

Part 6: Pesticide Poisoning

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Key Questions About Pesticide Poisoning

- What are the ways pesticides enter the body?
- Would you know if someone was poisoned?
- If someone is poisoned, do you know what to do?
- How can you prevent poisonings?

How a Person Can Be Poisoned

For a pesticide to cause harm to a person, it must first get into the body. This can happen if the pesticide comes into contact with the skin or eyes, if it is swallowed, or if it is inhaled. The greatest chance of accidents and highest risk of exposure resulting in a pesticide poisoning occurs when mixing and loading undiluted pesticide products.

Routes of Entry

Dermal exposure—contact with the skin or eyes—is the most common way that agricultural workers are exposed to pesticides. A pesticide can get on your skin or in your eyes:

- If it spills or splashes as you handle it.
- If it drifts as you apply it.
- If you brush against crops that have been treated.
- If you touch contaminated equipment, clothing or other items.

Pesticides can be absorbed through the skin into the bloodstream or nervous system. Certain parts of the body absorb pesticides more easily, especially the scrotum, eyes, and forehead.

Oral exposure—swallowing pesticides—can harm the mouth, throat, and digestive organs. From the digestive tract, the pesticide can enter the bloodstream.

Respiratory exposure—breathing in pesticides. Many pesticides form particles, droplets, or fumes. These are easy to breath in. The lungs can absorb pesticides very quickly, and from the lungs they can then move into the bloodstream.

Types of Exposure and Toxicity

There are two types of pesticide exposure and two types of pesticide toxicity:

- *Acute exposure* is a relatively large dose of a pesticide in a relatively short period of time. Because the toxicity of pesticides vary, an acute exposure dose for one pesticide may be much smaller than an acute dose for another pesticide.

- *Chronic exposure* is many relatively small doses over a long period of time.
- *Acute toxicity* is the poisoning that occurs within a few hours or days after an acute exposure.
- *Chronic toxicity* is the long-term health effects that may occur months or years after exposure. Chronic toxicity may occur after either acute or chronic exposure.

The Toxicity of Pesticides

Dose

Some pesticides are more toxic than others. But toxicity is not the only thing that creates a poisoning risk. The risk of pesticide poisoning depends on:

- **Class of pesticide**—the chemical makeup of the pesticide. Some chemical compounds in pesticides are more dangerous to humans than others.
- **Dose**—the amount of pesticide that enters the body. With some pesticides, a very small dose could cause permanent harm or even death.
- **Time**—how long the body is exposed to the pesticide. In general, the longer the exposure, the more harm the poison can do.
- **Route of entry**—the way the pesticide enters the body. For example, one pesticide may be less harmful if it gets on the skin than if it is swallowed.

A simple formula to keep in mind is: **Risk = Exposure x Toxicity**. Handling a toxic pesticide in a safe manner reduces exposure and risk of poisoning.

Measuring Toxicity: LD₅₀ and LC₅₀

Toxicity tells how poisonous a substance is. A rating is given to each substance to show how toxic it is. For oral and dermal exposures, the rating is called an LD₅₀. For respiratory exposure, the term LC₅₀ is used. The LD₅₀ or LC₅₀ tells the amount of pesticide that killed 50 percent of the animals tested in research studies. *LD* stands for lethal dose; *LC* stands for lethal concentration; 50 stands for 50 percent of the test population. The *test population* is the number of animals that were exposed to the pesticide.

The pesticide is measured in milligrams (mg); the weight of the animal is measured in kilograms (kg). The LD₅₀ or LC₅₀ number stands for the pesticide dose (in milligrams) for each kilogram of body weight. When a toxicity rating is given, it should state the species and sex of the test animals, the route of entry (oral, dermal, or respiratory), whether the result was acute or chronic, and the measurement units used.

Example of an LD₅₀: Pesticide A has an acute oral LD₅₀ of 42 for female white rats. This means that a large number of female rats were fed

pesticide A. The dose given each animal was 42 milligrams of pesticide for each kilogram of the animal's weight. At that rate, half of the rats died within a prescribed length of time (usually a few hours).

