E-759

Revised MARCH 1987

Pesticides

- Safety
- How They Work
- Treatments for Human Poisoning
- Poison Control Centers

DEAN K. McBRIDE
Extension Entomologist

ROBERT FANNING
Farm Safety Specialist

COOPERATIVE EXTENSION SERVICE
North Dakota State University Fargo, North Dakota 58105

Table of Contents

e information in this publication was obtained from Dr. Donald C.
inator at Kansas State University.

Introduction

Pesticides are chemicals "designed" to unfavorably alter life processes. These chemicals fall into broad groups including insecticides, fungicides, herbicides, nematicides, etc. The more similar the metabolic processes are between plants and plants, plants and animals (including insects), and animals and animals (including insects), the greater the likelihood of biological activity or hazard.

The important pesticides are chemically grouped into four major categories: synthetic organic, inorganic, biological, and botanic. There is a wide diversity of toxicity and specific effects throughout the groups.

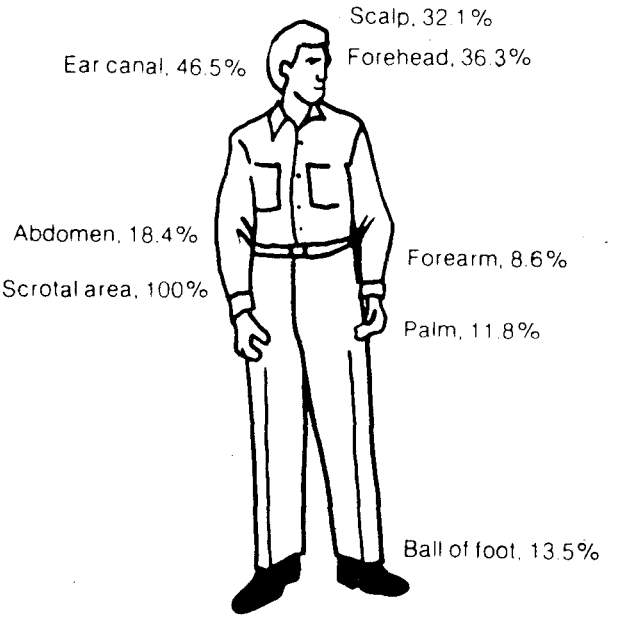
Exposure

Pesticides may enter the body in a wet or dry state through the skin (dermal absorption), through breathing (respiratory absorption), and through the mouth (oral and gastrointestinal tract absorption).

Dermal absorption is the most common route of exposure although the rate of absorption is higher for a given amount of chemical in the sensitive tissues of the respiratory and digestive tracts.

The following figure gives information obtained by Maibach, and others, (1971) in California from experiments conducted on six normal human volunteers.

The results show that parathion is absorbed at different rates on various areas of the body and that protective clothing must be worn to prevent skin absorption. Special care should be given to protect the scalp, ear canal and forehead. The abdominal area and belt (or waist) line should be protected to prevent chemical access to the scrotum and lightweight natural rubber gloves and boots should be worn to protect the hands and feet.



Parathion absorption in percent through the skin on various body areas.

(Maibach, H.I., R.J. Feldmann, T.H. Milby and W.F. Serat. 1971. Regional Variation in Percutaneous Penetration in Man. Archives of Environmental Health. Vol. 23, pp. 208-211)

Data have shown that most accidents occur during the mixing and loading operation; therefore, it is extremely important to wear protective clothing when concentrated chemicals are being handled as well as during application.

How Pesticides Work

Life depends on a vast number of chemical reactions (metabotic processes). Alteration of any of the metabotic processes will affect the plant or animal. Some alterations result in death, while others are less drastic.

In some individuals an alergic reaction is seen upon exposure to some formulated pesticides. The alergic reaction is often to one or more of the "inert ingredients," such as, wetting agents, excipients, emulsifiers, synergists, etc., rather than to the active ingredient. Such reactions must be differentiated from actual poison symptoms and signs resulting from exposure to the active ingredient.

