

## Making the Diagnosis

### *Tools for Clinicians to Ascertain Environmental and Occupational Health Exposures*

#### OVERVIEW

Accurate identification of the patient's exposure can lead to improved diagnostic, therapeutic and rehabilitative decisions by the clinician and result in improved patient outcomes. Without an accurate diagnosis, the clinician may decide upon a symptom-based treatment that may be less effective.

Once identified, a pesticide exposure incident should be considered a potential sentinel health event that may require follow-up efforts to locate the source and any additional cases. By identifying the source of exposure, the clinician can avert further exposure in the initial patient and other exposed individuals. Post-diagnostic activities are important to support a systems approach to pesticide exposure cases, including reporting the incident, filing a workers' compensation claim, and conducting specialty care referrals. The clinician must also be aware of several ethical and public health considerations. Lastly, there are key resources available to assist clinicians and patients in dealing with pesticide-related illnesses or injuries.

#### TAKE INITIAL SCREENING FOR PESTICIDE EXPOSURE

Asking the patient a few initial screening questions is critical for making an accurate diagnosis and may flag the need to take a more extensive exposure history. Given that time constraints in a primary care setting compete with the need to identify a patient's potential EOH exposures, it is **highly recommended that a few short screening questions be incorporated into the routine patient intake procedure** in order to identify relevant EOH exposures.<sup>1</sup> See the *Sample Screening Questions* in the sidebar.

#### OBTAIN DETAILED EXPOSURE HISTORY

If the initial screening suggests a potential EOH exposure concern, a detailed exposure interview is often needed. An extensive exposure history can take up to an hour and provides a more complete picture of pertinent exposure factors. The detailed interview includes questions on occupational exposure, environmental exposure, symptoms and medical conditions. Data collection guidelines specific to patients with confirmed acute pesticide illnesses or injuries is provided at the end of this chapter, on pages 26-27. Although the focus is on pesticide exposures and related health effects, concurrent non-pesticide exposures need to be considered in the overall patient health assessment.

Questions typical of a detailed EOH history are provided in **Appendix A, Detailed Occupational and Environmental Exposure History Questions**, on page 240. For further information on taking a history for all types of occupational and environmental hazards, consult a general occupational and environmental medicine reference text<sup>2</sup> or Agency for Toxic Substances and Disease Registry's *Case Study in Environmental Medicine: Taking an Exposure History*.<sup>3</sup>

## SAMPLE SCREENING QUESTIONS

### *For an adult patient*

*After establishing the chief complaint and history of present illness:*

What kind of work do you do?

*(If unemployed)* Do you think your health problems are related to your home or other location?

*(If employed)* Do you think your health problems are related to your work? Are your symptoms better or worse when you are at home or at work?

Are you now or have you previously been exposed to pesticides, solvents or other chemicals, dusts, fumes, radiation or loud noise?

### *For a pediatric patient*

*Questions asked of parent or guardian*

Do you think the patient's health problems are related to the home, child care setting, school or other location?

Has there been any exposure to pesticides, solvents or other chemicals, dusts, fumes, radiation or loud noise?

In what kind of work are the parents and other household members engaged?

## **DEALING WITH A SUSPECTED PESTICIDE EXPOSURE**

After conducting exposure screening and possibly a detailed exposure history, the clinician should take the following steps once they suspect a pesticide poisoning.<sup>4</sup> It should be noted that each pesticide incident is a unique situation with varying levels of severity and urgency; therefore, these steps are not always achieved in the order they are presented. It is, however, crucial to obtain and preserve any evidence of the exposure as soon as possible.

### **1. Collect Information on the Pesticide**

When you suspect a pesticide poisoning, try to get as much information about the pesticide(s) as possible, including: the name of the pesticide used, the EPA pesticide registration number, and the pesticide label and/or the Material Safety Data Sheet (MSDS) for the pesticide(s). If this is a case involving agricultural workers or residents in an agricultural area, try to talk directly to the farm manager, safety coordinator or the pesticide applicator to get this information in addition to a description of the incident itself. Often application records will be made available if requested. Under EPA's Worker Protection Standard (40 CFR 170), agricultural employers are required to make the name of the pesticide and the label available to healthcare providers and workers if it is requested. Refer to the material entitled *Data Collection on an Acutely Pesticide Exposed Patient* found on pages 26-27 at the end of this chapter.

### **2. Follow Decontamination Procedures**

Follow the decontamination procedures as outlined in **Chapter 3, General Principles**, beginning on page 29.

### **3. Collect Evidence of Contamination**

Obtain an unlaundered sample of clothing that the patient was wearing at the time of the incident, if available. Put it in a plastic bag to prevent further exposure and to preserve the specimens for subsequent analysis; freezing is optimal. It can be difficult to find appropriate clothing to sample if the worker has been instructed to go home and thoroughly wash his/her clothing. If most clothing has been washed or is not available, it is likely the patient's hat or shoes would still be contaminated and could be analyzed.

### **4. Obtain a Urine Sample**

If an exposure seems likely, either based on the history or the clinical exam, obtain a urine sample and freeze it. If more than one patient is exposed, obtain a urine sample for each patient. Freezing the urine allows you extra time to determine if the sample needs to be analyzed and to which laboratory it should be sent.

### **5. Order Laboratory Tests**

The National Pesticide Information Center (NPIC) provides a list of pesticides that can be analyzed by clinical laboratories. This list and a list of accredited laboratories can be accessed at: <http://npic.orst.edu/mcapro/PesticidesTestingForExposure.pdf>.

