SUMMARY OF RESULTS FROM THE CALIFORNIA PESTICIDE ILLNESS SURVEILLANCE PROGRAM - 2005 -

HS-1869

California Environmental Protection Agency
Department of Pesticide Regulation
Worker Health and Safety Branch
1001 I Street
Sacramento, California 95814

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Pesticide Illness Surveillance Program – 2005

Executive Summary

The California Department of Pesticide Regulation's Pesticide Illness Surveillance Program (PISP) seeks to identify any health effect caused by pesticides. While DPR strives to collect as many individual reports on illnesses and injuries as possible, within resource constraints, our primary goals are to identify high-risk situations that warrant regulatory action; and to promote pro-active, health-protective measures, especially for those individuals who regularly face the highest pesticide exposure risks.

The 2005 PISP summary continued to capture a wide range of pesticide illnesses in California, with 1,323 cases investigated (compared to 1,238 investigations in 2004). Investigation confirmed pesticide exposure as a potential causal factor in 911 cases in 2005, compared to 828 cases in 2004.

Two significant points of interest emerge from the 2005 data. First, a full one-third of the investigations involved a single incident: A field fumigation in Monterey County allowed irritant vapors to escape into a suburban neighborhood. (See details on page 14.) The incident graphically demonstrated the potential impacts of pesticide drift, and underscored the need for strong restrictions to prevent situations that may lead to drift injuries.

The second point of interest involves a sharp decline in the number of non-occupational injury reports. Apart from the Monterey incident, only 70 non-occupational cases were investigated in 2005, nearly a ten-fold decline from some recent years.

An obvious explanation is related to DPR budget cuts four years ago. At that time, DPR was unable to take over a federally funded project with the California Poison Control System (CPCS), which monitors emergency calls for toxic exposure information. DPR annually received hundreds of CPCS-mediated pesticide illness reports until 2002, when federal funding for the

project was exhausted. By late last year, the improved condition of DPR's budget allowed the Department to fund resumption of the project.

DPR also continues to work with the Office of Environmental Health Hazard Assessment (OEHHA) on a pilot project to improve physician reporting of pesticide cases. While state law requires such reporting, compliance has been spotty for years, despite extensive DPR efforts to inform the medical community of its responsibilities. With federal funding, DPR and OEHHA are working to integrate pesticide reporting into a statewide, internet-based system. The project now under development also involves cooperation with local health officials and agricultural commissioners in three pilot counties.

The number of suspected pesticide injuries to farm field workers in 2005 – 132 cases involving drift, 28 residue -- declined in comparison to 2004, with 180 and 68 cases, respectively.

This continues a long-term decline since the 1980s, when more than 350 workers were injured in some years. However, DPR continues to seek further improvements in field safety, such as worker notification rules.

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[1] illnesses has been part of this comprehensive program since 1971. It is the oldest and largest program of its kind in the nation, and supplies data to regulators, advocates, industry, and individual citizens.

The U.S. Environmental Protection Agency (U.S. EPA) and the National Institute for Occupational Safety and Health (NIOSH) have encouraged other states to develop programs similar to California's. Through NIOSH's Sentinel Event Notification System for Occupational Risk (SENSOR), they now partially support programs in the states of Michigan, New York, and Washington. SENSOR also provides technical assistance to the states of Arizona, Florida, Louisiana, New Mexico, Oregon, and Texas. In addition, it supports pesticide-related work by the Occupational Health Branch of the California Department of Health Services, which coordinates with DPR's Worker Health & Safety (WHS) Branch. U.S. EPA continues to rely heavily on California data for evidence of pesticide adverse effects because of the large size and long historical perspective of the database.

DPR scientists participate in the national working group on pesticide illness surveillance that NIOSH convened to develop standards for information collection. DPR's 1998 expansion of the Pesticide Illness Surveillance Program (PISP) database incorporated several features from the NIOSH standards. These upgrades have been applied to all data collected from 1992 through the present. Data earlier than 1992 have not been revised to incorporate the 1998 database upgrades, and will be presented only when historical perspective is important.