Herbicides and Fungicides

In general, herbicides and fungicides are not as readily absorbed into animals as are the insecticides. Thus, they are not as toxic to insects and warm blooded animals (including humans) as the insecticides. However, once they are absorbed, their lower toxicity to animals is due, mainly, to the *dissimilarity* between plant and animal systems, cell wall characteristics, tissue compositions, metabolic processes, and animal organ functions.

Herbicides and fungicides are chemicals designed to disrupt plant metabolic processes (example, inhibit photosynthesis, root development). Since animals do not have these (plant) metabolic processes, herbicides and fungicides are not as toxic to animals as they are to plants.

Animal exposure to herbicides and fungicides may result in skin irritation (sometimes severe) and respiratory and/or digestive ailments which vary in severity often from individual to individual. Once absorbed into an animal's system, the system attempts to metabolize and excrete these "foreign chemicals." In the process, various organs, usually the liver and kidneys (and in some cases the nervous system and a variety of metabolic processes) are adversely affected (poisoned).

Herbicide and fungicide poisonings in animals do not respond to the antidotal treatments used for organophosphate and carbamate insecticide poisonings in animals.

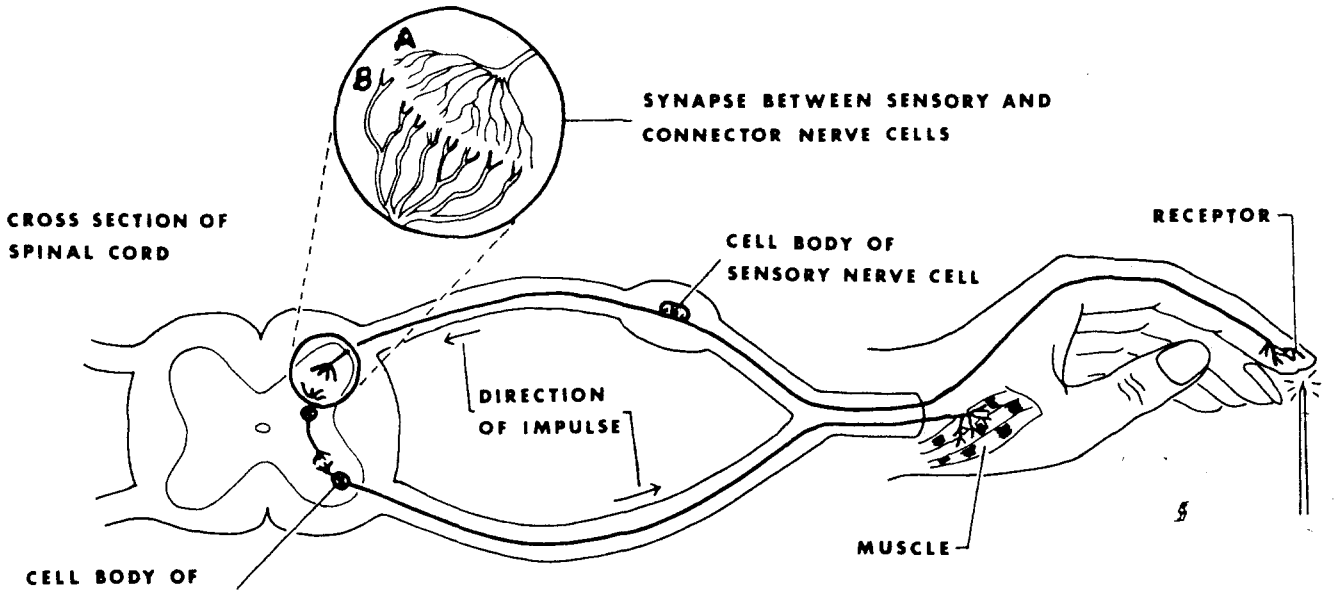
Insecticides

Because of the *similarities* between the metabolic processes of insects and higher animals (including humans), insecticides are often equally toxic to humans. At the present time, the most widely used insecticides are the organophosphates and carbamates. Different kinds of insecticides may alter metabotic processes in one or more ways; that is, they may have one or more modes of action.