If the patient appears to have been exposed to an organophosphate or N-methyl carbamate insecticide, order cholinesterase blood tests, both plasma and red blood cell, to determine the clinical level of cholinesterase activity. Some experts recommend blood testing if a clinician believes any significant exposure has occurred regardless of a baseline test. Unless a dramatic depression is present, the results of post-exposure testing are likely to be difficult to interpret in the absence of baseline cholinesterase testing. In this instance, it is advisable to conduct periodic re-tests, until it appears

that the cholinesterase level has returned to normal. A “negative” cholinesterase (*i.e.*, results within the “reference range”) does not rule out the possibility that the patient’s symptoms are due to pesticides if the patient was reacting to a pesticide other than an organophosphate or N-methyl carbamate or if s/he was reacting to other ingredients in the organophosphate or carbamate formulation (*e.g.*, the solvents, propellants and carriers in the pesticide product formulation). However, negative results could be misinterpreted by an employer or insurer to mean that no exposure occurred. Post-exposure cholinesterase tests need to be compared to baseline pre-exposure test results or re-testing of cholinesterase several weeks post-exposure. The recovery rate for depressed cholinesterase can be estimated to be 0.8% per day for red blood cells and 1.2% per day for plasma.

### **6. Consult with the Appropriate Specialists**

You may need to consult with others, such as toxicologists, occupational and environmental medicine specialists, and industrial hygienists, who have expertise in dealing with chemical exposures. Pesticide Information Resources including the Association of Occupational and Environmental Clinics (p. 25) are listed later in this chapter, beginning on page 23.

### **7. Schedule/Conduct Patient Follow-up**

Make arrangements with the patient(s) for follow-up appointments and for reporting test results. Once the patient has been cared for, inform everyone else who needs to know about the incident – the workers’ compensation case manager and the employer, in particular. The healthcare provider must obtain the employee’s permission before notifying the employer.

While a diagnosis can be based on a group exposure for the purpose of treatment, workers’ compensation systems generally deal with workers one at a time. Therefore the clinician must collect the information needed to document the exposure, symptomatology and confirmatory data for each individual involved in a multiple-patient poisoning. While illness consistent with other members in a clearly sick group may be sufficient for the clinician facing an outbreak, it may not be sufficient objective information to establish causality for a worker compensation claim.

### **8. Report the Pesticide Incident**

#### **a. Contact the Appropriate State Health Agency**

Pesticide exposures are reportable as health incidents and occupational incidents may also be reportable as a violation of the Agricultural Worker Protection Standard. Both of these important reporting requirements are discussed here.

If a healthcare professional suspects that a patient has a pesticide-related illness, the clinician should report it to the appropriate state health agency. If the healthcare professional is in one of the 30 states that mandate these reports, than s/he should send the report to the appropriate state health agency.

More information about state-specific reporting requirements can be found at <http://www.migrantclinician.org/exposurereportingmap>. The healthcare professional can notify the local poison control center (PCC) by calling (800) 222-1222.

The National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC) and EPA support surveillance for pesticide-related illness and injury through the SENSOR-Pesticides program that aggregates pesticide incident data from 11 states (California, Florida, Iowa, Louisiana, Michigan, New Mexico, New York, North Carolina, Oregon, Texas and Washington) and has an occupational focus. The California Department of Pesticide Regulation (DPR) maintains the

Pesticide Incident Surveillance System (PISP). These surveillance systems collect case reports on pesticide-related illnesses and injuries from clinicians and other sources (*e.g.*, poison control centers, workers' compensation agencies and state agencies that regulate pesticides); conduct selected interviews, field investigations and research projects; and function as a resource for pesticide information within their state.

The impacts of these surveillance programs extend beyond the participant states by identifying emerging pesticide exposure issues that steer intervention efforts to prevent future incidents with similar exposure scenarios nationwide. However, there remains a need for systematic reporting of pesticide poisonings in all states into a central agency in order to compile accurate statistics on the frequency and circumstances of poisoning and facilitate efforts to limit these occurrences.

**b. Contact Pesticide State Lead Agency**

Before sending the patient(s) home, call the appropriate EPA-recognized pesticide State Lead Agency (SLA), which can investigate pesticide poisoning incidents. To find your SLA contact, go to <http://aapco.org/officials.html>.

The SLA will help determine if there was any violation of the Agricultural Worker Protection Standard. It can also tell you if additional action or information is needed.

**9. Discuss Workers' Compensation with the Patient**

If the case involves an occupational exposure, each patient's chart should document it as such. A workers' compensation report must be completed for each exposed worker.

To achieve a successful workers' compensation claim, the healthcare provider must document evidence of the exposure and the illness and conclude that it is more likely than not that the illness was caused or aggravated by a workplace pesticide exposure. The legal standard for a workers' compensation case is that **there must be a "preponderance of evidence" that the disease is work related**. A preponderance of evidence is defined as meaning that it is more likely than not (*i.e.*, greater than 50% probability) that the poisoning was caused or aggravated by a workplace pesticide exposure.

Workers' compensation laws exist in all states, but benefit levels vary across states and not all states require coverage for agricultural workers. In the realm of workers' compensation, the worker is responsible for proving that his/her disease is occupational in origin. It is not the employer's responsibility. Workers' compensation claims for minor ailments or for injuries that are obviously work related are rarely contested by the compensation insurance companies.<sup>5</sup> This tends to be true for many acute pesticide poisoning cases where the illness is consistent with the known toxicology of the pesticide, where there is objective evidence that the patient experienced a pesticide exposure, and where the dose was sufficient to produce illness. Costly claims, such as death claims or claims involving permanent total disability are often contested by the workers' compensation insurance company. The proportion of workers' compensation claims for acute pesticide poisoning that are contested is not known. However, in those cases with little or no objective evidence that a pesticide exposure occurred (*i.e.*, lack of biological or residue evidence of exposure), especially when the poisoning signs and symptoms resemble a common respiratory or gastrointestinal illness, achieving a successful workers' compensation claim may be difficult. Finally, clinicians should be aware that reporting a workers' compensation case can have substantial deleterious implications for the worker being evaluated (*e.g.*, job loss or disciplinary action).