Keep in mind that the LD₅₀ refers to results of tests on laboratory animals, not humans. The findings may not always apply directly to humans. But they do help as a guide.

See Appendix C for a discussion on signal words and tables listing LD₅₀ and LC₅₀.

Note: Just because a product has a CAUTION statement and is therefore "safer" than one with a DANGER/POISON statement does not mean you can be more careless with it. Careless handling of a "safer" product may increase your exposure and end up being more risky than properly handling more toxic compounds. Remember:

$$\text{Risk} = \text{Exposure} \times \text{Toxicity}$$

Injuries Caused by Pesticides

The chemicals in pesticides may injure humans in a variety of ways. Each chemical has a different effect and causes different symptoms. Some are toxic to the liver, kidneys, and nervous system. Some affect the blood. Others may injure the lungs or the brain. Symptoms of pesticide poisoning range from headache, nausea, and dizziness to convulsions, vomiting, and unconsciousness.

Know the kinds of injury most likely to be caused by the pesticides you use. Knowing how pesticides affect the body makes a person more aware of the need for safe handling. Knowing what the symptoms of poisoning are may help prevent serious injury.

A chart listing the ways pesticides may harm human beings is found in Appendix D. In addition to the information given in Appendix D, there are some other important things to know about certain commonly used pesticide chemicals:

Organophosphates. Some of the most widely used chemicals are the organophosphates, which are found in many insecticides. Many are highly toxic and, due to their wide use, cause more poisonings than any other class of pesticide. In some cases, the symptoms do not appear immediately. It may take small, repeated doses over the course of the growing season before you feel ill. By that time, an added dose could cause death.

A cholinesterase blood test is a way to find out if small doses are harming you, even if there are no visible symptoms. Cholinesterase is an enzyme that affects nerve function. The blood test shows your cholinesterase level and if any harmful effects have taken place. If the blood test shows that there has been some damage, remember that a small additional dose of an organophosphate can cause illness and a larger dose could be fatal. Check with your doctor to find out if you need a blood test. Some doctors recommend a blood test before you start spraying and periodic tests during the spraying season to monitor the cholinesterase level.

Note: Carbamates also affect the enzyme cholinesterase, but they don't normally cause long-term, cumulative poisoning like organophosphates do, and so cholinesterase blood tests for carbamates are not as important.

Anticoagulants. These are used to kill rodents. They prevent blood clotting and cause bleeding. Humans are relatively safe from these pesticides as it takes repeated exposure to cause serious illness.

Fumigants. Most fumigants are highly toxic and very dangerous if inhaled. They must always be used with extreme caution. Some of the symptoms of poisoning resemble drunkenness: poor coordination, confusion, drowsiness, slurred speech. In fact, victims have been jailed or sent to mental hospitals when their condition was not diagnosed correctly.

The fumigant methyl bromide is particularly dangerous because it has no odor and is highly toxic. Chloropicrin, another fumigant, is also highly toxic, has a strong odor, and is very irritating to the eyes. It is often mixed with methyl bromide to provide a strong odor and serve as a warning agent.

Do not drink any alcohol for 24 hours before or after using a fumigant. This is a standard practice for professional fumigators. Alcohol may make you more sensitive to fumigants. It also makes it hard to diagnose fumigant poisoning.

Botanicals. These are pesticides that are made from plants. They vary greatly in their chemical structure and toxicity. Even though they are made from natural substances, some are quite toxic. For example, strychnine is one of the most toxic pesticides.

Long-term Dangers

If exposure is high certain pesticides may cause serious long-term effects such as cancer, birth defects, and sterility. It may take months or years before the symptoms show up and it may not be possible to prove that a pesticide was the cause.

