

Pesticide Poisoning

1. DISEASE REPORTING

A. Purpose of Reporting

1. To allow prompt investigation of exposure incidents, in order to identify and protect others who may be at risk from the same exposure.
2. To assist in the diagnosis and treatment of the identified case(s).
3. To develop information about pesticide-associated illness that can be shared with other public health and regulatory agencies.

B. Physician Reporting Requirements

All individuals with suspected or confirmed pesticide poisoning must be reported to the local health department (LHD) by telephone or fax within one working day of identification.

C. Local Health Department Reporting Responsibilities

Notify the Pesticide Analytical and Response Center (PARC) at the OHD by telephone (731-4025) or fax (731-4082) immediately on receipt of the initial report. Use the "Pesticide Related Illness Report Form" (OHD 44-1), completing as much information as is readily available from the physician or other reporting source at the time (see §4B).

D. OHD Follow-up Responsibilities

Investigation is the primary responsibility of the PARC, which is part of the Occupational and Environmental Epidemiology Program. The LHD will receive a case summary when the investigation is completed. The involvement of interested LHD personnel is welcome, and in some cases the LHD may be asked to help collect samples or do initial assessments of site-specific problems.

2. THE EPIDEMIOLOGY OF PESTICIDE-ASSOCIATED ILLNESS

A. About Pesticides

For surveillance purposes, pesticides are defined as any substance or mixture of substances intended for 1) preventing, destroying, repelling or mitigating any pest, or 2) for use as a plant regulator, defoliant, or desiccant as defined in ORS 634.006(8). Pesticides include herbicides, insecticides, rodenticides, fungicides and wood treatment products, but not disinfectants.

Legally, pesticides used in Oregon must be registered by the U.S. Environmental Protection Agency (EPA) and the Oregon Department of Agriculture. Registration includes labeling requirements and descriptions of allowable uses. There are over 8,000 pesticides registered in Oregon. Products may be licensed for use to manage agricultural, structural, nursery, lawn and landscape, veterinary or human pest problems. Older, no-longer-licensed products that can no longer be sold (e.g., chlordane, DDT) also turn up from time to time.

In addition to the active ingredients (i.e., those that kill the pests), products contain "inert" ingredients that function as solvents, carriers, surfactants and binding agents. These compounds may have properties that make them as toxic as the active pesticidal ingredient. A comprehensive survey of all pesticides and their effects is beyond the scope of this guideline. In its place, we present a brief overview of pesticide-associated illness and the way exposure incidents are investigated.

Pesticides can affect both children and adults, although children may be more susceptible because of smaller size (resulting in a larger dose from a given exposure) or different behavior patterns (increasing the likelihood of exposure). Persons of any age with asthma or other respiratory disease may be more susceptible to pesticide-associated illness. Such individuals might become ill following nominally appropriate applications of pesticides indoors, for example. Mild illness from pesticide exposure is often non-specific, mimicking many common illnesses. Some individuals are also sensitive to the odor or other irritant properties of certain pesticides, which is different than actual systemic intoxication.

Pesticide Poisoning

B. Description of Illness

1. Acute disease

Effects vary, depending upon the class of chemical. The table (facing page) lists major signs and symptoms of exposure-related acute disease for several classes of pesticides used in Oregon.

2. Chronic disease

The surveillance system is really not designed to capture chronic health effects from pesticide exposure. Most of the chronic problems associated with either large single dose exposures or low dose, long term exposure to several classes of pesticides (especially organophosphates and organochlorines) are neurologic.

Some pesticide ingredients may be carcinogenic. Chlorophenoxy herbicides have received a great deal of public attention because of a possible association with non-Hodgkins lymphoma. Data from epidemiologic and animal studies remain inconclusive, with substantial numbers of both positive and negative studies.

Other chronic health problems are occasionally attributed to pesticide exposure. Some of these claims may well be valid, but they are extremely difficult to confirm. As resources permit, OHD staff can provide assistance to health care providers, including referral to specialists at OHSU or Oregon State University.

C. Sources and Routes of Exposure

In general, pesticide exposure occurs by ingestion, inhalation, or skin absorption, depending on the product's chemistry, physical form, and mode of application. Many pesticides can be taken up by multiple routes.