## SPECIAL CONCERNS

### Ethical Considerations

Ethical guidelines and codes of conduct have been established that can guide healthcare professionals who are dealing with dilemmas involving pesticide poisoning.<sup>6,7</sup> Three fundamental values underpin these guidelines and codes of conduct: (1) it is the duty of the healthcare professional to do good for the patient and to place the patient's interests above those of the healthcare professional, (2) the individual is the best judge of his or her own best interests and (3) social justice promotion of a fair and equitable distribution of finite health resources. Among the codes of ethics most relevant to the realm of pesticide poisoning is the need to keep confidential all individual medical information, only releasing such information "with proper authorization when required by law, for overriding public health considerations, to other healthcare professionals according to accepted medical practice, to others at the request of the individual, or when there is reasonable concern about potential endangerment of third parties."<sup>6</sup>

Investigation of a suspected occupational pesticide illness may necessitate obtaining further information from the worksite manager or owner. Any contact with the worksite should be taken in consultation with the patient because of the potential for retaliatory actions against the patient (such as job loss or other disciplinary action). Similarly, a request for a workplace visit or more information about pesticide exposure at the workplace should occur only after gaining the patient's permission. Even when investigating non-occupational pesticide illnesses, the patient's permission should be obtained before calling the patient's neighbors or others potentially responsible for the pesticide exposure. The discovery of pesticide contamination in a residence, school, childcare setting, food product or other environmental site or product can have public health, financial and legal consequences for the patient and other individuals (*e.g.*, building owner, school district, food producer). It is prudent to discuss these potential adverse consequences and follow-up options with the patient before pursuing an investigation.

In situations where the pesticide hazard is substantial and many individuals might be affected, a request can be made to the state health department to obtain the assistance needed for a disease outbreak investigation. If an outbreak investigation demands more resources than the state health department can provide, the state health department can request assistance from the Centers for Disease Control and Prevention. In such a situation, even if the initial case patient objects to disclosing the pesticide hazard to public health authorities, state reporting requirements and overriding public health considerations may require this notification.

### Public Health Considerations

Healthcare providers must recognize and diagnose cases of pesticide poisoning to ensure that pesticides are not producing unreasonable harm to human health. Cases of suspected pesticide poisoning can lead to detection of new pesticide hazards. Healthcare professionals are often the first to see a poisoned patient who may represent evidence of a new or re-emerging pesticide hazard. Such patients may also represent a full-blown disease outbreak.

A disease outbreak is defined as a statistically elevated rate of disease among a well-defined population as compared to a standard population. For example, in 2010, two workers were diagnosed with methyl bromide poisoning after being exposed to methyl bromide over several months while inspecting produce in a California cold storage facility. Methyl bromide was being used to fumigate grapes imported from Chile. Both workers had profound neurologic symptoms and elevated serum

### Steps in Investigating a Disease Outbreak

Confirm diagnosis of initial case reports (the "index" cases)

Identify other unrecognized cases

Establish a case definition

Characterize cases by person, place, and time characteristics (*e.g.*, age, race, ethnicity, gender and location within a company or a neighborhood, timeline of exposure and health events)

Create plot of case incidence by time (an epidemic curve)

Determine if a dose-response relationship exists (*i.e.*, more severe clinical case presentation for individuals with higher exposures)

Derive an attack rate and determine if statistical significance is achieved (divide number of incident cases by number of exposed individuals and multiply by 100 to obtain attack rate percentage)



**Items Contained in a  
Material Safety Data  
Sheet (MSDS)**

- Material identification
- Ingredients and occupational exposure limits
- Physical data
- Fire and explosion data
- Reactivity data
- Health hazard data
- Spill, leak and disposal procedures
- Special protection data
- Special precautions and comments

bromide levels. The physician for one of these workers notified the local poison control center, which notified the California DPR. The California DPR conducted an investigation and found that methyl bromide reached unsafe concentrations in enclosed areas during the transportation and storage of fumigated grapes. Stakeholders (e.g., commodity groups, warehouse operators, USDA, EPA and the Chilean produce industry) were notified of these findings, and measures were adopted to reduce methyl bromide exposures.<sup>8</sup>

Disease outbreak investigations are conducted for many types of exposures and health events, not only those in the occupational and environmental areas. Usually, assistance from government or university experts is needed because the investigation may require access to information, expertise and resources beyond those available to the average clinician. The steps involved in such an investigation and the types of information typically gathered in the preliminary clinical stages are outlined in the Steps in Investigating a Disease Outbreak list in the margin on the previous page. The clinician must be aware that an outbreak investigation may be needed when severe and widespread exposure and disease scenarios exist. For more information on disease outbreak investigations, consult the literature.<sup>9,10</sup>

Clinicians are typically prohibited from sharing identifiable health data without the consent of the patient. However, an exception is made when the clinician disclosure is for public health purposes. The Health Insurance Portability and Accountability (HIPAA) Privacy Rule balances the protection of individual privacy with the need to protect public health. This privacy rule permits identifiable health data disclosures without patient consent to public health authorities authorized by law to collect or receive the information for the purpose of preventing or controlling disease, injury or disability [45 CFR 164.512(b)].<sup>11</sup> In other words, when state public health authorities need identifiable health data to address a public health need, this need overrides the HIPAA privacy rule requirements for patient consent before sharing.

## **RESOURCES**

### **Material Safety Data Sheets and Pesticide Labels**

In addition to the patient history, it is often helpful to obtain further information on suspect pesticide products. Two documents are useful starting points in the identification and evaluation of the pesticide exposure: the Material Safety Data Sheet (MSDS) and the pesticide label.

#### ***Material Safety Data Sheet (MSDS)***

Under OSHA's Hazard Communications Standard (29 CFR 1910.1200), all chemical manufacturers are required to provide an MSDS for each hazardous chemical they produce or import. Employers are required to keep copies of the MSDS for all chemicals used at the workplace and make them available to the workers. The items contained in an MSDS are shown in the margin.