Most of the studies on these long-term effects have been done with laboratory organisms. In studies, scientists look for these effects:

- *Carcinogenic*—may cause cancer
- *Oncogenic*—may cause tumors, which may or may not be cancerous
- *Mutagenic*—may increase mutations; mutations are changes, usually harmful, in inherited genetic material
- *Teratogenic*—may cause birth defects
- *Fetotoxic*—may harm a developing fetus; the effect is often fatal
- *Neurotoxic*—may damage the nervous system

Some pesticides have been shown to cause birth defects or genetic mutations in laboratory organisms, but it is still unclear if they have the same effects on humans. There is stronger evidence that some pesticides may cause cancer in humans but it is still not conclusive.

Much research still has to be done. To do this research, people who are exposed to certain pesticides must be identified at the start. The amount of pesticide exposure must be documented as well as the exposure to other potential carcinogens. Then their health must be checked for a number of years or even decades.

How to Know if Someone Has Been Poisoned

It is not always easy to tell if an illness is due to pesticide poisoning. Some illnesses such as heat exhaustion, asthma, or food poisoning may have the same symptoms as pesticide poisoning. But when someone who handles pesticides becomes ill, be aware that pesticide poisoning may be the cause. If you feel ill, think about whether the symptoms occurred before or after you used pesticides. If you need to see a doctor, be sure to mention any pesticides you have used.

What to Do if Someone Is Poisoned

Be Prepared

If an accident happens, you need to know exactly what to do.

Read this section now. Learn it well. Don't wait for an accident to find out what to do—any delay could lead to death.

Post emergency phone numbers next to all telephones. These numbers should include the poison center for your area. There is one poison center for Minnesota. They provide information on all types of poisoning. They can be reached 24 hours a day. The telephone number is:

All of Minnesota: 800 - POISON1 (800-764-7661)

Have a first aid kit ready for a poisoning emergency. Directions on how to make a first aid kit are given on page 6 - 11.

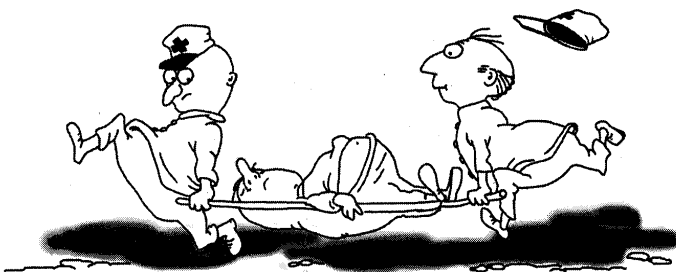
Learn CPR. You may need to give artificial respiration if a poisoning victim stops breathing. A CPR (cardio-pulmonary resuscitation) course will teach you how.

What to Do in a Poisoning Emergency

Emergency treatment depends on the type of exposure. For dermal exposure (skin or eyes), the most important thing to do is to get the poison off the victim immediately. Use lots of water and remove contaminated clothing. For respiratory exposure (inhaling fumes), the first thing to do is to get the victim away from the fumes. If the poison has been swallowed, your first step is to call the poison center and check the label to find out what to do.

Step-by-step instructions for each type of poisoning are given below. In all cases, be careful not to let the pesticide get on you. Otherwise you could become a victim, too.

As soon as the poison has been removed from the victim, call for help. If it is a life-



threatening situation (if the victim is unconscious, having a seizure, or is short of breath) call **911**. If there is no 911 service in your area, call an ambulance service.

In other cases of pesticide exposure—even if it doesn't seem to be a poisoning emergency—call the poison center. Doctors may not know what ingredients are in the pesticide but the poison center will. Have the pesticide label handy, if possible. Be prepared to give the poison center this information:

- The name of the pesticide
- How much pesticide got on or was inhaled or swallowed by the victim.
- How long ago the poisoning occurred.
- Any symptoms.

If you are alone, do not leave to make the phone call until you are sure the victim is breathing and is not further exposed to the poison. Save the pesticide and the label for the doctor.

