
CHAPTER 5

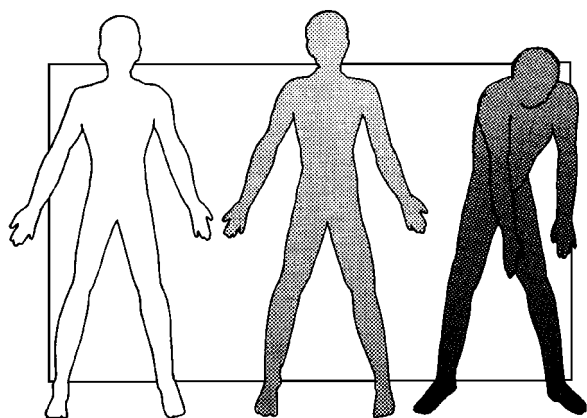
PESTICIDES AND HUMAN HEALTH

LEARNING OBJECTIVES

After you complete your study of this chapter, you should be able to:

- List the four routes by which your body can be exposed to pesticides.
- Understand acute toxicity and the effects.
- Understand chronic toxicity and the effects.
- Explain what the signal words on a pesticide label represent.
- Recognize some general signs and symptoms of pesticide poisoning.
- Perform appropriate first aid for pesticide exposure.
- Explain the concepts of risk, toxicity and exposure and how they relate to one another.
- Describe your legal responsibility for following personal protective requirements in pesticide labeling.
- Explain the importance of wearing gloves when you handle pesticides.
- Explain some basic guidelines for cleaning and maintaining personal protective equipment.

Pesticides are generally toxic to living organisms. They are specifically designed to be toxic to those organisms we consider pests. However, living organisms share some basic features, and a substance that is toxic to one species may be harmful to another, including humans.



This chapter explains how pesticides enter the body, how to protect yourself from contamination and how to perform first aid if contamination does occur. An explanation of terms will help

clarify this information. The words “toxicity” and “hazard” often are used interchangeably when describing a pesticide’s toxic effects. However, they are not the same. **Toxicity** is a measure of the capacity of the pesticide to cause injury. It is a property of the chemical itself and its concentration. **Hazard**, on the other hand, is the potential for injury. It reflects both the toxicity of the pesticide and the likelihood that significant exposure will occur in a particular situation. Pesticide applicators should be concerned with the hazards associated with exposure to the chemical not exclusively with the toxicity of the chemical itself.

To avoid or minimize the hazards of pesticide use, know what you are using and how to use it. This means you must read the label carefully and follow the instructions. Poisonings do occur as the result of occupational exposure, careless use, misuse or mishandling. The attitude of the applicator is of utmost importance. If applicators mistakenly think they know exactly how to use a pesticide or neglect or ignore precautions they should take, accidents are more likely to occur. Taking adequate precautions and practicing good common sense with safety in mind minimizes the potential for accidents from pesticide usage.

EXPOSURE: HOW PESTICIDES ENTER THE BODY

To cause an adverse effect (including death), a pesticide must first enter the body and reach a susceptible site. Four primary routes through which a pesticide can enter the human body are: the skin (dermal), the lungs (inhalation), the mouth (oral) and the eyes (ocular).

Dermal Exposure

The skin is an important route of pesticide entry into the body. Dermal absorption may occur from a splash, spill or drift when mixing, loading, applying or disposing of pesticides. It may also result from being exposed to plant residue or cleaning or repairing contaminated equipment.

Even small amounts of chemical allowed to remain on the skin and be absorbed into the body, can poison a person. Parts of the body vary in their ability to absorb pesticides. The statistics in Table 1, obtained from a study of volunteers, show that you should take special care to protect the scalp, ear canal and forehead, as well as the groin area. Note that the scrotal area is 100 percent absorptive. A hat with a wide brim and or face shield would serve to protect the three head areas, and a waterproof apron can protect the groin.

Table 1

Anatomy	Percent Absorption*
Scalp	32.1
Ear canal	46.5
Forehead	36.3
Forearm	8.6
Palm of hand	11.8
Abdomen	18.4
Scrotum	100.0
Ball of feet	13.5

*Parathion, an agricultural pesticide, was used in this study.

The scrotal area and the head tend to be the most absorptive areas, though cuts, abrasions and skin rashes can enhance absorption in other parts of the body. Pesticide formulations vary in their absorbency through skin. In general, wettable powders, dusts and granular pesticides are not as readily absorbed as oil-based liquid formulations such as emulsifiable concentrates.

