exposed to terbufos. Apparently he wore proper protective equipment when loading the spreader, but not during the spreading operation. He developed headache, nausea, blurred vision, and vomiting. He was seen at the hospital and fully recovered.

Incident #4201-1

An incident was reported in 1996 when farmer had terbufos applied in a six to eight inch band around the outside of his home (a misuse). After application the outside deck was washed down and the odor of mercaptan was quite pronounced. The farmer ate a sandwich on the deck and later that night, he awoke with nausea, diarrhea, profuse sweating, and collapsed into unconsciousness. He was treated in the hospital and recovered. The two workers who actually applied the terbufos were apparently unaffected and had normal cholinesterase values. Cholinesterase values and any further information on the disposition of this case were not reported.

Incident #4606-1

An incident was reported in 1996 in Brazil when a coffee plantation worker died within 12 hours of handling terbufos. Lack of protective equipment was suspected and there was some evidence that this worker handled other organophosphates just prior to using terbufos. The worker was admitted to the hospital in a precomatose state with symptoms of organophosphate poisoning. The patient died despite antidote and supportive therapies.

Incident #4747-1

An incident was reported in 1997 in Brazil when a coffee plantation worker became ill cleaning terbufos equipment. He did not use the protective equipment despite a training program in place to educate workers on how to avoid exposure. He experienced headache, abdominal pain, nausea, vomiting and was treated at the local hospital and discharged one day later.

Incident #6034-1

An incident was reported in 1997 when 2 uncertified applicators bought 100 pounds of terbufos and then using it without reading the label. After applying it to different fields the farmer developed problems with coughing and breathing and reported passing out (syncope, fainting) several times. The coughing was diagnosed as related to bronchial irritation likely secondary to his exposure to terbufos dust. However, the symptoms reported in this case are atypical of cholinesterase-inhibition type poisoning and there were other diagnoses that did not find terbufos to be the prime cause of the illness. No cholinesterase test results were provided.

Incident #6096-1

A Brazilian coffee plantation worker experience mild poisoning after using terbufos in 1997 without proper protective equipment.

Incident #6098-1

An incident was reported in 1997 when a mother made tortillas from corn seed contaminated with terbufos and fed them to her family. She apparently knew the seed was treated with insecticide but thought it would be safe if washed and boiled for an extended time. Three children died and six others survived. The cause of the illness was not immediately identified which delayed necessary treatment. Though a laboratory did report presence of terbufos in the seed, it is not used for treatment of seed. Another cholinesterase-inhibiting carbamate is used for treating corn seed and there was some suspicion that the identification of terbufos in this case was mistaken.

Incident #6343-1

In 1997 a two-year old child in Belize found some terbufos in an open bag in a garage and ate some. After delayed treatment in the hospital she died.

Incident #6400-1

An incident was reported in Brazil in 1997 when a bean crop worker was applying terbufos. He may have been exposed from ingesting food and smoking during the application. He experienced weakness, nausea, and headache. He was admitted to the local hospital, treated with atropine, and recovered.

Incident #6600-1

An incident was reported in Brazil in 1998 when a coffee plantation worker experienced dermal exposure due to misuse of personal protective equipment. Symptoms were not reported, but he was admitted to the hospital, treated with atropine, and recovered.

Incident #6601-1

An incident was reported in Brazil in 1998 when a coffee plantation worker experienced two days of dermal exposure without using personal protective equipment. Symptoms were not reported, but he was admitted to the hospital and recovered with treatment.

Incident #6683-1

A 19 year-old male ingested terbufos and 2 other pesticides (glyphosate and cyproconazole) in a suicide attempt in South America. Though he developed life-threatening symptoms (convulsions, coma and respiratory failure), he recovered with treatment. No further information on the disposition of this case is available.

Incident #6980-1

An incident was reported in Costa Rica in 1998 when a male banana plantation worker entered a treated area and subsequently died. He did not have on protective equipment at the time and ingestion of the terbufos is suspected based on presence of organophosphate in his stomach.

Incident #7197-1

A minor case was reported in 1998 when the individual got terbufos in his eyes and experienced tearing.

Incident #7511-1

An incident was reported from a foreign country in 1998 when a worker applied terbufos to corn without wearing protective equipment. He was hospitalized for two days and released. Lab tests reportedly found lower cholinesterase levels.

Incident #7603-1

A field was sprayed with a mixture of triazine herbicides and terbufos. About this time a woman across the street from the field called and complained of chest pains and other nonspecific complaints (tiredness, aches and pains) which have persisted. It is unlikely that these symptoms are related to the pesticide exposure.

Incident #7923-1

A Costa Rican worker planting corn in 1998 applied terbufos without wearing proper protective equipment. He developed headaches, weakness, diarrhea, and vomiting and was hospitalized for two days.

Incident #8280-1

An incident was reported in Mexico in 1998 when two junior high school students entered a recently treated banana plantation and became ill (headache, vomiting, chills, altered CNS). They

were hospitalized, treated with atropine and recovered.