[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.

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 any adverse effects from any component of pesticide products, including the active ingredients, inert ingredients, impurities, and breakdown products. DPR has a mission to mitigate any pesticide exposure that compromises health. This applies to products that affect health by acting as irritants or as allergens, through their smells or by causing fires or explosions, as well to classical toxic effects.

Sources of Illness Information

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 (whether it occurred on a farm, in a home, or in any other situation) by telephone to the local health officer within 24 hours of examining the patient. Each California county has a health officer with broad responsibility for safeguarding public health, and a few cities have chosen to have their own health officers. These officials may investigate pesticide incidents to whatever extent they find useful. The law only requires them to inform the county agricultural commissioner (CAC), to complete a pesticide illness report (PIR), and to distribute copies of the PIR to the Office of Environmental Health Hazard Assessment (OEHHA), the Department of Industrial Relations (DIR), and DPR.

DPR strives to ensure that the PISP captures the majority of significant illness incidents and records them in its database. To identify pesticide cases that may go unreported by doctors, DPR has negotiated a memorandum of understanding with DIR and the California Department of Health Services, under which scientists review Doctor’s First Reports of Occupational Illness and Injury (DFROIIs, documents that 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. From 1983 through 1998, DFROII review identified the majority of the cases investigated.

From 1999 through 2002, the California Poison Control System (CPCS) facilitated pesticide illness reporting. Funds from U.S. EPA supported development of an enhanced system of poison control facilitation, which operated from mid-2001 through November 2002. As DPR received increasing numbers of case reports through CPCS, the fraction located by DFROII review fell first to one-third and finally to one-fifth of all investigations. Cooperation with CPCS identified hundreds of symptomatic exposures that otherwise would have escaped detection, but the State's fiscal crisis prevented continuation of the contract after federal funding ended. Since the contract with CPCS lapsed, DFROII review has become more prominent again, although the majority of 2005 cases were identified outside of the usual reporting channels. DPR contracted with CPCS to facilitate illness reporting in October 2006.

DPR cooperates with OEHHA in broader efforts to improve reporting timeliness and completeness. A federal grant to OEHHA, DPR, and the California Environmental Protection Agency supports a set of initiatives for this purpose. Ultimately, this grant will support integration of pesticide illness reporting into the system by which doctors file other required reports. The California Department of Health Services has undertaken a software development project, WebCMR, to support physician report submission via the Internet. This project has been delayed; but when it is complete, doctors will be able to enroll in a system that gives them access to a website that complies with the security requirements of the Health Insurance Portability and Accountability Act. This site will accept reports on all conditions that doctors must report, including pesticide illness cases. The site will also feature links to resources related to the condition being reported. DPR has collaborated with OEHHA to identify critical information to collect and the most useful resources to offer. While awaiting development of the statewide system, OEHHA and DPR are working with San Diego, Monterey, and Fresno counties to pilot test computer systems to coordinate reporting and investigation of pesticide-related incidents.

The agricultural commissioners of the counties where exposures occurred investigate all identified incidents, whether or not they involved agriculture. They attempt to locate and interview all the people with knowledge of the pesticide exposure event, and also review relevant records. Their investigations determine how exposure occurred, characterize the subsequent illnesses, and determine whether pesticide users complied fully with safety requirements. 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 contracts with a specialized laboratory to analyze the samples. In 2005, DPR's PISP scientists and Enforcement Branch staff completed a joint effort to update and consolidate the investigation manual that all CACs use. Among other enhancements, the revised manual provides guidance in developing plans for conducting illness investigations and in writing clear and complete narratives to record investigation results. The manual also incorporates a protocol for investigating public exposure episodes involving large numbers of people, and documents DPR's policy on complaints or illnesses related to odor. The policy recognizes that odor detection inherently demonstrates exposure, and states that such reports must be investigated seriously.