These documents tend to provide very limited information on health effects, and some of the chemical ingredients may be omitted because of trade secret considerations. One cannot rely solely on an MSDS when making medical determinations.

#### ***Pesticide Label***

EPA requires that all pesticide products bear labels that provide certain information. This information can help in evaluating pesticide health effects and necessary precautions. Pesticide labels must include the information listed on the next page. The general

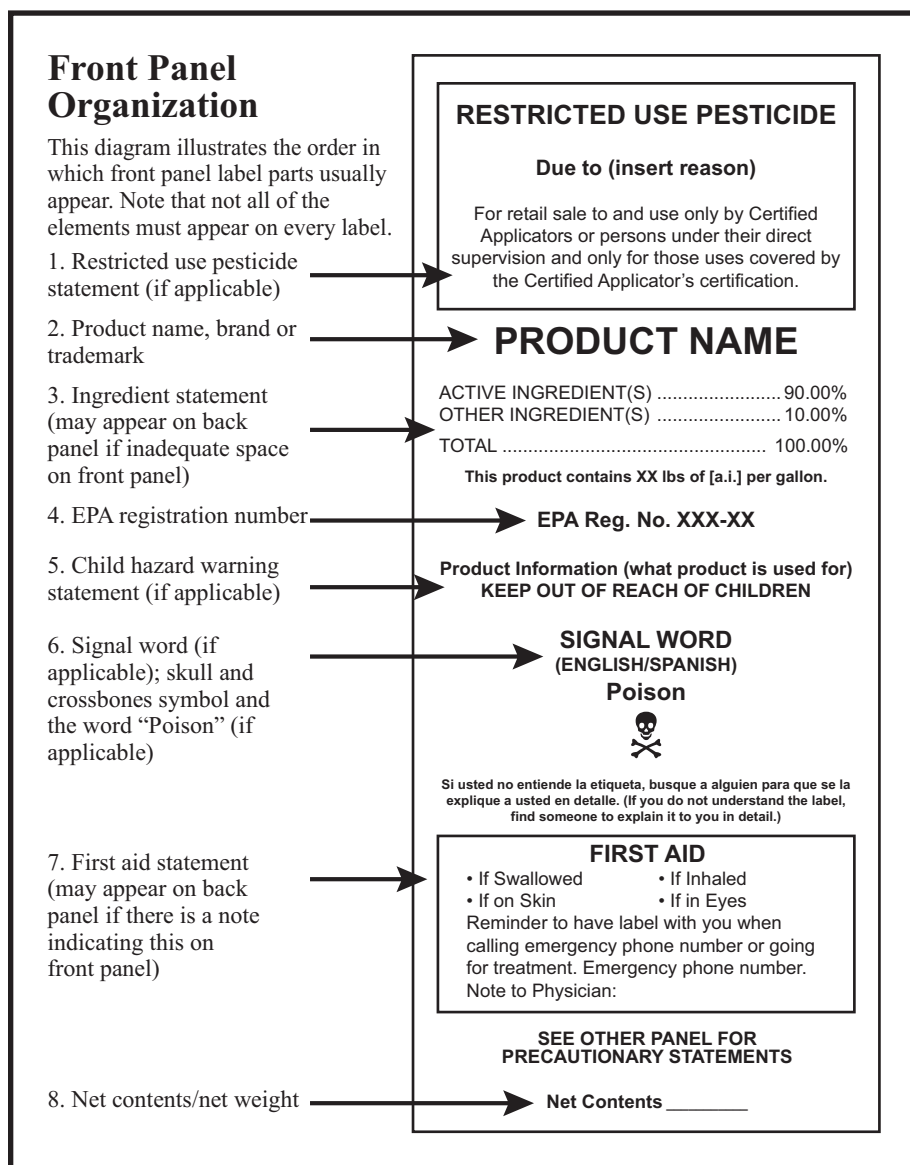
organization of a pesticide label is illustrated in the front panel schematic below and the back panel schematic on the following page.

Note that for some products with multiple uses (typically agricultural products) or products with very small containers, EPA allows some information, such as directions for use or worker protection requirements, to be contained in an accompanying booklet rather than affixed on the container. The booklet is part of the legal label, which is reviewed and approved by EPA. The most important safety-related elements of the label, such as the signal word, ingredients, hazardous statements, treatment statement and EPA registration number, must be on the container itself.

