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SUMMARY OF RESULTS FROM THE CALIFORNIA PESTICIDE ILLNESS SURVEILLANCE PROGRAM - 2002 -

HS-1851

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Pesticide Illness Surveillance Program – 2002

Background on the Reporting System

The California pesticide safety program, which the Department of Pesticide Regulation (DPR) administers, is widely regarded as the most stringent in the nation. Mandatory reporting of pesticide illnesses has been part of this comprehensive program since 1971. The U.S. General Accounting Office (GAO, 1993) noted that "California had by far the most effective and well-established monitoring system in place" and that the U.S. Environmental Protection Agency (U.S. EPA) "relies heavily on the pesticide illness data collected by the California monitoring system . . . and has tried to encourage selected states to develop monitoring systems modeled after the California system."

DPR scientists participate in the national working group on pesticide illness surveillance convened by the National Institute for Occupational Safety and Health (NIOSH) to develop standards for information collection. DPR’s 1998 upgrade of the Pesticide Illness Surveillance Program (PISP) database incorporated several features from the NIOSH standards. NIOSH now partially supports programs in the states of Massachusetts, Michigan, New Mexico, New York, Oregon, Texas, and Washington, which make use of the standards defined by the working group. This NIOSH program also provides technical assistance to the states of Arizona, Florida, and Louisiana, and supports pesticide-related work by the Occupational Health Branch of the California Department of Health Services, which coordinates with DPR’s Worker Health & Safety Branch (WH&S). As yet, most of the other states have collected only limited numbers of case reports, and U.S. EPA still relies heavily on California data for evidence of pesticide-related adverse effects.

In 2002, DPR scientists made a concerted effort to develop rules by which questionable entries could be identified automatically. They determined that only a handful of data elements could

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1 "Pesticide" is used to describe many substances that control pests. Pests may be insects, fungi, weeds, rodents, nematodes, algae, viruses, or bacteria -- almost any living organisms that cause damage or economic loss, or transmit or produce disease. Therefore, pesticides include herbicides, fungicides, insecticides, rodenticides, and disinfectants, as well as insect growth regulators. In California, adjuvants are also subject to the regulations that control pesticides. Adjuvants are substances added to enhance the efficacy of a pesticide, and include emulsifiers, spreaders, and wetting and dispersing agents.
ever be left blank, and identified a series of necessary relationships among data elements. Data from 1992 through the present are being reviewed and updated to assure conformity with these standards. Data earlier than 1992 have not been revised to incorporate database upgrades, and will be presented only when historical perspective is important.

Excessive exposure to pesticides may cause illness by various mechanisms, and the surveillance program attempts to monitor all of them. Every pesticide active ingredient has a pharmacologic effect by which it controls its target pests. Pesticide products may have other potentially harmful properties in addition to the qualities designed to control pests. PISP collects information on adverse effects from any component of pesticide products including the active ingredients, inert ingredients, impurities, and breakdown products. Whether pesticide products act as irritants or as allergens, through their smell or by causing fires or explosions, DPR's mission is to mitigate exposures that compromise health.

DPR maintains its surveillance of human health effects of pesticide exposure in order to evaluate the circumstances of pesticide exposures that result in illness. The PISP database provides the means to identify high-risk situations warranting DPR action including the implementation of additional California restrictions on pesticide use. Taking illness data into consideration, DPR may adjust the restricted entry interval following pesticide application, specify buffer zones or other application conditions, or require pesticide handlers to use protective equipment that meets certain standards. Reviews of illness investigations concerning mixer/loader/applicators (Fong, 2001), field posting requirements (Spencer, 2001), and hazard communication/notification requirements (McCarthy, 2002) have contributed to developing proposals for modifying regulations. In some instances, changes to pesticide labels provide the most appropriate mitigation measures, and DPR cooperates with U.S. EPA to develop appropriate instructions for users throughout the country. If an illness incident results from illegal practices, state and county enforcement staff take appropriate action to deter future incidents. DPR has also revised the Pesticide Safety Information Series, a set of brochures for use in pesticide safety training, to help reduce exposures by making the language and presentation easier to understand.
Sources of Illness Cases

Under a statute enacted in 1971 and amended in 1977 (now codified as Health and Safety Code section 105200), California physicians are required to report any suspected case of pesticide-related illness or injury by telephone to the local health officer within 24 hours of examining the patient. The health officer informs the county agricultural commissioner (CAC) and also completes a pesticide illness report (PIR), copies of which are distributed to the Office of Environmental Health Hazard Assessment, Department of Industrial Relations (DIR), and DPR. Scientists regularly consult the data collected to evaluate the effectiveness of DPR's pesticide safety regulatory programs and assess the need for changes.