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. Medical record authorizations comply with the Health Insurance Portability and Accountability Act (HIPAA) and always include commitments to maintain confidentiality. When investigations identify affected people not previously reported by other mechanisms, those people 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 http://www.cdpr.ca.gov/docs/dprdocs/pisp/brochure.pdf.

Purpose of Pesticide Illness Surveillance

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 implementing additional California restrictions on pesticide use. For example, 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.

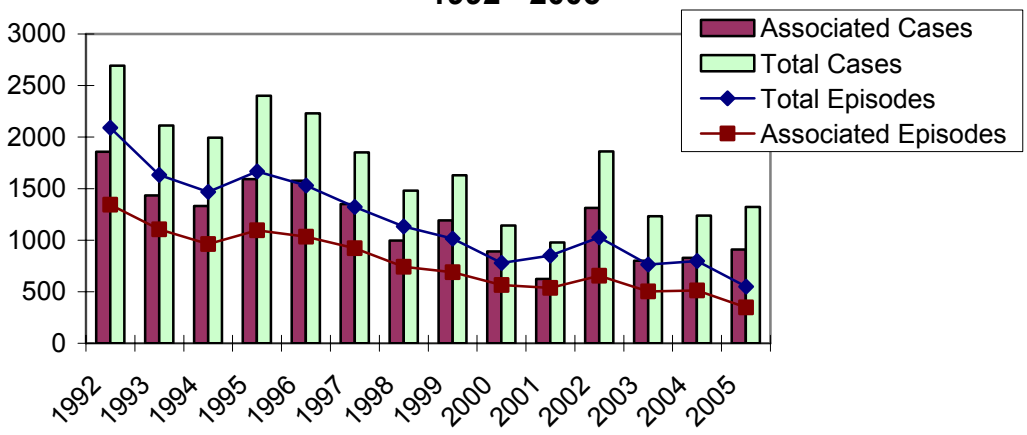
DPR scientists regularly consult the data collected to evaluate the effectiveness of DPR's pesticide safety regulatory programs and assess the need for changes. During 2005, PISP data were incorporated into exposure assessments and reviewed to inform mitigation proposals and discussions with pesticide registrants. PISP data provided the basis for a review of pyrethroid effects prepared by WHS scientists during 2005 and published by Reviews of Environmental Contamination and Toxicology in 2006 (Spencer and O'Malley, 2006).

In some instances, changes to pesticide labels provide the most appropriate mitigation measures. 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.

2005 Numeric Results – Totals

In 2005, DPR and CACs investigated 1,323 cases (see Figure 1), including 440 identified by the Monterey CAC following a release of chloropicrin from a field fumigation (described in the section on drift). This is consistent with the total of 1238 (DPR 2005) investigated in 2004. Apart from the Monterey episode, there were 70 instances of suspected non-occupational exposure identified for investigation, of which only 35 proved at least possibly related to pesticide exposure, while 20 could not be evaluated.

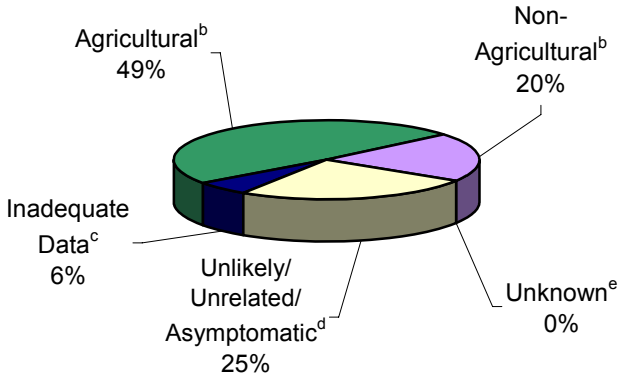
Figure 1: Number of Cases vs. Number of Episodes, 1992 - 2005



A case is the Pesticide Illness Surveillance Program representation of a person whose health problems may relate to pesticide exposure.
An episode is an event in which a single source appears to have exposed one or more people (cases) to pesticides.
Associated cases are those evaluated as definitely, probably, or possibly related to pesticide exposure. A definite relationship indicates that both physical and medical evidence document exposure and consequent health effects. A probable relationship indicates that limited or circumstantial evidence supports a relationship to pesticide exposure. A possible relationship indicates that evidence neither supports nor contradicts a relationship
Associated episodes are those in which at least one case was evaluated as associated.