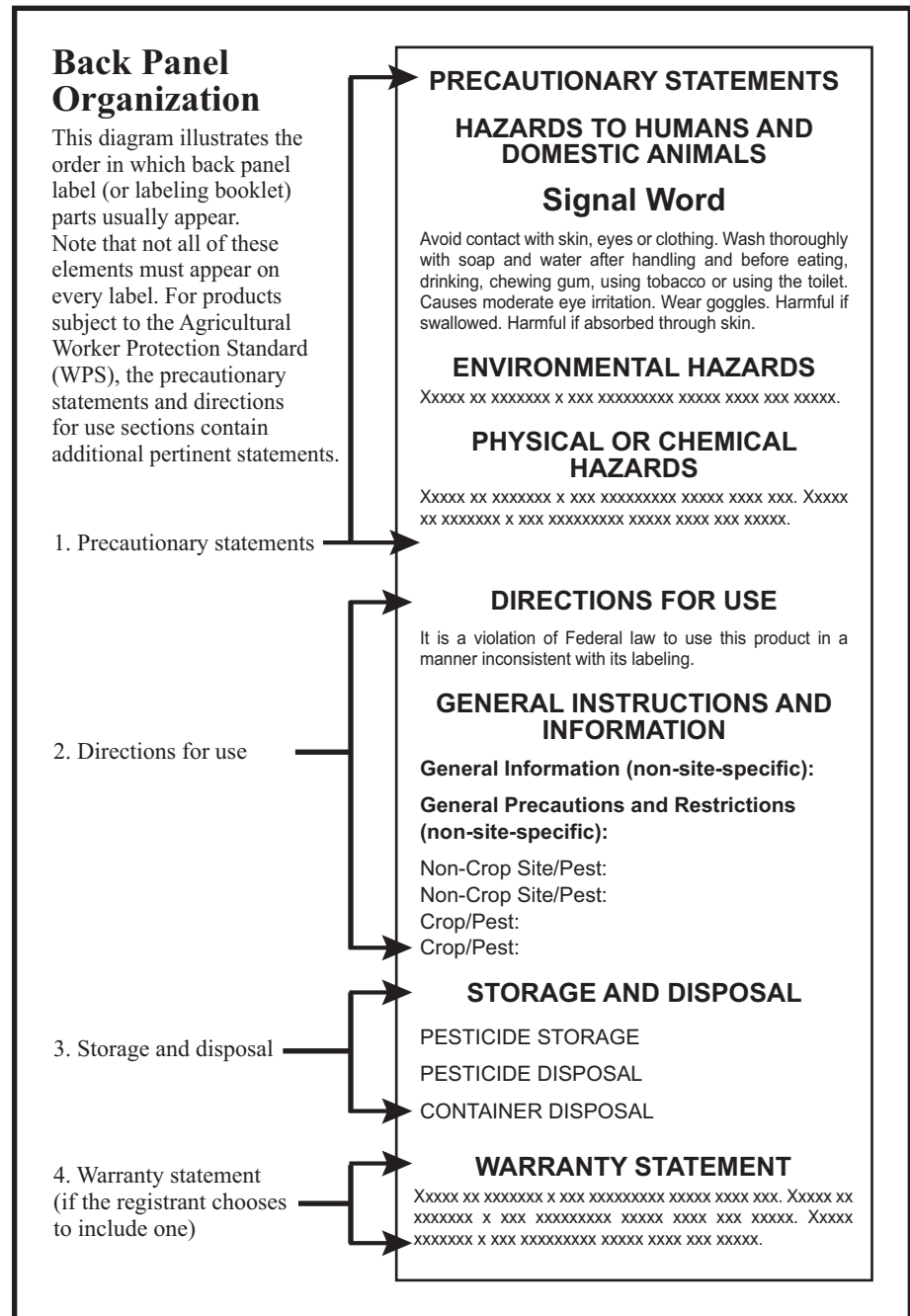
The EPA registration number is very useful when contacting EPA for information or when calling the National Pesticide Information Center hotline (see page 24). Pesticide product labels may differ from one state to another based on marketing or other area-specific considerations. Also, different formulations of the same active ingredients may result in different label information. The pesticide label generally lists information only for active ingredients (not for inert/other components) and rarely

### Items Required on Pesticide Labels

- Product name
- Manufacturer name and address
- EPA registration number
- Active ingredients
- Precautionary statements:
  - Human hazard signal words “Danger” (most hazardous), “Warning,” and “Caution” (least hazardous)
  - “Poison” and symbol, if applicable
  - Child hazard warning
  - Statement of practical treatment (signs and symptoms of poisoning, first aid, antidotes and note to physicians in the event of a poisoning)
  - Hazards to humans and domestic animals
  - Environmental hazards
  - Physical or chemical hazards
- Directions for use
- Net contents
- EPA establishment number
- Worker Protection Standard (WPS) designation, including restricted entry interval and personal protection equipment required (agricultural products only) (see WPS description on page 21)



contains information on chronic health effects (e.g., cancer and neurologic, reproductive and respiratory diseases). Although further information is often needed, pesticide labels and labeling should be considered as the first step in identifying and understanding the health effects of a given pesticide. The Agricultural Worker Protection Standard provides the legal basis for the healthcare provider(s) to obtain from the employer the name of the pesticide product to which the patient was exposed. When requesting this information, the clinician should keep the patient's name confidential whenever possible.





## Federal Regulatory Agencies

### *U.S. Environmental Protection Agency*

#### **a. Office of Pesticide Programs**

Since its formation in 1970, EPA has been the lead agency for the regulation of pesticide use under the Federal Insecticide, Fungicide, and Rodenticide Act. EPA's mandates include the registration of all pesticides used in the United States, setting restricted entry intervals (*i.e.*, the time interval during which individuals should not enter or be present in a pesticide-treated area, unless the individual is using appropriate personal protective equipment), specification and approval of label information and setting acceptable food and water tolerance (*i.e.*, residue) levels. In addition, EPA works in partnership with state, territorial, and tribal agencies to implement two field programs. First, the certification and training program for pesticide applicators sets national standards for those who apply restricted use pesticides, currently just under 1 million people. Second, the Agricultural Worker Protection Standard protects agricultural workers and pesticide handlers from pesticide exposures through training, field posting, requirements for protective equipment and decontamination protocols.

The authority to enforce EPA pesticide regulations is delegated to the states. Concerns about non-compliance with these regulations can typically be directed to your pesticide State Lead Agency (SLA). The EPA-recognized pesticide SLA is typically the state agriculture department but in some states and territories it can be another state agency (*e.g.*, the state environmental protection agency). To identify the pesticide SLA in your state, visit the Association of American Pesticide Control Officials (AAPCO) website at <http://aapco.org/>. If a worker would like to report a pesticide violation to the SLA but fears possible retaliatory action by management (*e.g.*, job loss or disciplinary action), the worker can make an anonymous call to the SLA. Note that not all state departments of agriculture have identical regulations. For instance, only California and Washington State require employers to obtain cholinesterase testing of agricultural pesticide handlers who apply pesticides containing cholinesterase-inhibiting compounds.