Organophosphate and carbamate insecticides, once inside the body, interfere primarily with the nervous system by inhibiting or depressing the enzyme cholinesterase. All living things with cholinesterase in the nervous system, such as insects, birds, animals, and humans may be poisoned by these chemicals. However, in order to understand how these insecticides affect the nervous system and thereby the symptoms and treatments of poisonings, it is necessary to see how the nervous system works.

The nervous system—which includes the brain—is the most complex system in the body. It consists of millions of cells which make up a message or communication system throughout the body. The messages (or stimuli) travel along this network in the form of an electrical impulse. Think of it as a spark!

The nerve cells are connected at the *synapse* (see the drawing). The ends of the connecting nerve cells in-



Example of Simple Reflex Action. Acetylcholine released at nerve ending A crosses synapse and stimulates electrical impulse along nerve fiber beginning at B. The acetylcholine is broken down by cholinesterase in the body fluids surrounding the synapse.

tertwine, but do not actually touch each other. Stimuli cause the release of chemical substances called neurotransmitters. The chemical acetylcholine carries the electrical impulse across the synapse to the next nerve cell. Then the cholinesterase breaks down the acetylcholine and the synapse is back to normal. If the acetylcholine is not broken down it continues to stimulate the receptive nerve endings.

In the drawing, a stimulus (sticking your finger with a pin) begins at the skin. The stimulus or spark travels down thousands of nerve fibers and across the synapses. Some of the stimuli go to muscles to make you jerk back while others go to the brain where they are interpreted as the feeling of pain. This is an extremely simplified example, but it serves to illustrate the basic components and workings of the nervous system.

Organophosphate and carbamate insecticides each inhibit a type of cholinesterase. This results in an accumulation of acetylcholine so all stimuli or "sparks" continue to arc across the synapses stimulating continuous muscle contractions or tremors. Thus, the nervous system is "poisoned."

The antidote, atropine, is used to block the action of excessive acetylcholine in organophosphate and carbamate insecticide poisoning once adequate oxygen is being absorbed by the patient and cyanosis is overcome. Afterwards, 2-PAM is used in organophosphate poisoning to reactivate the cholinesterase. In carbamate insecticide poisoning, 2-PAM is ineffective and should not be used as an antidote. Because these antidotes (atropine and 2-PAM) also affect the nervous system and heart, they should never be self-administered.

The amount of insecticide necessary to poison an organism generally depends on the size of the organism. It may take only a tiny amount to affect an insect, more for a dog, more for a man, and still more for a horse. Of course, some species, as well as individuals within a given species, can stand more or less of a given insecticide. This may be due to differences in metabolism, age and general health of the species or individual. However, some insecticides are so potent that only one drop is required to seriously poison an adult.

Symptoms/Signs

Herbicides and Fungicides

Since herbicides and fungicides are designed as "plant poisons," human exposure to toxic levels results in a variety of general symptoms and signs of poisoning.

The symptoms and signs vary with the given herbicide or fungicide, the amount absorbed, and the general health condition of the individual. Some of the most common symptoms and signs include: skin irritation (drying and cracking), discoloration (reddening or yellowing), itching; when breathed: burning sinuses, throat and lungs with coughing, hoarseness and upper respiratory congestion; when ingested: mouth and throat irritation, chest pains, nausea (stomach ache), diarrhea, muscle twitching, sweating, headache, weakness. Some of these symptoms may begin immediately upon exposure while others may be delayed several hours or, in some cases, two or more days.

Insecticides

Symptoms differ with the various insecticides, but all are dose and dose-interval dependent. Symptoms may begin almost immediately after exposure to a direct cholinesterase inhibitor such as TEPP, mevinphos, or Furadan. However, symptoms may be delayed several hours after an equal exposure to a delayed cholinesterase inhibitor such as parathion, Guthion, or phorate (Thimet). Onset of symptoms more than 12 hours after the termination of exposure generally excludes the diagnosis of organophosphate or carbamate insecticide poisoning unless it is a chronic poisoning from small repeated exposures.