Ocular (Eye) Exposure

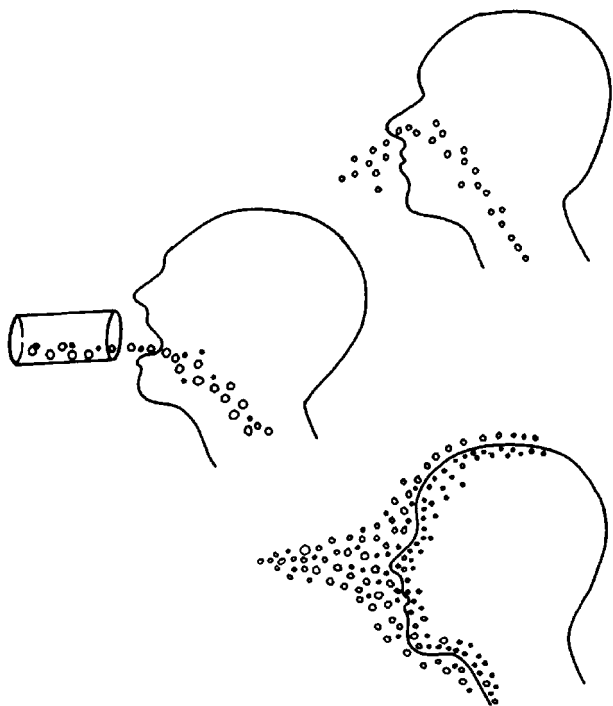
Under certain conditions and with certain pesticides, absorption through the eyes can be significant and particularly hazardous. Eyes are very sensitive to many pesticides and, considering their size, are able to absorb surprisingly large amounts of chemical. Serious eye exposure can result from a splash or spill, drift, or rubbing the eyes with contaminated hands or clothing. Avoid this type of exposure by always wearing protective eye covering such as goggles or a face shield.



Wear the correct amount of personal protective equipment when working with pesticides.

Inhalation Exposure

Protecting the lungs is especially important because pesticide powders, dusts, gases, vapors and especially very small spray droplets can be inhaled during mixing, loading or application or when pesticides are applied in confined areas. Once breathed into the lungs, pesticides can enter the bloodstream rapidly and completely. If inhaled in sufficient amounts, pesticides can damage nose, throat and lung tissue. The label will indicate whether face masks or respirators are required when using specific pesticides.



Oral Exposure

Accidental oral exposure occurs most frequently when pesticides have been taken from the original labeled container and put into an unlabeled bottle or food container. Unfortunately, children are the most common victims. Children under age 10 are the victims of at least half of the accidental pesticide deaths in the United States. Keep pesticides in their original containers.

Oral exposure also occurs when liquid concentrates splash into the mouth during handling or when cleaning equipment. The mouth should never be used to clear a spray line or to begin siphoning a pesticide. Chemicals can also be swallowed when eating, drinking or smoking, or even licking one's lips. Many pesticides are rapidly and completely absorbed by the intestinal tract, so it is sound advice to **wash hands and face thoroughly before eating, drinking or smoking**. Do not eat or smoke while handling pesticides.

TOXICITY AND POTENTIAL HEALTH EFFECTS OF PESTICIDES

The toxicity of a particular pesticide is determined by subjecting test animals (usually rats, mice, rabbits and dogs) to various dosages of an active ingredient and to each of its formulated products. From these studies, acute and chronic toxicity and effects are determined. Then signal words are assigned and proper handling procedures are determined to reduce risk.

Acute Toxicity and Acute Effects

Acute toxicity is the capacity of a pesticide to cause injury from a single exposure. This is the most common type of pesticide poisoning.

Acute toxicity is determined by at least three methods:

1. Dermal toxicity is determined by exposing the skin to the chemical.
2. Inhalation toxicity is determined by permitting the test animals to breathe vapors of the chemical.
3. Oral toxicity is determined by feeding the chemical to test animals.

The harmful effects that occur from a single exposure by any route of entry are termed acute effects. In addition, the effect of the chemical as an irritant to the eyes and skin is examined under laboratory conditions.