Exposure can occur as a result of spills or drift while mixing, loading or applying pesticides. Drift from aerial or airblast spraying is also common, as these application methods are difficult to control. Individuals may be exposed when working in areas that have been treated with pesticides. Many products can be absorbed through the skin in addition to being inhaled. Individuals mixing, loading and applying pesticide products other than fumigant gases, receive the majority of their exposure through skin contact. Inhalation is the primary route of exposure for fumigants. Intentional and accidental ingestion in the home environment is another, albeit less common, route of exposure. Outbreaks of illness have also been caused by consumption of fruit or vegetables that were inappropriately treated with a pesticide product (e.g., aldicarb on watermelons—a memorable July 4th in 1985).

Children are particularly susceptible to pesticide poisoning from surface treatments and fogging of the home environment, since they spend more time closer to floor level and therefore have a greater dermal exposure than adults in the same environment.

D. Latency Period

Varies with dose and product. The acute effects of pesticide exposure may occur within minutes, or up to 12 hours after an acute exposure. Low level chronic exposure may manifest itself only after several days or weeks of exposure. The latency period for chronic health effects associated with pesticide exposure varies with the specific chemical and effect, and is often not well established.

3. CASE DEFINITIONS, DIAGNOSIS AND LABORATORY SERVICES

A. Case Definition

For reporting purposes, "pesticide poisoning" is a clinical diagnosis that includes acute poisoning as well as any subacute illness or condition (dermatologic, ophthalmologic, or systemic) caused by, or suspected of being caused by, pesticide exposure.

In the case of known occupational exposure, this category can be expanded to include patients presenting with minor symptoms such as: minor dermatitis, conjunctivitis, or low grade mucosal irritation.

To be confirmed case, a case must have some specific laboratory indication of exposure and absorption, or a history and pattern of symptoms that are pathognomonic for exposure to the particular chemical.

Typical Acute Health Effects of Selected Common Pesticides¹

| Chemical Class | Examples | Signs and Symptoms | Mechanism | Exposure Route |
|---|--|--|---|---|
| N-methyl carbamates (insecticides) | carbaryl (Sevin®), propoxur (Baygon®), oxamyl, aldicarb (Temik®) | Headache, dizziness, muscle weakness and twitching, sweating, nausea, vomiting, abdominal cramps, diarrhea, confusion, chest tightness, pinpoint pupils, pulmonary edema. | Reversible inhibition of acetylcholinesterase. | Ingestion; skin contact |
| Carbamates and dithiocarbamates (herbicides and fungicides) | benomyl, maneb, zineb, ziram, ferbam, thiram, diallate | Skin irritants. Allergic skin response. Nausea and vomiting may occur if alcohol is consumed. | Irritation (not cholinesterase inhibition). Dithiocarbamates may interfere with alcohol metabolism | Ingestion; skin contact |
| Chlorophenoxy compounds (herbicides) | 2,4-D; MCPA; MCPP | Irritation of skin, nose, throat, and bronchi; fatigue, nausea, impaired coordination; possible peripheral and sensory neuropathy, myotonia | Irritant of respiratory mucosa, skin, and gastrointestinal tract. | Ingestion; skin contact |
| Coumarins and indandiones (rodenticides) | warfarin, pindone, diphacinone, zoocoumarin, coumatfuryl | Depressed prothrombin time, hematuria, epistaxis, ecchymoses. | Anticoagulant; depressed synthesis of prothrombin and other clotting factors. | Primarily by ingestion; skin contact possible |
| Dipyridyls (herbicides) | paraquat | Severe irritation of eyes, and respiratory tract. Ingestion or excessive skin absorption: pain, nausea, vomiting, diarrhea, GI bleeding; 24-72 hours: renal and hepatic damage is evident; 3-10 days: cough, dyspnea, cyanosis, pulmonary edema, pneumonitis | Highly toxic. Direct irritation and peroxidation of phospholipids. Possible inhibition of lung tissue surfactant synthesis. | Ingestion or contact with broken skin |
| | diquat | Like paraquat, except no delayed pulmonary effects | Like paraquat, but much less toxic | Like paraquat |
| Nitrophenolic and nitroresolic herbicides | dinoseb, dinocap (Karathane®) | Yellow staining of the skin, hair; sweating, headache, malaise, tachycardia, restlessness, fever, convulsions | Highly toxic. Stimulates oxidative metabolism via uncoupling of oxidative phosphorylation. | Ingestion; skin contact; inhalation |
| Organochlorines (insecticides) | aldrin ² , chlordane ² , dieldrin (Kelthane®) | Excitability, disorientation, dizziness, restlessness, weakness, tremors, convulsions, coma. Possible carcinogens. | Disrupts CNS nerve impulse transmission | Ingestion; skin contact; inhalation |
| Organophosphates (insecticides) | malathion, diazinon, dimethoate, azinphos-methyl (Guthion®), chlorpyrifos (Dursban®, Lorsban®), dichlorvos | See N-methyl carbamates. Symptoms are the same, only more severe and persistent | Irreversible inhibition of acetylcholinesterase. Inhibits muscarinic and nicotinic activity. | Skin contact (usually); ingestion |
| Pentachlorophenol (wood preservative) | PCP, "penta", sodium pentachlorophenate | Irritation of skin, eyes and respiratory tract. Contact dermatitis may occur, or possibly chloracne. Sweating, headache, nausea, anorexia, fever, tachycardia, chest and abdominal pain. | Uncoupling of oxidative phosphorylation. Toxic to liver and kidneys. | Ingestion; skin contact; inhalation |
| Pyrethrins, pyrethroids (insecticides) | fenvalerate (Pydrin®), permethrin (Ambush®), Pounce®, resmethrin (Synthrin®), cypermethrin (Ripcord®) | Allergic rhinitis or asthma. Rare anaphylactic reaction in sensitive people. Stuffy, runny nose, and scratchy throat from inhalation. Possible paresthesias of ears and fingers. Pruritus, contact dermatitis. | Irritation and swelling of mucous membranes. Possible sensitizer. | inhalation; skin contact |