The most commonly reported symptoms, somewhat in their order of progression and depending somewhat on the route of exposure (lungs, oral or skin), are: headache, visual disturbances (blurred vision), pupillary abnormalities (primarily pin point pupils but on rare occasions, dilated pupils), and greatly increased secretions such as sweating, salivation, tearing, and respiratory secretions.

More severe poisoning results in nausea and vomiting, pulmonary edema (the air spaces in the lungs begin to fill with fluid), changes in heart rate, muscle weakness, respiratory paralysis, mental confusion, convulsions and/or coma and ultimately death.

Cholinesterase Tests

Cholinesterase tests are used only for cholinesterase inhibiting insecticides. Urine and blood analysis, together with symptoms, are used to diagnose most herbicide, fungicide, and non-cholinesterase inhibiting insecticide exposure and poisonings.

Persons who work with organophosphate or carbamate insecticides for an extended time during the year (farmers, pesticide applicators, pesticide manufacturers, formulators, etc.) should establish a regular cholinesterase testing program with their doctor. For a farmer, such a program would likely consist of one (initial) cholinesterase test to determine his "base line level." This test should be done "off season" (e.g., January or February).

Then, when the insecticides are being used during the summer, similar tests are done on the individual and the results compared with the base line level of cholinesterase. Through this testing procedure, the pesticide user can be made aware of his cholinesterase level during the time of year when he is exposed to pesticides. When cholinesterase levels are depressed to a given level, the doctor may advise that the individual limit or possibly stop his exposure to these pesticides until the cholinesterase level returns toward normal.

Doctors should arrange for their patients to have these tests and may obtain additional information through N.D. State Toxicology Lab, Box 5195, Fargo, N.D. 58105.

Poison Treatments

Everyone who works with pesticides should have a well thought out plan of action to follow in the event of an accident. It should include basic knowledge of first aid as it relates to pesticide poisoning, and a prepared kit.

Call a Doctor or a Poison Control Center

First aid is the initial effort to help a victim while medical help is on the way. Step one in any poisoning emergency is to call an ambulance or doctor. The only exception is when you are all alone with the victim. Then you must see that he is breathing, and out of further exposure to the pesticide before leaving him to make a phone call. Always save the pesticide and the label for the doctor.

Poison on the Skin

The sooner the poison is washed off the patient, the less the injury.

- Remove clothing and drench skin with water (shower, hose, faucet, pond, ditch).
- Cleanse skin and hair thoroughly with soap and water. (Don't abrade or injure the skin while washing.)
- Dry and wrap in blanket.

WARNING: Do not allow any of the pesticide to get on you while you are helping the victim.

Chemical Burns of the Skin

- Remove contaminated clothing.
- Wash the skin with large quantities of cold running water.
- Immediately cover loosely with a clean, soft cloth.
- Avoid use of ointments, greases, powders, and other drugs in first aid treatment of chemical burns.

Poison in the Eye

It is very imprtant to wash the eye out as quickly, but as gently, as possible.

- Hold eyelids open, wash eyes with a gentle stream of clean running water at body temperature.
- Continue washing for 15 minutes or more.
- Do not use chemicals or drugs in wash water. They may increase the extent of injury.

Inhaled Poisons (Dust, Vapors, Gases)

If victim is in an enclosed area use an air-supplied respirator to get him.

- Carry patient (do not let him walk) to fresh air immediately.
- Open all doors and windows.
- Loosen all tight clothing.
- Apply artificial respiration if breathing has stopped or is irregular.
- Keep patient as quiet as possible.
- If patient is convulsing, watch his breathing and protect him from falling and striking his head. Pull his chin forward so his tongue does not block his air passage.
- Prevent chilling (wrap patient in blankets but don't overheat).
- Do not give alcohol in any form.

Swallowed Poisons

The most important decision you have to make when aiding a person who has swallowed a pesticide is whether to induce *vomiting or not.* The decision must be made quickly and accurately; the victim's life may depend on it. Usually it is best to get rid of the swallowed poison fast. But: NEVER induce vomiting if the victim is unconscious or is in convulsions. The victim could choke to death on the vomitus.