For pesticide contamination in water, EPA sets enforceable maximum containment levels. EPA also works jointly with the Food and Drug Administration (FDA) and the U.S. Department of Agriculture (USDA) to monitor and regulate pesticide residues and their metabolites in food and drugs. Tolerance limits are established by EPA for pesticides and their metabolites in raw agricultural commodities.

#### **b. Agricultural Worker Protection Standard (WPS)**

Recognizing that agricultural employees needed increased protection from pesticide exposures, EPA promulgated 40 CFR 170, the Agricultural Worker Protection Standard (WPS). The intent of the regulation is to protect agricultural employees by eliminating or reducing pesticide exposure, mitigating exposures that occur and informing agricultural employees about the hazards of pesticides. The WPS applies to two types of employees in the farm, greenhouse, nursery and forest industries: (1) agricultural pesticide handlers (mixer, loader, applicator, equipment cleaner or repair person, and flagger) and (2) field workers performing hand labor tasks (cultivator or harvester). The regulation does not cover agricultural employees in livestock production. The WPS includes requirements that agricultural employers notify employees about pesticide applications in advance, offer basic pesticide safety training, provide necessary personal protective equipment for direct work

with pesticides and observe restricted entry interval (REI) times. Of special interest to healthcare providers, the WPS also requires agricultural employers to:

- Post an emergency medical facility address and phone number in a central location.
- Arrange immediate transport from the agricultural establishment to a medical facility for field workers or pesticide handlers who become ill or injured after an acute work-related pesticide exposure.
- Provide the exposed worker or handler and medical personnel with the pesticide product name, EPA registration number, active ingredient(s), medical information from the label, a description of how the pesticide was used, and any other relevant exposure information.

### ***Occupational Safety and Health Administration***

The Occupational Safety and Health Administration (OSHA) plays a less substantial role than EPA in pesticide regulation. Whereas EPA has authority over pesticides in the home, environment and workplace, OSHA has authority only in the workplace. Like EPA, OSHA allows states to enforce federal OSHA regulations or their own adaptation of the federal regulations (which must be approved by federal OSHA and be at least as stringent as the federal regulations). A total of 25 states, Puerto Rico and the Virgin Islands have such OSHA-approved state plans. In the other 25 states, regulations are enforced by federal OSHA.

OSHA has fewer responsibilities in agricultural workplaces compared to non-agricultural workplaces. For example, small farms (employing 10 or fewer non-family workers and having no temporary labor camps within the last 12 months) are exempt from enforcement of all OSHA rules, regulations and standards ([http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=DIRECTIVES&p\\_id=1519](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=1519)). The only exceptions to this are in California, Oregon and Washington, where the OSHA-approved state plans enforce OSHA rules, regulations and standards on farms of all sizes. OSHA is authorized to inspect farms with 11 or more employees but generally defers to EPA-delegated state agencies for enforcement of all pesticide-related activities in crop-based agriculture. The pesticide enforcement activities deferred to these EPA-delegated state agencies include the Worker Protection Standard, compliance with language on the pesticide label and compliance with pesticide registration, classification and labeling requirements.

In the non-agricultural setting, OSHA has greater jurisdiction over workplace pesticide exposures. All workers involved in pesticide manufacturing are covered by OSHA, which has established permissible exposure levels for selected pesticides (*e.g.*, captan, carbaryl, carbofuran, chlorpyrifos, chloropicrin, 2,4-D, diazinon, propoxur and pyrethrum). Similar to the option of anonymous reporting of suspected pesticide exposures or violations in agriculture to EPA or the State Lead Agency, a worker in a non-agricultural setting who fears possible retaliatory action can anonymously report a suspected pesticide violation to OSHA.

## Pesticide Information Resources

### **EPA Office of Pesticide Programs**

EPA's Office of Pesticide Programs (OPP) is responsible for registering pesticide products and regulating their use.

**a. Pesticide Worker Safety Program.** Within OPP, the Pesticide Worker Safety Program conducts a variety of regulatory and outreach activities aimed at protecting the pesticide workforce, including agricultural workers, handlers and pesticide applicators. EPA/OPP also leads the National Strategies for Health Care Providers: Pesticides Initiative with the goal of improving the training of healthcare providers in the recognition, diagnosis, treatment and prevention of pesticide poisonings among those who work with pesticides. See **Appendix B, Key Competencies for Clinicians** to learn more. Pesticide safety materials developed through the Pesticide Worker Safety Program, including this manual, can be ordered online at no charge from the National Agricultural Center at:

<http://www.epa.gov/agriculture/awor.html>

Further information on Pesticide Worker Safety Program activities is available at:

<http://www2.epa.gov/pesticide-worker-safety>

**b. Pesticide Chemical Search.** Pesticide Chemical Search was created by EPA/OPP to allow users to easily find information such as Reregistration Eligibility Decisions (REDs), factsheets, science reviews and regulatory actions on the chemical of interest. The site is searchable by chemical name or active ingredient (CAS number or pc code) and is located on the EPA Pesticides website at <http://iaspub.epa.gov/apex/pesticides/f?p=chemicalsearch:1> or click on the Chemical Search icon on the EPA Pesticides homepage.

### **National Institute for Occupational Safety and Health (NIOSH) Centers for Disease Control and Prevention**

NIOSH is the federal agency responsible for conducting research on occupational disease and injury. NIOSH investigates potentially hazardous working conditions upon request, makes recommendations on preventing workplace disease and injury, and provides training to occupational safety and health professionals.

(800) 356-4674 or <http://www.cdc.gov/niosh/homepage.html>

**a. Centers for Agricultural Disease and Injury Research, Education, and Prevention.** NIOSH has funded eight Agricultural Health and Safety Centers throughout the country. These centers conduct research and develop intervention programs aimed at preventing occupational disease and injury of agricultural workers and their families.