Of the 1,323 cases investigated, DPR found that pesticide exposure had been at least a possible contributing factor to 911 (69 percent). Evidence established an unlikely or unrelated relationship to pesticide exposure for 336 (25 percent) of the 1,323 cases assigned for investigation, including 114 individuals (9 percent) who denied experiencing health effects. Lack of information prevented evaluation of 76 (6 percent) (Figure 2).

Figure 2: Outcome of 2005 Illness Investigations[a]



[a] Total cases investigated = 1323.
[b] *Agricultural* and *Nonagricultural* refer to the intended use of the pesticide.
[c] *Inadequate* means that there was not enough data available or reported to determine if pesticides were involved in the case.
[d] *Unlikely/Unrelated/Asymptomatic* refers to cases determined as unlikely related or unrelated to pesticide exposure or the exposed person did not develop symptoms.
[e] *Unknown* refers to a single case possibly related to exposure to agricultural pesticides and/or to a non-agricultural pesticide.

Of the 911 cases recognized as definitely, probably, or possibly related to pesticide exposure, 647 (71 percent) involved use of pesticides for agricultural purposes (i.e., intended to contribute to production of an agricultural commodity, including livestock) and 263 (29 percent) involved pesticide exposure in other situations, such as structural, sanitation, or home garden use, in the manufacturing process, or during storage. One case could not be classified as agricultural or non-agricultural. That case concerned a vector control worker who developed eye irritation while applying a mosquito larvicide in a treated field. Although it is far from certain that any pesticide contributed to this case (the worker himself suspected a plant allergy), we cannot exclude the possibility of some contribution from (agricultural) field residue and/or the (non-agricultural) material that the affected worker applied.

Evidence established a definite relationship to pesticide exposure for 89 (10 percent) of the 911 definite, probable, and possible cases. Another 678 (74 percent) were classified as probable, with 144 (16 percent) entered as possible. Tabular summaries presenting different aspects of the data

are available through DPR's Web site at www.cdpr.ca.gov/docs/dprdocs/pisp/2005pisp.htm, or by contacting the WHS Branch.

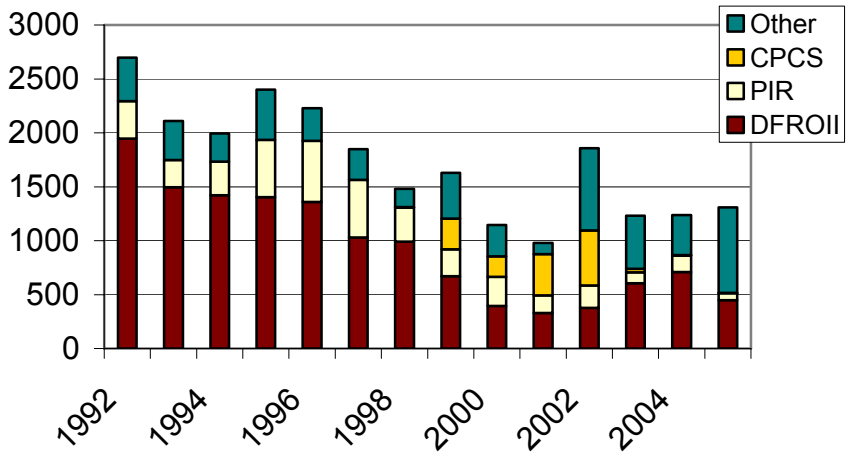
Enforcement actions often are still under consideration when DPR receives the illness investigative reports, and identification of violations is difficult. Based on the information available at the time of evaluation, WHS scientists concluded that factors already prohibited by pesticide labels and safety regulations contributed to 615 (68 percent) of the 911 cases evaluated as definitely, probably, or possibly related to pesticide exposure. This includes all 324 people who developed symptoms attributed to chloropicrin in the Monterey field fumigation episode (described in the section on drift) and another 175 people affected by apparent violations during or following other agricultural uses of pesticides. In the other 148 cases connected to agricultural pesticide use (23 percent), investigations did not identify violations that contributed to exposure. Further evaluation of these cases is needed to determine if additional safety requirements are needed. In circumstances other than agricultural use, evaluators determined that violations contributed to 116 (44 percent) of the 263 definite, probable or possible cases. No violations were identified in the case of the vector control worker potentially exposed to both agricultural and non-agricultural pesticides as he applied larvicide in a treated field.