You need water to wash off the poison. If there is no fresh running water, use any source of fairly clean water such as irrigation canals, lakes, ponds, or watering troughs. Don't let the victim die while you worry about how dirty the water is.

If Poison Has Been Swallowed

First, call the poison control center or check the pesticide label for specific information on poisoning.

There are two ways to help people who have swallowed a poison: 1) inducing vomiting, or 2) diluting the poison by having the victim drink milk or water.

Inducing vomiting

Vomiting is the quickest way to get the poison out of the stomach, but there are times when you must not induce vomiting. The pesticide label will tell you when NOT to induce vomiting. Call the poison center or physician before inducing vomiting.

Never induce vomiting:

- If the victim is unconscious or in convulsions. The victim could choke to death.
- If the victim has swallowed a corrosive poison (a strong acid or alkali). A corrosive poison causes severe mouth and throat burns and severe pain. It will burn as severely coming up as it did going down.
- If the victim has swallowed concentrated petroleum products (gasoline, kerosene, oil, lighter fluid, or an emulsifiable concentrate). Many liquid pesticides contain petroleum.

Note: If the pesticide formulation was diluted with water before it was swallowed, then the victim should be forced to vomit immediately.

How to help someone vomit:

1. Make sure the victim is lying face down or kneeling forward. Do not let him lie on his back because the vomit could enter the lungs and do more damage.
2. Give the patient lots of milk or water—1-2 cups for children up to five years old; up to a quart for victims five years or older. Ipecac or a glass of soapy water will also cause the victim to vomit.
3. Give syrup of Ipecac or soap water to induce vomiting. If that is not possible put your finger or the blunt end of a spoon at the back of the victim's throat. Do not use anything sharp or pointed.
4. Save some of the vomit. The doctor may need it for chemical tests.

Diluting the poison

If the patient has swallowed an acid or alkali, the best first aid is to dilute the poison as quickly as possible. Give the patient water or milk. If the victim is under two years of age, give 1 cup of water or milk. For ages two to five, give 1 to 1½ cups. For adults and children over five, give 2 cups.

If Poison Is on the Skin

The faster the poison is washed off the victim, the less injury there will be. Do not allow any pesticide to get on you while helping the victim.

1. Drench the skin and clothing with water (shower, hose, faucet, pond).
2. Remove the clothing. Cut it off if necessary.
3. Wash skin and hair thoroughly with soap and water. Detergents and commercial cleansers are better than soap.
4. Dry and wrap the victim in a blanket.

If the Skin Is Burned

1. Wash the skin with lots of running water.
2. Remove contaminated clothing carefully to avoid harming the skin.
3. Immediately cover the burn loosely with a clean, soft cloth.
4. Do not use ointments, greases, powders, or other drugs.

If Poison Is in the Eye

It is most important to wash the eye out as quickly but as gently as possible.

1. Hold the eyelids open and wash the eyes with a gentle stream of clean, running lukewarm water.
2. Keep washing the eyes for 15 minutes or longer.
3. Do not use chemicals or drugs in the wash water. They may make the injury worse.

If Poison Is Inhaled

Pesticides in the form of dusts, vapors, or gases may be breathed in and cause damage to the lungs. If the victim is in an enclosed space such as a room or a building, do not go in the area without an air-supplied respirator.

1. Carry the victim to fresh air immediately. Do not let him walk.
2. Open all doors and windows.
3. Loosen all tight clothing.
4. Give artificial respiration if the victim has stopped breathing or if the breathing is irregular.
5. Keep the victim as quiet as possible.
6. If the victim has any convulsions, watch his breathing and protect him from falling and striking his head. Keep his chin up so his air passage will remain free for breathing.
7. Wrap the patient in a blanket to prevent chills but don't let him get too hot.
8. Do not give alcohol in any form.

If the Victim Is in Shock

Sometimes poisoning victims go into shock. A victim can die from shock even if the poisoning itself is not fatal.