DPR strives to ensure that the PISP captures the majority of illness incidents and records them in its database. For example, since doctors do not always properly report pesticide cases, DPR also reviews Doctor’s First Reports of Occupational Illness and Injury (DFROII), which California's Labor Code requires workers' compensation claims payers to forward to DIR. Scientists select for investigation any DFROII that mentions a pesticide, or pesticides in general, as a possible cause of injury. Reports that mention unspecified chemicals are also investigated if the setting is one in which pesticide use is likely. Until recently, two-thirds to three-quarters of the incidents investigated were identified through DFROII review.

Over the past several years, DPR has worked with the California Poison Control System (CPCS) to assist in identifying potential pesticide illnesses. Before 2000, DPR scientists managed two pilot projects in which CPCS specialists offered to report pesticide-related illnesses on behalf of physicians. Funds from U.S. EPA supported development of an enhanced system of poison control facilitation, which operated from mid-2001 through November 2002. Cooperation with CPCS identified several hundred exposures that otherwise would have escaped detection, but the State’s fiscal crisis necessitated suspension of the contract. When resources become available, DPR will pursue funding for a continuing contractual relationship with CPCS. A summary of the 2002 reporting results from CPCS can be found at the end of this document.

The agricultural commissioners of the counties where incidents occurred investigate all identified incidents. They attempt to locate and interview all the people with knowledge of the
event, and also review relevant records. Primarily, their investigations determine whether pesticide safety requirements were fully followed. Secondarily, the CAC determines the causes of exposure and characterizes the illness. DPR provides instructions, training, and technical support for conducting investigations. These instructions include directions for when and how to collect samples of foliage, clothing, or surface residues to document environmental exposures. As part of the technical support, DPR maintains specialized laboratories to analyze the samples. The CACs prepare reports describing the circumstances in which pesticide exposure may have occurred and any other relevant aspects of the case. When appropriate, they request authorization from the affected people to include relevant portions of their medical records with the report. When investigations identify additional affected people (not previously reported by other mechanisms), they are identified in the investigation report and recorded in the PISP database. DPR scientists evaluate the physicians' reports and all the information the CACs have gathered. They then classify incidents according to the circumstances of pesticide exposure.

DPR evaluators undertake a complex evaluation of medical records and investigation reports to determine the likelihood that a pesticide exposure caused the incident. Standards for the determination are described in the PISP program brochure, “Preventing Pesticide Illness,” which can be viewed or downloaded from the DPR Web site at www.cdpr.ca.gov/docs/dprdocs/pisp/brochure.pdf.

2002 Numeric Results -- Totals
The number of case investigations nearly doubled in calendar year 2002, increasing to 1,859 from the 2001 total of 979. This reverses a trend of declining case identification over the past decade, but does not represent a major increase in the number of events in which people were exposed to pesticides. In 2002, there were 1,029 episodes investigated compared to 852 in 2001 (see Figure 1). Several 2002 events exposed large numbers of individuals, each of whom is represented by a separate case record. Investigators collected information on 73 group episodes that occurred in 2002, involving a total of 903 individuals. Offsite movement from metam-sodium applications elicited 273 case reports in one episode and 138 in another (see descriptions under drift, below). By comparison, the 979 cases investigated in 2001 included only 173
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reports of people exposed in 47 group episodes. The largest 2001 group episode involved 16 people. Assistance from CPCS also increased the number of cases identified in 2002.

Of the 1,859 cases investigated, DPR found that pesticide exposure had been at least a possible contributing factor to 1,316 (71 percent). Lack of information prevented evaluation of another 196 (11 percent) (Figure 2).