<http://www.cdc.gov/niosh/agctrhom.html>

**b. Sentinel Event Notification System for Occupational Risk (SENSOR)-Pesticides.** Surveillance for pesticide-related illness and injury is designed to protect the public by determining the magnitude and underlying causes of over-exposure to pesticides. Surveillance also serves as an early warning system of any harmful effects not detected by manufacturer testing of pesticides. The NIOSH Centers for Disease Control and Prevention (CDC) and EPA support surveillance for pesticide-related illness and injury through the SENSOR-Pesticides program. In 2012, 11 states were participating in the SENSOR-Pesticides program. The success of these state-based pesticide poisoning surveillance systems relies on healthcare providers to report cases of suspected pesticide poisoning. Further information about SENSOR-Pesticides is available at the website.

<http://www.cdc.gov/niosh/topics/pesticides/>

### ***National Pesticide Information Center***

The National Pesticide Information Center (NPIC) is based at Oregon State University and is cooperatively sponsored by the university and EPA. NPIC serves as a source of objective, science-based pesticide information on a wide range of pesticide-related topics, such as recognition and management of pesticide poisonings, safety information, health and environmental effects, referrals for investigation of pesticide incidents, emergency treatment for both humans and animals and cleanup and disposal procedures. NPIC also provides a rapid response in the form of skilled technical assistance to persons suspected of being adversely affected by pesticide exposures. Highly qualified pesticide specialists and a physician with extensive experience in pesticide toxicology provide and deliver appropriate information to all inquiries. A toll-free telephone service provides pesticide information in both English and Spanish to callers in the continental United States, Puerto Rico and the Virgin Islands. Additionally, pesticide questions and comments can be sent to an email address. The website (in both English and Spanish) has links to other sites and databases for further information.

**(800) 858-7378**

*(Hotline hours of operation: 6:30 am – 3:30 pm PST,  
Monday through Friday, except holidays)*

**<http://www.npic.orst.edu>**

### ***Migrant Clinicians Network***

The Migrant Clinicians Network strengthens healthcare services and infrastructure for migrants and other mobile poor through training and technical assistance to clinicians and communities. As a partner to EPA's Health Care Provider Initiative, MCN assists primary care providers in recognizing, managing and preventing pesticide exposures and provides critically needed referral to occupational and environmental specialists. MCN's pesticide website provides clinical tools and resources and patient educational materials as part of its comprehensive pesticide exposure prevention and response efforts.

**(512) 327-2017** or **<http://www.migrantclinician.org>**

**[http://www.migrantclinician.org/clinical\\_topics/pesticides.html](http://www.migrantclinician.org/clinical_topics/pesticides.html)**

**[http://www.migrantclinician.org/clinical\\_topics/environmental-and-occupational-health.html](http://www.migrantclinician.org/clinical_topics/environmental-and-occupational-health.html)**

### ***American Association of Poison Control Centers***

The American Association of Poison Control Centers (AAPCC) is a non-profit, national organization founded in 1958. AAPCC represents the poison control centers of the United States and the interests of poison prevention and treatment of poisoning.



**(800) 222-1212**

*(local Poison Control Center access)*

**<http://www.aapcc.org>**

### ***Association of Occupational and Environmental Clinics***

The Association of Occupational and Environmental Clinics (AOEC) is a network of more than 60 clinics and more than 250 specialists that facilitates the prevention and treatment of occupational and environmental illnesses and injuries.

(202) 347-4976 or <http://www.aoec.org>

### ***Farmworker Justice***

The Farmworker Justice Fund can provide an appropriate referral to a network of legal services and nonprofit groups which represent farmworkers for free.

(202) 776-1757 or <http://www.farmworkerjustice.org>

## **Pesticide Information Databases**

### ***California Department of Pesticide Regulation Pesticide Illness Surveillance Program***

Since 1971, California law has required doctors to report any disease or condition that they know or have reason to believe resulted from pesticide exposure. The California Department of Pesticide Regulation (DPR) collects these reports in its Pesticide Illness Surveillance Program. To supplement physician reporting, DPR cooperates with the California Department of Public Health and California Department of Industrial Relations to search workers' compensation documents for pesticide-related disability. More recently, DPR has contracted with the California Poison Control System to help doctors fulfill their responsibility to report. As of 2011, a law requires clinical laboratories to send DPR the results of cholinesterase tests done to evaluate pesticide exposure. County agricultural commissioners (CACs) investigate every case identified and send reports of their findings to DPR. Scientists of the Pesticide Illness Surveillance Program review, evaluate and abstract all reports received from CACs and are working to integrate cholinesterase reports. Data from this program and others (including pesticide use, product label, enforcement, school IPM and more) can be retrieved from the website.

<http://www.cdpr.ca.gov/dprdatabase.htm>

### ***National Pesticide Information Retrieval Service (NPIRS)***

The National Pesticide Information Retrieval System (NPIRS) receives funding from EPA to maintain a pesticide information database. NPIRS provides publicly available registration information on approximately 90,000 EPA-registered pesticides. The data include: product number and name, company number and name, registration date, cancellation date and reason, existing stocks date and product manager name and phone number. NPIRS is administered by the Center for Environmental and Regulatory Information Systems at Purdue University in West Lafayette, Indiana.

<http://ppis.ceris.purdue.edu/>

### ***Agency for Toxic Substances and Disease Registry***

The Agency for Toxic Substances and Disease Registry (ATSDR), part of the Department of Human Health and Services, publishes fact sheets and information on pesticides and other toxic substances.

<http://www.atsdr.cdc.gov/>



## Data Collection on an Acute Pesticide Exposed Patient

When patients present with an identified pesticide poisoning, the following data collection format has been recommended to guide the clinician on the appropriate information to obtain as well as an evaluation of appropriate samples and other materials.