Symptoms of shock

- Skin is pale, moist, cold, and clammy
- Eyes are vacant, with dilated pupils
- Breathing is shallow and irregular
- Pulse is very weak, rapid, and irregular
- Victim is unconscious or in a faint

Steps to take while waiting for medical help for shock victims

1. Keep the victim flat on the back with legs up 1½ feet above the head.
Exception: Do not keep a victim who is vomiting on the back.
2. Keep the victim warm enough to prevent shivering. Do not overheat.
3. Keep the victim quiet and calm.
4. **Never** try to give anything by mouth to an unconscious person.

Poisoning Prevention

Avoid as much as possible all contact with a pesticide. The key to personal safety when using pesticides is to remember that they can enter your body through your mouth, skin, eyes, or lungs. If you block these entry ways, you won't be hurt.

The warnings on the label and toxicity tables tell you if a pesticide is particularly hazardous (for instance, if it can be absorbed through the skin) so you can take special safety precautions.

Protecting Yourself from Accidental Poisoning

To protect your skin and eyes:

- Wear clothing that covers all your skin.
- Wear goggles or shields if there is any chance that sprays or dusts may get in your eyes.
- Wash your hands before using the bathroom and before smoking.

To prevent accidental swallowing:

- Wash your hands before eating or smoking.
- Always keep pesticides in the original, labeled container.
- Never use your mouth to clear a plugged nozzle.
- Never use your mouth to begin siphoning a pesticide.
- Do not eat, drink, or smoke in an area where pesticides are being handled.

To protect your lungs:

- Wear respiratory protection if there is any risk of breathing in pesticides.

Part 7—Safe Handling of Pesticides gives more specific information on how to prevent accidents.

Summary

A person may be poisoned if a pesticide comes in contact with the skin or eyes, or if it is swallowed or inhaled.

The risk of poisoning depends on the pesticide, the dose, the time of exposure, and the route of entry (oral, dermal, or respiratory). A simple formula to remember is $\text{Risk} = \text{Exposure} \times \text{Toxicity}$. The LD_{50} (or LC_{50}) value tells how toxic a pesticide is. The smaller the LD_{50} number, the greater the toxicity.

Pesticide poisoning can be acute or chronic. Acute poisoning is a sudden, severe illness. Chronic poisoning is the gradual poisoning that takes place over a period of time and refers to possible effects such as cancer or birth

defects that may not show up for years after exposure.

Each class of pesticides causes different poisoning symptoms. Some of the most common symptoms are nausea, headache, stomach pains, diarrhea, dizziness, and weakness.

If an accident occurs, get medical help immediately. Call the poison center. In an emergency, call 911 or an ambulance. A delay can lead to death.

Give first aid while waiting for medical help. The most important thing is to get the poison off the victim. Use water to wash it off. If poison was swallowed, either dilute the poison with water or milk or induce vomiting. Check the label first. A person overcome by fumes should be moved into fresh air.

How to Make a First-aid Kit

Use a sturdy wooden box, tool box, or lunch pail. It should have a tight-fitting cover with a latch so that it won't come open or let pesticides leak in. Label the box clearly with a waterproof marker.

Contents

Activated charcoal—small package or premix

Clean water—at least 1 pint in a thermos or jar

Saline eye wash—at least 1 quart

Syrup of ipecac

Band-aids, bandages, and tape

A quarter (25 cents)—taped to inside cover of the kit

Empty jar with lid

Telephone numbers of doctor, hospital, and poison center

Pencil and paper

Health information about workers

Use

to drink with water to absorb swallowed poisons

to dilute poisons

to wash out eyes

to induct vomiting

to cover cuts and scrapes so that pesticides don't easily enter the body

to make emergency phone call

for a drinking glass or to collect vomit for the doctor

for quick reference

to record time and duration of exposure and names of chemicals (from label)

to inform the doctor of special health conditions

A **blanket** is another useful first-aid item. It should be kept near the first-aid kit in a place where it will not be contaminated by pesticides.