Incident #8280-2

An incident was reported in Brazil in 1998 when an applicator applied terbufos without protective clothing. He developed headache, stomach ache, and dizziness. He was treated at the hospital and recovered.

Incident #8369-1

An incident was reported in Brazil in 1999 when a worker was applying terbufos for several days and was reported missing. The worker was found with excessive sweating and salivation and abdominal cramping. He was admitted to the intensive care unit of the hospital but died shortly thereafter. There is suspicion this case may be a suicide due to personal problems. His earlier work in the field had not resulted in any symptoms. Cause of death has not been concluded.

Poison Control Centers - Data was obtained on terbufos as the result of Data-Call-Ins issued in 1993 which covered the years 1985 through 1992. The Office of Pesticide Programs also obtained Poison Control Center data covering the years 1993 through 1996. 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 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.

<u>1985-1992 Data</u>

There were a total of 117 cases of occupational exposure to terbufos reported to the Poison Control Centers; 80 (68%) involved exposure to terbufos alone and 37 (32%) involved exposure to multiple chemicals, including terbufos. There were a total of 65 non-occupational exposures; 49 (75%) involved this chemical alone and 16 (25%) were attributed to multiple chemicals. Terbufos is registered mainly for agricultural uses, but some non-occupational cases involve may involve workers not directly involved in application or bystanders exposed to residue or drift.

Both occupational and non-occupational risks to terbufos was measured by examining the percent cases with known medical outcome

that had symptoms or life-threatening symptoms. Percent of exposures seen in a health care facility and percentage of those case that were hospitalized were also measured. A ranking of the 28 chemicals was done based on these measures, with the lowest number being the most frequently implicated in adverse effects. Terbufos ranked number 5 for occupational exposure and number 3 for non-occupational exposure. Terbufos was one of eight chemicals in the top 10 rankings for both occupational and non-occupational exposure. When the number of symptomatic terbufos cases was compared to pounds used, the ratio for terbufos was about one-third below the median for 15 cholinesterase-inhibiting pesticides used predominantly in agriculture.

From 1993 through 1996, Poison Control Centers reported 27 occupational exposures to terbufos and 30 non-occupational exposures. Taking into account the increased coverage of the U.S. population by PCCs in later years, these numbers suggest a significant drop (about one third less) in terbufos exposures since the 1985 to 1992 time period. Of the 27 occupational cases, 12 received follow-up to determine outcome and 10 of these were symptomatic. Of the 10 symptomatic cases, 5 experienced minor effects, 5 were moderate, and none were life-threatening. Fifteen of the occupational cases were seen in a health care facility, 3 were hospitalized, and 1 was seen in the intensive care unit. Of the 30 non-occupational cases, 15 received follow-up to determine outcome, of which 4 had minor outcome, 4 had moderate outcome, and 2 cases were life-threatening. Eighteen of the non-occupational cases were seen in a health care facility, four were hospitalized, and 2 were seen in the intensive care unit. Too few cases of terbufos exposure were reported from 1993 through 1996 to warrant detailed comparisons with other organophosphates or other pesticides.

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.

There have been no reports of adverse reactions received by the California Pesticide Illness Surveillance Program from 1982 through 1994 and no use of terbufos reported from 1980 through 1995.

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.

A total of 29 terbufos-related involving human incidents and 7 incidents involving animals were handled by NPTN from 1984 to 1991, Terbufos ranked 108th out of the top 200 pesticides based on the human incident count. All of the reported incidents are considered allegations only and are not documented with medical records or exposure data.

Conclusions

The hazard from terbufos exposure tended to be higher than other cholinesterase inhibitors based on Poison Control Center data. Of the 28 insecticides with Poison Control Center data (1985-1992), terbufos ranked 5th for occupational exposure and 3rd for non-occupational exposure, with number 1 being most frequently associated with adverse effects. This suggests that terbufos is above average in its ability to cause adverse effects. Unfortunately these rankings are based on a relatively small number of cases and there is no confirmation of the risks from another independent data source, such as the California Pesticide Illness Surveillance Program where terbufos has not been reported in use for many years. Most of the cases reported result from not using the required protective clothing. Incidents of death have been reported apparently due to prolonged and unprotected dermal exposure.

Terbufos is currently only used in granular formulations. Some of the above average ratios or measures of hazard suggest that handlers may not fully observe precautions because of the perception that poisoning is much less likely with a granular than liquid formulation. A similar pattern, with even greater hazard

measures, has been found for granular aldicarb (Blondell and Taub 1999). Label requirements for these products need to be as stringent as for liquids. A prominent label warning that failure to follow precautions may be expected to result in serious or even life-threatening poisoning requiring immediate medical care should be considered. Also, the following may be added, "This granular formulation is soluble and is readily absorbed across skin to cause poisoning."

Reference

Blondell JM, Taub SR. 1999. Poisoning incidence per 1000 applications among handlers of agricultural insecticides in California and acute dermal toxicity. Pesticides, People and Nature 1:15-24.

cc: Correspondence
Terbufos file (105001)