Occupational exposures (those that occurred while the affected people were at work) accounted for 552 (61 percent) of the 911 pesticide-associated cases from 2005. One 2005 case could not be classified as occupational or non-occupational. It was not clear whether the affected person was waxing her own tractor when exposed to drift or working at an assigned task.

Occupational exposures typically predominate among the cases PISP collects, reflecting the importance of DFROIIs (workers' compensation documents) for identifying cases. DPR has tried to develop supplementary methods for finding pesticide cases that doctors neglect to report, but DFROII review has been the only consistently productive mechanism. Figure 3 shows that historically, DFROII retrievals identified more cases than any other source, providing reasonably effective surveillance of occupational exposures.

Figure 3 also shows increasing case identification outside of the usual pathways (PIR and DFROII) in recent years. Since PIRs and DFROIIs come only from medical care providers, they cannot be filed unless the affected people consult doctors. In recent years, episodes in which pesticides escape into populated areas have become more prominent. Many people may incur low-level exposures in such events, but few may seek medical care. Such episodes come to the CACs' attention via emergency response contacts, news reports, or direct citizen complaints. CACs also locate some additional cases in the course of investigating reported illnesses.

Figure 3: Mechanisms that Identified Cases for Investigation



DFROII – Doctor's First Report of Occupational Illnesses and Injury (Workers' Compensation document).
PIR – Pesticide Illness Report (physician reporting in compliance with Health and Safety Code105200).
CPCS – California Poison Control System (facilitated physician reporting).
Other – All other methods of case identification. Including citizen complaints, contacts by emergency responders, and news reports.

Agricultural Field Worker Incidents

In 2005, 162 cases of field worker illness or injury were evaluated as definitely, probably or possibly related to pesticide exposure (Figure 4). Twenty-eight of them (17 percent) were exposed to pesticide residue, and 132 (81 percent) were exposed to drift. One field worker was sprayed in the face with diluted metam-sodium as he passed a chemigation sprinkler that had lost

its guard. Another worker in a treated field saw a cloud of sulfur dust from an application to an adjacent field, so could have been exposed to residue, drift, or both.

Drift exposure definitely affected one worker, probably caused or contributed to symptoms experienced by 113 workers, and was a possible factor in 18 field worker cases. In the largest of the episodes affecting field workers, a Kern County sprinkler application of metam-sodium gave off an odor that apparently affected at least 42 workers in nearby vineyards. The workers were not available for interview; but WHS scientists arranged to distribute questionnaires with their paychecks, and 42 of the workers returned responses. One worker went on to develop a very serious form of pneumonia. WHS's clinical consultant interviewed this worker's husband and reviewed her medical records.