1. PT ID: Name/Age/Sex/Occupation
2. Initial and subsequent symptoms and signs\*
3. Name of pesticide product and active ingredients, their concentration and EPA registration number
4. Date and time when exposure occurred
5. How the pesticide was applied, when applied and on what crop or for what use
6. Route(s) of exposure: dermal, ocular, oral, respiratory
7. How much of the product was ingested, if ingested
8. Circumstances of exposure – intentional or accidental, occupational or non-occupational
9. A detailed description of how the exposure happened
10. Treatment already received
  - a. Skin exposure:
    - i. Was affected area washed? If so, when? If not, proceed with skin decontamination procedures
    - ii. Was any clothing contaminated?
    - iii. If so did they change clothes?
  - b. Ocular exposure:
    - i. Were the eyes irrigated?
    - ii. If so, with what and for how long?
  - c. GI exposure:
    - i. Were any emetics used?
    - ii. Were any absorbents used?
    - iii. Were any home remedies (e.g., water, milk, lemon juice) used?
    - iv. Was there any emesis before arrival?

*Data Collection on an Acute Pesticide Exposed Patient, continued*

**Materials to be Gathered:**

1. A copy of the pesticide label and/or a copy of the Material Safety Data Sheet (MSDS).
2. A copy of the pesticide application record (tank mix, concentration, etc.) if applicable. This should be available from the pesticide applicator or the grower.
3. 10 cc whole blood, anticoagulated with sodium heparin (refrigerate).
4. 5 cc plasma anticoagulated with sodium heparin (refrigerate).
5. A fresh urine sample (label and freeze).
6. Any contaminated clothing, hats, foliage from the site. Place in clean sealable plastic bag; label, seal and freeze.
7. Other options:
  - a. Fingernail residue. If the worker handled the pesticide or materials with pesticide residue, some pesticide may be lodged under the fingernails. Clean under the nails. Place in clean sealable plastic bag, label, seal and freeze.
  - b. Saliva sample. Some pesticides can be detected in saliva. Have the patient spit repeatedly into a clean glass or plastic container. Seal the container, label and freeze.
  - c. Hair sample, if the head was exposed. Place in clean sealable plastic bag, label, seal and freeze.
  - d. A skin wipe with ethanol-impregnated swab
    - i. Wipe skin that was contaminated if possible. Use a newly opened alcohol wipe. Wipe an area of skin and if possible estimate the size of the area wiped and record this on the sample label. Try to focus on an area that is likely to have been contaminated in the exposure.
    - ii. Place wipe in clean sealable plastic bag, label, seal and freeze.

*\*For the pediatric patient, note parents' occupations and child's appearance compared to his/her usual baseline. It is important to ask if the child is acting normally, if there is an abnormal gait, stumbling or ataxia; and if the child has experienced excessive sleepiness, irritability or other personality changes.*

*Developed by Matthew C. Keifer MD, MPH  
National Farm Medicine Center*

## References

1. Liebman AK, Rowland MM. To ask or not ask: The critical role of the primary care provider in screening for occupational injuries and exposures. *J Public Health Manag Pract.* 2009;15(2):173-5.
2. Levy BS, Wegman DH (eds). *Occupational and Environmental Health*, 5th ed. Lippincott Williams and Wilkins, Phila. 2006. 847 pp.
3. Agency for Toxic Substances and Disease Registry. *Case studies in environmental medicine: taking an exposure history. 2008, 2011.* Accessed 10/12/12: [http://www.atsdr.cdc.gov/csem/exphistory/docs/exposure\\_history.pdf](http://www.atsdr.cdc.gov/csem/exphistory/docs/exposure_history.pdf).
4. Rowland MM, Liebman AK, Sudakin DL, Keifer MC. Learning Opportunities from the Reported Incident of Pesticide Poisoning. *Streamline.* 2006, 12(5):6.
5. Ashford NA. Workers' compensation. In: Rom WN, editor. *Environmental and Occupational Medicine.* 4th ed. Philadelphia: Wolters Kluwer/Lippincott Williams and Wilkins. 2007. pp 1712-19.
6. ACOEM. The seven ethical principals of occupational and environmental medicine. ACOEM: Elk Grove Village, IL. 2010. Available at <http://www.acoem.org/codeofconduct.aspx>.
7. Blank L, Kimball H, McDonald W, Merino J; ABIM Foundation; ACP Foundation; European Federation of Internal Medicine. Medical professionalism in the new millennium: a physician charter 15 months later. *Ann Intern Med.* 2003;138:839-41.
8. Centers for Disease Control and Prevention. Illnesses associated with exposure to methyl bromide-fumigated produce — California, 2010. *MMWR.* 2011;60:923-26.
9. Brooks SM, Gochfield M, Herzstein J, et al. *Environmental Medicine.* St. Louis, MO: Mosby Yearbook. 1995.
10. Steenland K. *Case Studies in Occupational Epidemiology.* New York: Oxford University Press. 1993.
11. Centers for Disease Control and Prevention. HIPAA Privacy Rule and Public Health: Guidance from the CDC and the U.S. Department of Health and Human Services. Available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/m2e411a1.htm>.

## Other References

- Blondell, J. Epidemiology of pesticide poisonings in the United States, with special reference to occupational cases. *Occup Med-C.* 1997; 12(2):209-20.
- McCauley LA, Lazarev MR, Higgins G, Rothlein J, Muniz J, Ebbert C, et al. Work characteristics and pesticide exposures among migrant agricultural families: A community based research approach. *Environ Health Perspect.* 2001;109:533-538.
- Stanbury M, Anderson H, Rogers P, Bonauto D, Davis L, Materna B, Rosenman K. Guidelines for Minimum and Comprehensive State-Based Public Health Activities in Occupational Safety and Health, DHHS Publication No. 2008-148. National Institute for Occupational Safety and Health, Cincinnati, OH. 2008. Online at <http://www.cdc.gov/niosh/docs/2008-148>.