Of the 1,316 cases recognized as definitely, probably, or possibly related to pesticide exposure, 702 (53 percent) involved use of pesticides for agricultural purposes and 614 (47 percent) involved pesticide exposure in other settings. Evidence established a definite relationship to pesticide exposure for 105 of the 1,316 cases. Another 920 were classified as probable, with 291
entered as possible. Evidence established an unlikely or unrelated relationship to pesticide exposure for 343 of the 1,859 cases assigned for investigation. Four cases were attributed to precautions prescribed for avoiding pesticide exposure, and not to pesticide exposure (i.e. a reaction to the warning agent, chloropicrin, put in some fumigant products). Tabular summaries presenting different aspects of the data are available through DPR’s Web site at www.cdpr.ca.gov/docs/dprdocs/pisp/2002pisp.htm, or by contacting the WH&S Branch.

**Figure 2: Outcome of 2002 Illness Investigations**

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural</td>
<td>38%</td>
</tr>
<tr>
<td>Nonagricultural</td>
<td>33%</td>
</tr>
<tr>
<td>Inadequate Data</td>
<td>11%</td>
</tr>
<tr>
<td>Unlikely/Unrelated/Asymptomatic</td>
<td>18%</td>
</tr>
</tbody>
</table>

*Total cases investigated = 1859.*

- **Agricultural and Nonagricultural** refers to the intended use of the pesticide.
- **Inadequate** means that there was not enough data available or reported to determine if pesticides were involved in the case.
- **Unlikely/Unrelated/Asymptomatic** refers to cases determined as unlikely related or unrelated to pesticide exposure or the exposed person did not develop symptoms.

Enforcement actions often are still under consideration when DPR receives the illness investigative reports. Based on the information available, DPR scientists identified contributory factors already prohibited by pesticide safety regulations in 255 (39 percent) of the 656 episodes in which at least one case was evaluated as definitely, probably, or possibly related to pesticide exposure. Violations during or following agricultural pesticide use contributed to 48 episodes and 207 episodes derived from other exposure circumstances. This indicates that improving compliance could further reduce illnesses.

Occupational exposures (those that occurred while the affected people were at work) accounted for 793 (60 percent) of the 1,316 pesticide-associated cases from 2002. Before 1999,
occupational exposures accounted for 90 percent of the cases classified as definitely, probably, or possibly related to pesticide exposure. The relative percentage of occupational vs. non-occupational cases is at least partially the result of case identification sources. Over the last decade the percent of cases identified through DFROIIIs has decreased dramatically (Figure 3). DPR scientists have identified no demonstrable cause for the long-term decrease in case identification by DFROI retrieval. The percentage of occupational cases was further reduced in 2002 by the large number of people exposed by pesticide movement into a residential area.

Figure 3: Number of Cases Reported by Method of Reporting

PIR – Pesticide Illness Report (physician reporting).
CPCS – California Poison Control System (facilitated physician reporting).
Other – All other methods of case identification.

Agricultural Field Worker Incidents

In 2002, 240 cases involving field worker illness and injury were evaluated as probably or possibly related to pesticide exposure. Exposure via drift or offsite movement was implicated for 160 (67 percent) of the field workers, including 123 exposed in a single episode (described under “drift”, below). Another 78 field workers (32 percent) were exposed to residue. The cause of exposure could not be identified for the other two field workers.

Early reentry violations contributed to 55 of the 78 residue cases. In 38 of the 55 cases, investigators identified additional violations. Other violations, but not early reentry, contributed
to six more of the cases of field workers exposed to pesticide residue. Violations were identified as contributing to the drift episode that affected 123 field workers and to 26 of the other 37 field worker drift/offsite movement cases. Of the 240 total pesticide-associated cases of field workers exposed to pesticides by any mechanism, DPR evaluated 187 as probable and 53 as possible. Exposures to drift gave rise to 144 of the cases evaluated as probable and 16 of those evaluated as possible.

![Figure 4: Field Worker Exposure to Pesticides, 2002](a)

<table>
<thead>
<tr>
<th>Exposure Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drift</td>
<td>66%</td>
</tr>
<tr>
<td>Residue</td>
<td>33%</td>
</tr>
<tr>
<td>Unknown</td>
<td>1%</td>
</tr>
</tbody>
</table>

- **Figure 4**: Total field worker cases associated with pesticide exposure = 240.
- **Drift**: Refers to field worker cases associated with exposure to drift from a pesticide application.
- **Residue**: Refers to field worker cases associated with exposure to residue on the crops.