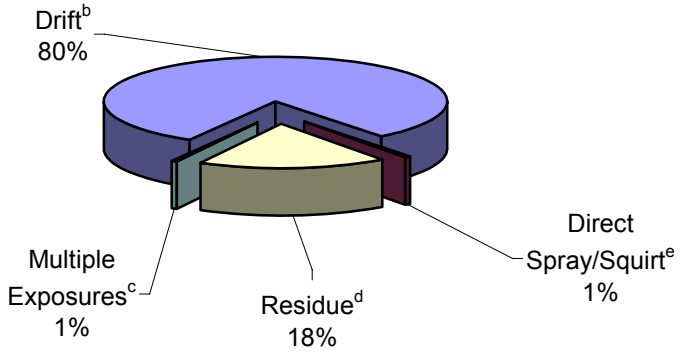
Another 27 vineyard workers in Kern County developed symptoms when they smelled the odor from an application of insecticides (cyfluthrin, spinosad, and oil) to an adjacent citrus orchard. WHS scientists participated in the investigation and collected samples of foliage and clothing (Spencer, 2006); chemical analysis detected pesticide residue only in a sample taken within the orchard being treated. The result failed to document exposure, but the vineyard workers still may have reacted to some attribute of the pesticides (most probably the odor). All 27 field workers, and the six emergency responders who developed transient symptoms while assisting them, were evaluated as having symptoms probably related to their exposure.

The other 63 field workers definitely, probably, or possibly affected by drift exposures included two groups of 13 workers and five groups ranging in size from two to 11 workers, as well as six incidents that affected just one person. Violations of pesticide safety regulations were identified in 10 drift episodes in which 93 field workers were definitely, probably or possibly affected.

Three of the 28 residue exposures were evaluated as probably related to reported health effects; the other 25 field worker residue exposures were evaluated as possibly related. Violation of a restricted entry interval was a factor in the eye irritation experienced by an irrigator who entered the field to repair equipment. Use above label rate contributed to the rash a field packer developed after washing radicchio in an insufficiently diluted antimicrobial solution. Non-

contributory violations were identified in four episodes involving a total of six workers. Except for one group of three workers and one group of two, field residue episodes affected one worker each.

Figure 4: Field Worker Exposure to Pesticides, 2005[a]

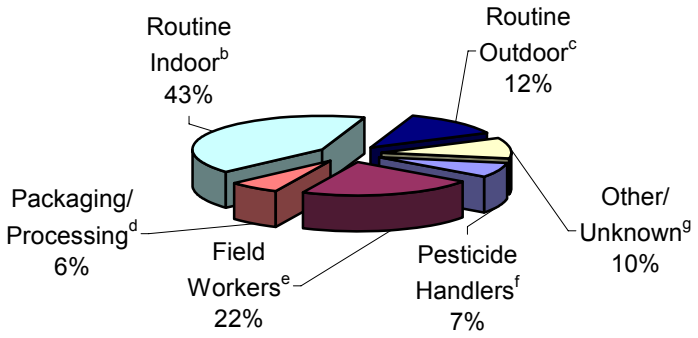


[a] Total field worker cases associated with pesticide exposure = 162.
[b] Drift refers to field worker cases associated with exposure to drift from a pesticide application.
[c] Multiple Exposures refers to contact with pesticides through two or more mechanism
[d] Residue refers to field worker cases associated with exposure to residue of previously applied pesticides.
[e] Direct Spray/Squirt refers to contact made when the pesticide is propelled from handling equipment (e.g., direct spray).

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 at the target site, so long as the application remains in progress. It also includes exposures of pesticide handlers in which air movement carried the pesticide and caused exposure. In 2005, DPR recorded a total of 615 individuals who reported symptoms evaluated as definitely, probably, or possibly related to exposure to drift (Figure 5) in 96 separate episodes. Agricultural pesticide use was found responsible for 45 percent of the episodes and 91 percent of the affected people (43 episodes, 558 cases), including one episode in which investigation identified 324 affected people. Non-agricultural exposure situations accounted for 53 episodes in which 57 people (including 33 pesticide handlers) experienced effects evaluated as definitely, probably, or possibly related to airborne pesticide exposure.