¹Several commonly used classes of fungicides and herbicides are not listed here, as their effects are not so easily characterized. The health effects of agricultural chemicals other than pesticides are also not covered here.

²No longer licensed or sold, but old containers of product are occasionally used.

Pesticide Poisoning

Health care providers are required to report those cases diagnosed or suspected on the basis of clinical judgment, in addition to cases confirmed by laboratory test.

B. Diagnosis

A proper diagnosis depends on a history of pesticide exposure and illness with objective signs documented by a health care provider. Signs and symptoms will vary with the class of chemical or combination of chemicals, route of exposure, duration of exposure and a variety of other factors. In many cases, specific lab tests may be helpful or even essential in establishing a diagnosis.

All reported cases are reviewed to determine how well symptoms fit the known toxicology of the chemical(s), the temporal relationship between exposure and illness and, whether laboratory evidence (environmental or clinical) indicates that a significant exposure occurred.

C. Laboratory Services

The public health laboratory does not offer any pesticide exposure-related testing. Under certain circumstances, some clinical testing for pesticide residues or metabolites may be available through the Oregon Department of Agriculture Laboratory. Such testing is arranged through the OHD.

Plasma or red blood cell cholinesterase testing to evaluate exposure to organophosphate or *N*-methyl carbamate insecticides is readily available through commercial clinical laboratories. Only two commercial laboratories in the United States routinely offer testing for a limited number of pesticide residues or metabolites in blood or urine.

4. RESPONDING TO INQUIRIES OR REPORTS

Occasionally, you may receive calls from people who believe that they have been poisoned or made ill by exposure to pesticides. The following comments may help you triage these calls.

A. No Physician Involvement Yet

If a person who has not consulted a physician calls with questions or concerns about a pesticide exposure, encourage them to see a physician as soon as possible. Acute care advice is available from the Oregon Poison Center (in the Portland area, 494-8968; 800/452-7165 elsewhere). If the individual provides a history of exposure that sounds significant, refer them to PARC staff at the Health Division (731-4025).

B. Doc Already Consulted, or Visit Pending

Record the patient's name, address and telephone number, as well as the name and telephone number of the health care provider involved. Check with the provider to confirm that the complaint appears to be pesticide related. If so, complete the report form (OHD 44-1) and contact PARC (731-4025).

Using The Pesticide Illness Report Form (OHD 44-1)

1. Fill out this form when a telephone report is received from a health care provider. Information that is useful but optional is indicated by shading. Keep the yellow copy of the form on file at the local health department.
2. Not all relevant information may be available when the initial report is made. While we encourage you to be as thorough as possible, do not wait until you have all the information before calling the case in to the OHD. It is more important that we know about the case as soon as possible to respond quickly. Missing information can always be collected later.
3. If multiple individuals are involved in a single exposure incident, complete separate forms (items 1-10 and 26-27) for each affected person.

C. Occupational Exposures

If the exposure is work-related, advise the caller to seek prompt medical attention. They should also be encouraged to contact the nearest Oregon Occupational Safety and Health Division (OR-OSHA) office. OR-OSHA is the agency with the primary responsibility for worker health and safety. They are able to respond to claims of unsafe conditions or practices, while protecting the identity of the person who filed the complaint.