Find out what poison has been ingested. NEVER induce vomiting if the victim has swallowed a corrosive poison. A corrosive poison is a strong acid or alkali (base) such as dinoseb (DN Compounds). The victim will complain of severe pain and have signs of severe mouth and throat burns. A corrosive poison will burn the throat and mouth as severely coming up as it did going down.

Most labels on emulsifiable concentrate and solution formulations suggest the victim should not have vomiting induced. However, when the toxicity of the pesticide is marked, its removal may be essential.

To Induce Vomiting

Give 1 tablespoon (½ ounce) of syrup or ipecac to a child over 1 year of age or 1 fluid ounce (2 tablespoons) to an adult, followed by a glass of water. If vomiting does not occur in 15 minutes, the dose may be repeated. Do not waste a lot of time waiting for the vomiting. Get the victim to a hospital.

Make sure the victim is kneeling forward or lying on his right side while retching or vomiting. Do not let him lie on his back because vomitus could enter the lungs and do more damage. Catch the vomitus in a container and save for the doctor. He may need it for chemical tests.

An ounce of syrup of ipecac may be obtained without prescription from your pharmacist.

If you do not have syrup of ipecac, give 1 cup of milk or water for victims up to 5 years old or 1 to 2 glasses for victims 5 years and older. Induce vomiting by putting your finger or the blunt end of a spoon on the very back of this tongue. Do not use anything which is sharp or pointed!

A glass of soapy water (such as Ivory soap from a bar dissolved in water) may also cause the victim to vomit.

Corrosive Poisons

The best first aid is to dilute the poison as quickly as possible. For acids or alkalis (bases), give the patient water or preferably milk or ice cream—1 cup for victims under 5 years; or 1 to 2 glasses for patients over 5 years. Milk or ice cream is better than water because it dilutes and helps neutralize the poison. Water only dilutes the poison.

It is very important that the victim get to a hospital without delay. Do not induce or encourage vomiting!

Activated Charcoal

After first-aid suggestions for noncorrosive poisons have been followed and medical help is delayed due to travel or other reasons, activated charcoal may be administered to hopefully absorb the remaining poison. It does not absorb all poisons and a rather large amount may be required for it to be effective. For example: it takes 1½ ounces of charcoal powder (about 10 grams) to bind 3 adult aspirin. Mix the charcoal with water into a thick soup for the victim to drink.

Individuals who work with insecticides should purchase from their pharmacist a sealed pint jar of activated charcoal to have available in the event of an accident. The most favorable experience has been with the following products: (1) Norit A (American Norit Co., Jacksonville, FL) (2) Darco G 60 (Atlas Powder Co., Wilmington, DE), but other products may be available locally. Remember that the activated charcoal poison mixture must be removed from the body and medical help is required more than ever.

When syrup of ipecac has been given, do not use activated charcoal until *after* vomiting has occurred. The charcoal can inactivate the emetic principle in the syrup of ipecac.

Shock

Sometimes poisoning victims go into shock. If untreated or ignored, the victim can die from shock even if the poisoning injuries would not be fatal.

Symptoms

The skin will be pale, moist, cold and clammy. The eyes are vacant and lack luster with dilated pupils. The breathing will be shallow and irregular. The pulse is very weak, rapid and irregular. The victim may be unconscious or in a faint.

First Aid

Unless he is vomiting, keep the victim flat on his back with the legs 1 to 1½ feet higher than the head. Keep the victim warm enough to prevent shivering. Do not overheat.

If the victim is *conscious and has not swallowed any poison,* give small amounts of milk, water or if it is an adult, a dilute salt solution (½ teaspoon of table salt to 1 quart of water). Give as often as the victim will accept it. Keep the victim quiet and reassure him often.

WARNING: Never try to give anything by mouth to an unconscious victim.

First Aid Equipment

A well equipped first-aid kit, which is always readily available, can be important in a pesticide emergency. Make up your own Pesticide First-Aid Kit from a lunch pail, tool box, or a sturdy wooden box. It should have a tight fitting cover with a latch so that it won't come open or allow pesticides to leak inside. Label it clearly with paint or a waterproof marker.