One episode accounted for 37 of the 38 cases involving early reentry and additional violations. In June, a Kern County grape grower did not post the vineyard as required or notify his farm labor contractor of a treatment with methomyl and other pesticides. When workers arrived in the morning to resume tipping bunches, they observed that the vines were wet as well as having an odor. Safety training was also found to have been inadequate, but some workers remembered what they had learned previously and refused to handle the contaminated plants. When the error was confirmed, the workers were withdrawn from the vineyard and, in groups of ten, all were transported for medical care. Symptoms of exposure included eye and skin irritation, nausea, vomiting, headache and dizziness. Enforcement action for this incident is pending at the time of this writing.

WH&S assisted in the onsite investigation of the episode described above, and in analysis of the samples that documented the level of methomyl contamination. WH&S scientists also
participated in investigating another reentry episode and an episode of drift onto field workers. In each case, field samples demonstrated the presence of compounds known to have been applied and detected no unexpected pesticides.

**Drift Exposure**

The PISP defines drift exposure as exposure to pesticide “spray, mist, fumes, or odor carried from the target site by air.” This definition includes the offsite movement of pesticides after they have been deposited on the target site, so long as the application remains in progress. In 2002, DPR recorded a total of 648 individuals who reported symptoms definitely, probably, or possibly related to exposure to drift (Figure 4) in 174 separate episodes. Thirteen of these episodes affected five or more people, and two episodes of metam-sodium drift each affected more than 100 people. The county referred both of these episodes to DPR for enforcement action.

One of the large episodes occurred in June when 138 people detected a strong odor as they arrived at work in a Kern County vineyard where they were scheduled to girdle vines, pull leaves, and tip bunches. The odor came from a sprinkler application of metam-sodium to an adjacent field. The application was completing as the vineyard workers arrived, and the sprinklers were then switched to running clean water to keep the pesticide in the soil. An hour later, an unexposed monitor arrived at the field and reported no odor.

Supervisors repeatedly offered to take the exposed crews for medical care, but only one worker accepted the offer. Once clear of the contaminated area, the rest of the crew felt well and preferred to resume work. DPR evaluated 123 of the exposed workers as having symptoms probably related to exposure: primarily eye irritation, with some workers additionally reporting respiratory irritation and/or systemic symptoms. DPR did not receive specific information about the symptoms the other 15 experienced, so could not classify their cases. Penalties in this case are still under consideration.
The other large episode occurred in July and affected workers at a Kern County carrot processing plant and residents of a long, narrow housing development that occupied a block-wide strip of land between the carrot processor and the treated field. In this episode, metam-sodium was shank-injected into the soil, after which workers ran clean water through sprinklers to contain it in the fields.

The application tractors moved faster, however, than the irrigators could supply water. By evening, a temperature inversion developed and a shift in wind direction blew irritant gases through the residential community. The PISP characterized this episode as exposure by drift, since air carried pesticide breakdown products offsite before the water treatment was completed.

The residents summoned emergency services, but by the time the fire department responded, the gas had largely dissipated. The fire crew took one woman to the hospital, because of her
longstanding lung problems; they were so severely exacerbated that it took a week of inpatient care to stabilize her. In all, reports were collected from 72 workers at the carrot processor and from 201 residents and visitors in the residential area. DPR concluded that sufficient evidence was available to demonstrate that the woman who was hospitalized definitely had been affected by pesticide exposure, and that most of the rest probably had been. Twenty-one of the residents denied experiencing health effects, and two did not mention having any symptoms. Five residents reported delayed or atypical symptoms that were judged possibly related.

DPR reached a legal settlement with the applicator in this case. Without admitting liability, the applicator has agreed to pay DPR $50,000 in civil penalties and reimburse Kern County $10,000 for local investigation costs.