Figure 5: Illness Associated with Pesticide Drift, by Activity, 2005[a]



[a] Total drift cases for 2005 = 615.
[b] Routine Indoor includes people in offices and businesses, residential structures, etc. (occupational and non-occupational) who were not handling pesticides.
[c] Routine Outdoor includes people outdoors (occupational and non-occupational) with little expectation of contacting pesticides (e.g., gardeners not handling pesticides, residents)
[d] Packaging/Processing includes people involved in processing harvested crops..
[e] Field Workers are people working in agricultural fields at the time of drift exposure
[f] Handlers include people mixing, loading and applying pesticides, repairing pesticide equipment and flagging for aerial application.
[g] Other/Unknown – Any other type of activity or unknown activity.

DPR learned of nine 2005 events in which ten or more people reported health effects evaluated as definitely, probably, or possibly related to airborne exposure to agricultural pesticides. The largest episode occurred in Monterey County following an application of chloropicrin through a drip irrigation system to beds covered in plastic. The drip line was then flushed with water, and more water was applied to the field by sprinkler to supplement the barrier. Similar applications had been made nearer to homes on preceding days, and had caused no problems. That evening, local residents noticed an odor and developed symptoms, primarily eye irritation. Nearby weather stations recorded light winds (2 - 3 mph) blowing from the field toward the affected residential neighborhood. Investigators canvassed the neighborhood and sent explanatory letters to 1,163 addresses in the area. Four hundred forty potentially exposed individuals were identified. Of those, DPR scientists evaluated the symptoms reported by 324 people as at least possibly related to pesticide exposure, including 303 evaluated as probable.. Judging from odor

complaints and illnesses, detectable levels of chloropicrin moved two to three miles from the field.

After this episode, the application system was tested using dye to represent the fumigant. Dye was still visible in the irrigation water after the lines were flushed for the same length of time as was done after the application. This suggests that fumigant remained in the supposedly clean water applied to help confine the fumigant. The grower agreed to a civil settlement with the District Attorney and was ordered to pay approximately $180,000: $26,000 in penalties, $65,000 in remedial costs associated with compliance, $39,000 in reimbursement to agencies that responded to the release, and $50,000 to support annual training for agricultural pesticide users in the county.

Apart from the Monterey chloropicrin episode, which affected residents otherwise unconnected to the application (and at least one fire fighter who responded to calls about the problem), drift exposure was evaluated as definitely, probably, or possibly related to health effects reported by 132 field workers, 39 workers processing harvested produce, 38 people engaged in routine indoor activities when exposed, 19 people engaged in routine outdoor activities, 17 people involved in activities not adequately described by any of the defined categories, and two whose activities were not known. Additionally, 44 pesticide handlers were definitely, probably, or possibly affected by airborne exposure to the pesticides they handled. Such exposures are recorded as drift. Of the 44 pesticide handlers exposed via drift, 11 worked in agriculture.

Morbidity and Mortality

Among the 767 cases evaluated as definitely or probably related to pesticide exposure, nine people were admitted to hospitals and 63 lost time from work. Of the 144 possible cases, none reported hospitalization and 30 lost work time.

DPR and CACs investigated eight deaths in 2005. Pesticides were strongly implicated in four of the deaths, and excluded as causes in three. One case could not be evaluated.

The deaths included those of three professional pesticide applicators, two of which clearly had non-pesticide causes: A structural pest control worker died of a massive heart attack as he began to loosen the tarp from a fumigated building, before any significant potential for exposure. Another applicator death occurred when an application vehicle fell and crushed the applicator as she unloaded it from a trailer onto unsecured planks. The victim had not handled any pesticides likely to impair judgment. The third involved an aerial applicator who died in a crash. Potential pesticide contribution could not be evaluated in this case, since (despite the CAC's repeated requests) the decedent's cholinesterase level was not tested.

No pesticide link was found in the death of a man who worked for an agricultural chemical company after having been treated for cancer. His family sued the employer and did not cooperate in the investigation. Since he worked at a facility that handled only fertilizers and no pesticides, we concluded that pesticides were not involved.

