

**SUMMARY OF RESULTS FROM THE  
CALIFORNIA PESTICIDE ILLNESS  
SURVEILLANCE PROGRAM  
- 1998 -**

**HS-1795  
February 2000**

California Environmental Protection Agency  
Department of Pesticide Regulation  
Worker Health and Safety Branch  
830 K Street  
Sacramento, California 95814

## **Pesticide Illness Surveillance Program – 1998**

### **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. It includes requirements for thorough data review of all pesticides<sup>1</sup> before registration for use in California, safety training of all pesticide handlers and field workers, and ongoing monitoring of people and the environment to detect potential for pesticide exposure. 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 maintains its surveillance of human health effects of pesticide exposure in order to evaluate the circumstances of pesticide exposures that result in illness. Staff members regularly consult the data collected to evaluate the effectiveness of DPR's pesticide safety regulatory programs and assess the need for changes. 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, copies of which are distributed to the Office of Environmental Health Hazard Assessment, to the Department of Industrial Relations (DIR), and to DPR.

---

<sup>1</sup> "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, 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.

DPR strives to ensure that the PISP captures the majority of illness incidents. For example, since doctors do not always properly report pesticide cases, DPR's Worker Health and Safety Branch (WH&S) also reviews Doctors' First Reports of Occupational Illness and Injury, which California's Labor Code requires workers' compensation claims payers to forward to DIR. Staff members select for investigation any Doctors' First Reports of Occupational Illness and Injury that mentions a pesticide, or pesticides in general, as a possible cause of injury. Reports that mention unspecified chemicals also are investigated if the setting is one in which pesticide use is likely. In typical years, this procedure identifies two-thirds to three-quarters of the incidents investigated.

The agricultural commissioner of the county where the incident occurred investigates every incident. 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. If investigations identify additional affected people, they are identified in the investigation report and recorded in the PISP database.

WH&S staff members evaluate the physicians' reports and all the information the CACs have gathered, and classify incidents according to the circumstances of exposure to a pesticide. Evaluators undertake a complex task of determining the likelihood that a pesticide exposure caused the incident.

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. The Pesticide Illness

Surveillance Program (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.

The PISP database provides the means to identify high-risk situations warranting DPR action to implement 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. Since many illness incidents result from illegal practices, illness investigations direct the attention of state and county enforcement staff to significant non-compliance activities.

In some instances, changes to pesticide labels provide the most appropriate mitigation measures, and DPR cooperates with the federal Environmental Protection Agency to develop appropriate instructions for users throughout the country. Use of liquid nitrogen for termite control gave rise to one such cooperative effort. Following the death of a California applicator in 1989, California and federal staff worked together to develop additional safety measures, which are now in force nationwide.

DPR staff members also participate in the working group convened by the National Institute for Occupational Safety and Health (NIOSH) to develop standards for collection of information on pesticide illnesses. NIOSH now partially supports programs in the states of Florida, New York, Oregon, and Texas, which make use of the standards that the working group defined. This NIOSH program also supports pesticide work by the Occupational Health Branch of the California Department of Health Services, which coordinates closely with the DPR program.

### **Changes to the Data Collection Program**

Data for 1998 were collected using a revised and enhanced computer program. The new system assures Y2K compliance, takes a necessary first step towards making surveillance data available

to the public via the Internet, and provides the opportunity to increase the amount of data collected and to organize it more logically.

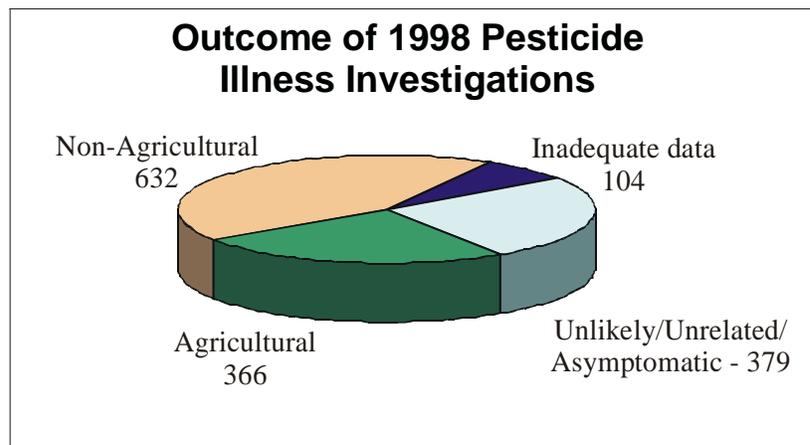
The most obvious change concerns the categories into which the program classifies the activities of the affected people. Under the former system, activity codes combined aspects of occupation, mechanism of exposure, and equipment used. For instance, one of the categories used previously was exposure to drift. The system provided no way to differentiate among farm workers, applicators or others exposed to drift. Similarly, recording that a person was applying pesticides when exposed prevented us from indicating the manner of exposure, except as part of the narrative description.

The new, expanded system provides three separate entries for activity, exposure, and equipment used. We can identify the activities of people who were drifted upon and distinguish among sprays, spills, and drift exposures to applicators.