Contents

- One ounce bottle of *syrup of ipecac.*
- Small plastic bottle of *soap* solution to quickly wash pesticides off the skin.
- Small plastic container of *salt.* Salt is used with water (½ teaspoon salt to 1 quart water) to aid an adult in shock if medical care will be delayed hours.
- Pint jar of *activated charcoal.* Mixed with water and swallowed, activated charcoal acts as an absorber of many pesticides.
- *Shaped plastic airway* for mouth-to-mouth resuscitation.
- Two, one-quart containers of *clean water.* If there is no clean water, in any emergency use any available pond or stream water.
- Simple *"band aids," bandages,* and *tape.* All cuts and scrapes should be covered to prevent pesticides from easily entering the body.
- One *teaspoon.*
- A *blanket* kept in a place where it will not be contaminated by pesticides.
- Two *quarters,* taped to the inside cover of the first-aid kit for emergency phone calls.
- *Tongue blades* (wooden sticks)—one to mix charcoal, another to prevent biting tongue if convulsing.
- Two small, plastic *empty jars* with tight fitting lids; one for a drinking glass or mixing activated charcoal. The other can be used for collecting vomitus to take to the doctor.
- Can of *evaporated milk* (with can opener).

Warn Doctor Ahead of Time

Doctors generally may not be well informed of the symptoms and treatments of pesticide poisoning. This is due to the few cases they treat. Pesticide poisoning symptoms are similar to those of other illnesses and poisonings. The pesticide applicator should tell his doctor which chemicals he will use. Then, the doctor can review the symptoms and treatments and have the antidotes on hand.

It is strongly recommended that those with above average use of pesticides *establish a regular health surveillance program with their physician.*

WARNING: There are no drugs that can be given to

prevent poisoning. Prevention of poisoning by reading labels and utilizing safe practices is the best antidote. Do not drink alcohol or smoke while on the job. Alcohol and smoking accentuate many poisonings.

Medical Antidotes

Antidotes such as those described below should be prescribed or given only by a qualified physician. They can be very dangerous if misused.

Organophosphates

For poisons such as: Azodrin, Bidrin, Bomyl, carbophenothion (Trithion), Co-Ral, Dasanit, DDVP (Vapona), demeton (Systox), Diazinon, dimethoate, dioxathion (Delnav), disulfoton (Di-Syston), Dursban, Dyfonate, EPN, ethion, famphur (Warbex), fenthion (Baytex), Guthion, malathion, Metasystox-R, methyl parathion, Monitor, parathion, phorate (Thimet), mevinphos (Phosdrin), phosphamidon, Schradan (OMPA), Supracide, TEPP.

Antidotes

Clear airway, maintain respiration by whatever means available (manual or mechanical), administer oxygen.

1. Once cyanosis is overcome, *atropine sulfate* is given intravenously to counteract the effects of excessive acetylcholine. It is given repeatedly as symptoms recur.

NOTE: Atropine tablets should not be self administered in a poisoning emergency. The dose is much too small. Often the victim cannot or should not take oral medicine. The atropine can hide or delay early symptoms of poisoning. The victim may be fooled into thinking he is all right and may continue to work. Or a doctor may misdiagnose the problem because the symptoms are hidden by the atropine.

WARNING: *Atropine can be poisonous if misused. It should never be used to prevent poisoning. Workers should not carry atropine for first-aid purposes. It should be given only under a doctor's direction.*

2. *Protopam Chloride* (2-PAM) is administered following atropinization to reactivate cholinesterase in organophosphate poisonings, but *not* carbamate poisoning.

3. *Do not use* morphine, theophyllin, aminophyllin, epinephrine or barbiturates.

Carbamates

For poisons such as: Carzol, mexacarbate (Zectran), aldicarb (Temik), carbofuran (Furadan), methomyl (Lannate), carbaryl (Sevin).

Antidotes

1. *Atropine sulfate* is used to counteract the effects of excessive acetylcholine. The dose should be repeated as symptoms recur.

2. *Do not use* Protopam Chloride (2-PAM).

Chlorinated Hydrocarbons

For poisons such as: endrin, dieldrin, aldrin, lindane, chlordane, endosulfan (Thiodan), hpetachlor.