Of the four pesticide-related deaths, one was a suicide. The victim stated repeatedly that she had drunk Round-Up for the purpose of ending her life. No one else ever saw the bottle, however, and no test identified the toxicant. The clinical course was consistent with massive exposure to Round-Up (specifically, according to a poison control consultation, to a surfactant in the formulation), although some clinical features suggested another toxicant may have been present. The other three deaths were caused by fumigants:

Structural pest control workers returned to check a San Diego County apartment building about three hours after introducing fumigant. They were shocked to hear noises and see movement behind the tarpaulin. They lifted the tarp and helped a disheveled woman out. She was taken directly to a hospital, where she quickly lapsed into a coma and died within hours. In retrospect, workers remembered perplexing changes in her room during the time that they searched the building to verify that it was vacant. No fully consistent sequence of events could be determined, but the cause of death was unquestionably sulfuryl fluoride inhalation. WHS asked the county Environmental Health Department to collect air samples in the apartment building. The next day, six samples were taken in and around the apartment the victim had occupied. Laboratory analysis

detected a sufficient amount of chloropicrin in each to cause painful eye irritation within seconds of exposure (Schneider, 2005).

The other two fatalities involved a group of three young people who entered the United States from Mexico without documentation. They were told that a certain freight train would go to the city where the one of them had family. They climbed onto that train, and pried open the hatch of a car filled with rice. In the dark, they did not see the placards (in both English and Spanish) that warned of fumigation. They noticed no unusual odor, and kept the hatch nearly shut to avoid detection. After about half an hour, they began to vomit, but remained in the car. They left the train in Riverside County after traveling for two or three hours. At that time, the first to enter the car was barely conscious, and soon became unconscious. One companion carried her, while the other followed, gravely ill. They stopped a taxi and were taken to the family home. An ambulance took the youths to a hospital from there. One person was pronounced dead on arrival, and another died the next day. The last to enter the rail car, who presumably rode closest to the hatch, survived and was released after eight days of intensive treatment. Investigators measured 2.5 parts per million of phosphine in the air of the compartment they had occupied, approximately double the maximum concentration to which workers may be exposed for up to 15 minutes.

No children are known to have suffered life-threatening illness from pesticide exposure in California in 2005.

Examples of the Importance of Safe Pesticide Practices

Several 2005 cases illustrate aspects of respiratory sensitivity: An asthmatic food service worker was hospitalized for five days to regain control of her condition, which flared up after she smelled a strong bleach odor. In this incident, a co-worker used bleach to sanitize a food service line. That worker had no trouble handling the bleach, but her sensitive colleague needed hospital care.

A two-year-old spent time in the hospital following exposure to a pesticide used to promote hygiene. His mother was preparing to refill their swimming pool's chlorinator when she was

momentarily distracted. In that moment, the toddler put his mouth over the mouth of the jar of tablets, and inhaled the vapors that had collected. He began coughing; and by the time his mother got him to the hospital, he was visibly pale and breathing hard. He responded well to treatment in the emergency room, and developed no problems during two days of observation in the hospital. When interviewed, his mother reported complete recovery.

Among a group of field workers exposed to a nearby metam-sodium application, one apparently had an unsuspected type of vulnerability. This worker had not previously had respiratory problems, but she reported a strong odor, eye and throat irritation, and nausea and vomiting while working next to the treated field. Two days later, she went to a clinic with continuing respiratory complaints. She received treatment for pneumonia, but her condition deteriorated over the following week. She was admitted to the hospital, where specialists determined that her pneumonia was caused not by bacteria, but by the fungus Coccidioides immitis. This condition is known as "valley fever", because the fungus is prevalent in the dust of the San Joaquin Valley. This fungal infection requires treatment with highly toxic medications. The worker was on a respirator for weeks, but ultimately recovered enough to leave the hospital. No hard evidence links this worker's pesticide exposure to development of valley fever. It is essentially certain that the fungus was already present in the worker's system when she was exposed to metam-sodium. The coincidence raises the concern, however, that the exposure may have suppressed her immune system just enough to allow the fungus to take hold.

These cases illustrate that even the most familiar products can be dangerous, and that even the most vigorous adults can be vulnerable. Using chemical products always requires caution and respect.

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