The new system also allows us to record registration numbers, types of formulation, and application dates and sites individually for an unlimited number of different pesticides in each case. This will allow us to respond more fully and accurately to inquiries about particular products and uses.

### 1998 Numeric Results -- Totals

During 1998, DPR received reports of 1,481 people whose health may have been affected by pesticide exposure. After investigation, WH&S analysts found that pesticide exposure had been at least a possible contributing factor to 998 (67 percent) of the 1,481 cases. Of those 998 cases, 366 (37 percent) involved use of pesticides for agricultural purposes and 632 (63 percent) occurred in other settings.



Evidence established a definite relationship to pesticide exposure for 216 of the cases. Another 405 were classified as probable, with 377 entered as possible. Of the 1,481 cases, 483 either had insufficient data available to evaluate the case (104 cases) or evidence established an unlikely or unrelated relationship to pesticide exposure (379 cases). Tabular summaries presenting different aspects of the data are available through DPR's Web site at <[www.cdpr.ca.gov](http://www.cdpr.ca.gov)>, or by contacting the WH&S.

The total of 1,481 cases investigated during 1998 represents a decrease of 325 (18 percent) relative to 1997, when 1,806 cases were investigated because of some indication that they might reflect adverse effects of pesticides. The 1997 total of 1,806 itself constituted a 19% decline relative to 1996. The reason for the decrease is unclear.

Occupational exposures (those that occurred while the affected people were at work and eligible for workers' compensation) accounted for 914 (92 percent) of the 998 pesticide-related cases identified during 1998. Actions already prohibited by pesticide safety regulations contributed to 322 (32 percent) of the 998 cases evaluated as definitely, probably, or possibly related to pesticide exposure. This indicates that safety could be further improved through increased compliance efforts. In 1999, DPR established the Enforcement Initiative, a program to thoroughly evaluate and improve all aspects of enforcement of pesticide safety laws and regulations. In addition, WH&S staff initiated meetings with worker safety advocacy groups to assist in evaluating the effectiveness of existing regulations and what they think is needed to improve farm worker safety.

### **Agricultural Field Worker Incidents**

In 1998, exposure to residue was implicated in the cases of 111 field workers. Another 52 field workers were exposed to drift, and seven encountered other or unknown exposures. Due to changes in the database, the number of field workers exposed to residue may not be exactly comparable to the numbers of individuals reported exposed to field residue in past years. The category 'exposed to field residue', which appears in surveillance reports prior to 1998, includes all people who had any sort of contact with pesticide residue on crops. It excludes field workers

exposed to pesticides other than as residue on crops. These exceptions are not frequent occurrences, however, and the count of field worker exposures is low.

Of the total of 170 cases of field workers exposed to pesticides by any mechanism, DPR classified 91 as possible and 79 as definite or probable. Exposures to residue gave rise to 66 of the cases classified as possible and 45 of those classified as definite or probable. Illegal reentry during the restricted entry interval contributed to 42 (37 percent) of the 111 cases of field workers exposed to residue.

Although the total number of field worker cases was low in 1998, it includes one of the most serious poisoning episodes of the decade. A Fresno county grower scheduled an application of carbofuran, mepiquat chloride and abamectin for the night after a contractor's crew was due to finish weeding his cotton field. He did not inform the labor contractor of his plan; and the contractor did not inform the grower that his crew did not finish weeding the field as scheduled, and would return early the next morning. The crew returned about two hours after the pesticide applicator finished the job. They worked there for three to four hours, then took a break and went to another field. They started getting sick 10 to 15 minutes after starting work in the second field, exhibiting typical poisoning symptoms such as vomiting, diarrhea, salivation, and muscle weakness. Of the 34 crew members, 30 were transported directly to a local clinic, where they were decontaminated and sent to area hospitals. All 34 are recorded in the illness database as field workers exposed to residue, with 10 classified as definite, 23 classified as probable, and one as possible. The incident was a violation of the restricted entry interval as well as the additional violation of failure to post signs to prohibit entry to the treated field.

The Occupational Health Branch (OHB) of the California Department of Health Services cooperated with DPR and the CAC staff in investigating this episode. Staff from OHB interviewed crew members and reviewed their medical records. DPR and CAC staff took leaf samples from the treated field and arranged for chemical analysis of the workers' clothing and urine samples, as well as interviewing crew members and other parties involved. A report of the OHB findings was published in *Morbidity and Mortality Weekly Reports* (Das et al, 1999).

Findings of WH&S activities in the investigation are available as report HS-1779 (Edmiston et al., 1999).

### **Drift Exposure**

Drift exposures accounted for the largest number of pesticide exposures in 1998, with 302 individuals reporting symptoms definitely, probably or possibly related to exposure to drift. In addition to 52 field workers, 18 people packing or processing harvested crops, 42 other people performing routine outdoor work and 30 people outdoors while not at work were exposed to drift. Drift also exposed 20 mixer/loaders and 51 applicators. Drift from agricultural applications was responsible for 134 of the 302 drift exposures, including all 52 field workers, 14 of the 18 packers, and 33 of the 42 people working at other outdoor tasks when exposed.