Antidotes

1. There are no specific antidotes. Requires good supportive care and control of convulsions.
2. Epinephrine (adrenalin) contra-indicated.
3. Charcoal hemoperfusion has been successful.

Arsenicals

For poisons such as: sodium arsenite, Paris Green, cacodylic acid.

Antidotes

May be chelated by BAL (dimercaprol) given intramuscularly.

Cyanides

For poisons such as: hydrogen cyanide, Cyanogas.

Antidotes

A kit by Lilly contains the specifically needed medications.

1. *Amyl Nitrite* through inhalation initially; then,
2. *Sodium Nitrite* given intravenously *followed by*,
3. *Sodium Thiosulfate* given intravenously.

Anticoagulants

For poisons such as: Warfarin, Fumarin, Pival, PMP (Valone), diphacinone (Diphacin). (Very small repeated doses are of greatest danger.)

Antidotes

1. *Vitamin K* by mouth, intramuscularly, or intravenously.

Fluoroacetates

For poisons such as: sodium fluoroacetate (1080).

Antidotes

1. *Monacetin* (glycerol monoacetate) intramuscularly has been suggested experimentally.

Dinitrophenols

For poisons such as: DNOC, DNOCHP, dinoseb (DNBP, Premerge).

Antidotes

1. There are no specific antidotes. Requires excellent supportive care and treatment of possible burns.

Bromides and Carboxides

For poisons such as: Methyl Bromide, Carboxide, Ethylene Dibromide. (Symptoms may be delayed.)

Antidotes

1. BAL *(dimercaprol)* may be given *before symptoms appear.*
2. Control of convulsions.

Chlorophenoxy Herbicides, Ureas, Miscellaneous

For poisons such as: 2,4-D, 2,4,5-T, silvex (2,4,5-TP), monuron (Telvar), diuron (Karmex), Hyvar-X, endothall, Diquat, Paraquat.

Antidotes

1. No specific antidotes.
2. Maintain life supports.

Paraquat poisoning should be handled at a specialized treatment center. DO NOT WAIT for the delayed appearance of symptoms. Check with your physician for the exact location of these facilities.

Nicotine

For poisons such as: ERL, Mash-Nic Powder, Twenty X-N, Wilsonite, Black leaf 40.

Antidotes

1. Wash out stomach with 1:5,000 to 1:10,000 potassium permanganate solution. Then give activated charcoal.
2. Control convulsions.
3. Ephedrine and atropine may help control symptoms.

Strychnine

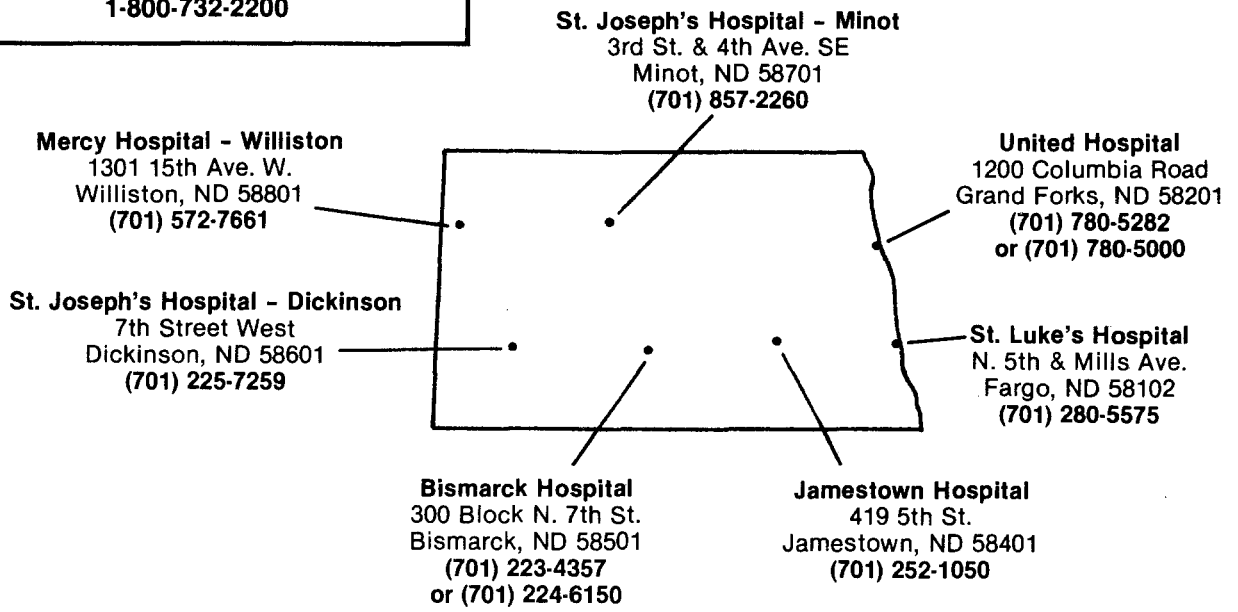
For poisons such as: Strychnos, Strychnos Nux-Vomica, Nux Vomica, Strychnine Sulfate.