Apart from the two episodes described above, drift exposure was evaluated as definitely, probably, or possibly related to health effects reported by 30 people engaged in routine indoor activities when exposed, 44 people engaged in routine outdoor activities, 37 field workers, 32 workers handling harvested agricultural products, and 23 people involved in other activities. Additionally, 109 pesticide handlers were definitely, probably, or possibly affected by airborne exposure to the pesticides they handled. Such exposures are recorded as drift.

Overall, agricultural pesticide use was found responsible for 478 (74 percent) of drift cases, while nonagricultural pesticides accounted for 170 (26 percent). Of the 109 pesticide handlers who exposed themselves via drift, just 13 were working in agriculture.

**Morbidity and Mortality**

Among the 1,025 cases evaluated as definitely or probably related to pesticide exposure, 19 people were admitted to hospitals and 106 lost time from work. Of the 291 possible cases, six reported hospitalization and 42 lost work time.

DPR investigated five deaths in 2002, and found three of them definitely related to pesticide exposure: Two people died of unintentional pesticide ingestion, and one broke into his home
while it was being fumigated. DPR evaluated as unrelated to pesticide exposure the death of an 85-year-old man who suffered a heart attack a few hours after spraying an herbicide (prometon) in his back yard. No information was available to determine whether pesticide exposure might have contributed to a fatal crash when an aerial applicator hit a power line.

One of the ingestion victims was an 88-year-old Alzheimer’s disease patient who drank sanitizer under the misimpression it was apple juice. She was hospitalized for four days before she succumbed. The other was an 88-year-old farmer who used old bleach bottles to store both pesticides and drinking water. One afternoon after spraying herbicides in his orchard, he drank from a bottle he thought contained water. It proved to contain demeton concentrate, an organophosphate insecticide. He informed his family of the mistake, and they called for help, but he died at the hospital about an hour later.

No California children are known to have suffered life-threatening illness from pesticide exposure in 2002.

Examples of the Importance of Compliance with Safety Procedures
Severe intoxications typically result from careless and often illegal use of pesticides. Besides the farmer who fell victim to his dangerous and illegal practice of storing pesticides in unmarked containers, a man was hospitalized overnight after drinking an herbicide (monosodium methane arsonate) that he found in a lemonade container at a friend’s home. These cases demonstrate the importance of properly storing pesticides in accordance with regulations.

Results of Cooperation with Poison Control Centers
As discussed earlier in this report, DPR constantly works to improve reporting of pesticide illnesses. Cooperation with CPCS has shown particular promise for identifying pesticide illnesses that would otherwise be missed and providing the information more promptly than any other mechanism. In 2001, renewed U.S. EPA funding allowed DPR to negotiate a new contract with CPCS to assist physicians in reporting pesticide cases. Reporting under the new contract began July 1, 2001, and continued through November 2002. Availability of this information source greatly improves the likelihood that DPR will learn of pesticide problems that occur.
outside of agriculture or the workplace. In particular, it allows some confidence that the absence of severely affected children may be real and not just the consequence of poor reporting.

In 2002, DPR assigned 508 cases for investigation based on information that CPCS had helped to provide. These reports included 54 (89 percent) of the 61 reports received on the day of the event, 185 (93 percent) of the 198 reported the day after, and 440 (82 percent) of the 539 reported within a week of occurrence. The average time from occurrence to notification was five days for cases that CPCS helped to report. For all other cases, the average time from occurrence to notification was 120 days. Median time to notification was two days for reports facilitated by poison control; for PIRs without poison control assistance, it was seven days. For DFROIIs, the median time from occurrence to case identification was 113 days.

Investigation revealed at least a possible relation to pesticide exposure in 317 (62 percent) of the 508 cases reported with assistance from poison control. These 317 cases include 214 (41 percent) of the 523 cases associated with non-occupational exposures, 14 (56 percent) of 25 hospitalizations, 45 (87 percent) of 52 cases in which people ingested pesticide, and 36 (34 percent) of the 107 cases involving children 10 years old or younger.

These figures demonstrate the importance of poison control intervention to identify non-occupational and pediatric pesticide exposures. This cooperation has been valuable to DPR surveillance, which otherwise has limited ability to detect health problems caused by home-use pesticides. Prompt notification enhances the value of investigation, as CACs take advantage of the opportunity to collect environmental samples and to interview the people involved.

References
Pesticide Illness Surveillance Program – 2002