### **Morbidity and Mortality**

Among the 621 cases evaluated after investigation as definitely or probably related to pesticide exposure, 9 people were hospitalized and 153 lost time from work. Of the 377 possible cases, 17 included hospitalization and 83 lost work time. This indicates a high degree of morbidity among the reduced number of case reports, especially among those classified as possible. Review of individual cases, however, failed to reveal any consistent or unusual pattern.

Of three 1998 fatalities investigated, two proved related to pesticide exposure. One fatality was an intentional suicide by pesticide ingestion. In the second fatality, a structural pest control operator found the victim between the tarp and the building of a fumigated structure. The third fatality involved an aerial applicator who died of burns suffered in a crash. The investigation attempted to determine whether pesticide had contributed to the crash, either by intoxication of the pilot or spontaneous combustion of the sulfur he had been applying. The evidence pointed to a mechanical problem.

### **Examples of the Importance of Compliance with Safety Procedures**

Severe intoxications typically result from careless and often illegal use of pesticides. In 1998, for instance, a grower applied methyl bromide through his drip irrigation system and assigned an

employee to prevent spillage by standing on the open end of the line. This illegal procedure burned the worker's feet. He lost no work time. In unrelated episodes, two mixer/loaders hand poured Category I pesticides, which require closed mixing/loading systems, and burned their arms.

Two toddlers were reported during 1998 as having ingested pesticides that they found in their homes. One toddler ate rodent bait, which she found behind furniture. The other child had a piece of insecticidal chalk in her mouth, a product not registered for use in California (or the United States) and consequently illegal to sell. These two children recovered without hospitalization. Leaving toxic products within the reach of young children can result in serious illness.

### **Regulatory Responses to Illness Data Analysis**

Shortly after the child became ill from eating insecticidal chalk, the Department issued a press release warning the public that the insecticidal chalk products are hazardous to children and illegal to sell in the United States. In addition, the enforcement staff conducted focused inspections looking for retailers of insecticidal chalk. From September 1998 through January 1999, DPR conducted 31 focused inspections and issued 19 economic poison statutes violation notices for sales of the product. DPR also urged the federal Environmental Protection Agency to develop a strategy for addressing the illegal sales of insecticidal chalk on a national basis.

Review of illness data identified fumigating tree-planting sites with methyl bromide as a task that can cause serious injury. Applicators use hand-held probes to fumigate soil for this purpose, and drips from the probes repeatedly caused severe burns to applicators' feet. From 1994 through 1997, 31 case reports were evaluated as definitely or probably related to any type of methyl bromide exposure. Eight of these involved tree hole fumigators, including four whose injuries prevented them from working for a week or more. Four cases identified during 1998 were evaluated as definitely or probably related to methyl bromide exposure from any source. Two of these involved tree hole fumigators who burned their feet. One was disabled for four days by his burns, and the other left the area and could not be interviewed. DPR is working with applicators

to evaluate safer equipment. Of two prototypes developed to replace currently available application probes, one was found ineffective, but the other provided promising initial results. Initial monitoring took place in December 1999; plans are in place to monitor additional applications during January or February 2000. If monitoring substantiates risk reduction, DPR may require applicators to use the modified probes for methyl bromide tree hole fumigations.

Based on preliminary review of episodes involving pesticide applicators, use of backpack sprayers appears to be another area of potential concern. Pesticides frequently leak, drip, or splash onto the applicators. DPR will undertake more extensive analysis of use patterns and health complaints to determine whether the situation warrants regulatory intervention.

A large-scale review of the contribution of cholinesterase inhibition to pesticide illness identified another type of problem. Cholinesterase test results rarely provide useful information unless the clinician can compare results from the time of exposure to levels measured when the person had not been in contact with pesticides. At present, laboratories use such a variety of methods and procedures that tests done at one laboratory provide little guidance in determining whether another laboratory's test reflects a change from a person's normal status. Regulations requiring laboratories to report cholinesterase test results in standard units were approved in April 1999. The new regulations will not eliminate differences among laboratories, but should achieve reasonable comparability among their results.

### References

GAO 1993. Pesticides on Farms: Limited capability exists to monitor occupational illnesses and injuries. Report to the Chairman, Committee on Agriculture, Nutrition, and Forestry, U.S. Senate GAO/PEMD-94-6.

Das, R. MD, R. Harrison, MD, P. Sutton, MPH, A. Souter, et al. 1999. Farm Worker Illness Following Exposure to Carbofuran and Other Pesticides -- Fresno County, California, 1998. Morbidity and Mortality Weekly Reports 48(6):113-116

Edmiston, S., F. Schneider, B. Hernandez, A.S. Frederickson and V. Quan. 1999. Exposure and Illness Following Early Reentry into a Carbofuran-Treated Field. Department of Pesticide Regulation, Worker Health and Safety Branch. Health and Safety Report No. HS-1779.