Antidotes

1. Feed activated charcoal immediately and repeatedly if conscious. Empty stomach afterwards.
2. Control convulsions.

North Dakota Poison Treatment & Education Centers

North Dakota
Toll Free Poison Information Number
1-800-732-2200



NOTE: These centers have information on treatment of poisoning which will be of value to your physician. Be sure to take the pesticide container label along when going to the physician or hospital.

Pesticide Safety Tips

- Always read the label before buying or using pesticides. Use pesticides only for the purpose(s) listed and in the manner directed.
- Pesticides that require special protective clothing or equipment should be used only by trained, experienced applicators.
- Do not apply more than the specified amount of pesticide. Overdoses can harm you and the environment
- Keep pesticides away from food and dishes.
- Keep children and pets away from pesticides and sprayed areas.
- Do not smoke or eat while applying pesticides.
- Avoid inhalation of pesticides.
- Never spray outdoors on a windy day.
- When you mix pesticides, do it carefully to avoid splashing.
- Avoid breaks or spills of pesticide containers.
- If you spill a pesticide on your skin or on your clothing, wash with soap and water and change your clothing immediately.
- Store pesticides under lock in the original containers with proper labels. Never transfer a pesticide to a container that would attract children, such as a soft drink bottle.
- Dispose of empty containers safely. Wrap single containers of home use products in several layers of newspaper, tie securely and place in a covered trash can. Never burn boxes or sacks. In the case of farm or ranch use, single containers maybe buried where water supplies will not be contaminated. Dispose of large quantities in special incinerators or special landfills.
- Wash with soap and water after using pesticides, and launder clothes before wearing again.
- If someone swallows a pesticide, check the label for first aid treatment. Call or go to the doctor or the hospital immediately and keep the pesticide label with you.

IMPORTANT RESOURCES FOR PESTICIDE INFORMATION

For information regarding proper cholinesterase testing, have your doctor contact:

State Toxicology Laboratory
P.O. Box 5195
Fargo, North Dakota 58105
Telephone: Dr. N. G. Rao
(701) 237-7876)

For information regarding pesticide disposal or what to do in the event of contamination by pesticides such as an accidental spill or fire, contact:

North Dakota State Health Department
Environmental Waste Management
& Research
1220 Missouri Avenue
Bismarck, North Dakota 58501
Telephone: (701) 224-2382

In the event of an accident involving pesticides (or any chemicals) on the highway, railway or waterway, contact:

CHEMTREC
(24 hours a day-7 days a week)
Telephone: (800) 424-9300

REMEMBER—ALWAYS READ THE LABEL *BEFORE* USING ANY PESTICIDE. DO NOT WAIT UNTIL SYMPTOMS APPEAR TO GET MEDICAL CARE.

Cooperative Extension Service, North Dakota State University of Agriculture and Applied Science, and U. S. Department of Agriculture cooperating. Myron D. Johnsrud, Director, Fargo, North Dakota. Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. We offer our programs and facilities to all persons regardless of race, color, sex, religion, age, national origin, or handicap; and are an equal opportunity employer.