Acute toxicity is usually expressed as LD50 (lethal dose 50) and LC50 (lethal concentration 50). This is the amount or concentration of a toxicant required to kill 50 percent of a test population of animals under a standard set of conditions. LD50 values of pesticides are recorded in milligrams of pesticide per kilogram of body weight of the test animal (mg/kg) or in parts per million (ppm). LC50 values of pesticides are recorded in milligrams of pesticide per volume of air or water (ppm). To put these units into perspective, 1 ppm can be compared to 1 inch in 16 miles or 1 minute in 2 years.

The LD50 and LC50 values are used to compare the toxicity of various active ingredients as well as different formulations of the same active ingredient. The lower the LD50 value of a pesticide, the less it takes to kill 50 percent of the population, and therefore the greater the acute toxicity of the chemical. Pesticides with high LD50 values are considered the least acutely toxic to humans when used according to the directions on the product label. If the label does not state the LD50, this information can be obtained from the product's Material Safety Data Sheet (MSDS).

Acute toxicities are the basis for selecting the appropriate signal word (toxicity categories) to be used on a product label.

Signal Words

Signal words indicate the toxicity of a pesticide. The signal word may reflect the active ingredient's toxicity, the inert ingredient's toxicity, or the toxic affect of their combined activity. Those pesticides that are classified as "highly toxic," on the basis of either acute oral, dermal or inhalation

toxicity, must have two signal words: **DANGER** and **POISON** (in red letters) and a skull and crossbones prominently displayed on the package label. **PELIGRO**, the Spanish word for danger, must also appear on the labels of highly toxic chemicals. Acute oral LD50 values for pesticide products in this group range from a trace to 50 mg/kg. As little as a few drops of such a material taken orally could kill a 150-pound person.

Some pesticide products carry the signal word **DANGER** without the skull and crossbones symbol. This occurs when possible skin irritation or eye effects are more severe than suggested by the acute toxicity (LD50) of the product.

Pesticide products considered “moderately toxic” must have the signal words **WARNING** and **AVISO** (Spanish) displayed on the product label. Acute oral LD50 values range from 50 to 500 mg/kg. From 1 teaspoonful to 1 ounce of this material could kill a 150-pound person.

Pesticide products classified as either “slightly toxic or relatively nontoxic” are required to have the signal word **CAUTION** on the pesticide label. Acute oral LD50 values are greater than 500 mg/kg.

Chronic Toxicity and Chronic Effects

Chronic toxicity is the ability of repeated, prolonged exposure to a pesticide to cause injury. A number of pesticides cause this type of effect. Chronic toxicity is very dangerous because pesticide applicators do not realize anything is wrong until the injury has progressed. Applicators should remember that the absence of any immediate effect is not necessarily an indication of no exposure or safe use.

The chronic toxicity of a pesticide is determined by subjecting test animals to long-term exposure to an active ingredient. The harmful effects that occur from repeated doses over a period of time are termed **chronic effects**. Some possible chronic effects from exposure to certain pesticides include birth defects (teratogenesis); toxicity to a fetus (fetotoxic effects); production of tumors (oncogenesis), either benign (non-cancerous) or malignant (cancerous; the process is carcinogenesis); genetic changes (mutagenesis); blood disorders (hemotoxic effects); nerve disorders (neurotoxic effects); and reproductive effects. Pesticides are required to include chronic toxicity warning statements on the product label if effects may occur. The chronic toxicity of a pesticide is more difficult to determine through laboratory analysis than the acute toxicity.

Because of the variety of effects that pesticides can cause and the amount of time it might take

for the effects to appear, it is prudent to reduce exposure as much as possible to all pesticides. When effects do occur, treatments are generally available, but prevention is much preferable to treatment, especially because some of the effects are irreversible.

FIRST AID FOR PESTICIDE POISONING

Most pesticide poisonings result from careless use, improper storage or ignorance. By law, everything you need to know to apply pesticides safely is on the pesticide label. Therefore, the most important rules to follow when using pesticides are to **read and follow the instructions and precautions on the label**. Read the label before buying the product, opening the container, mixing or applying the solution, and before disposing of unused product or empty containers.

Symptoms and Signs of Pesticide Poisoning

Pesticides are designed to be toxic to pests. Human exposure to toxic levels results in a variety of general symptoms and signs of poisoning. These vary with the pesticide, the amount absorbed and the general health of the individual. Some of the most common symptoms and signs are:

- **When a substance is touched:** skin irritation (drying and cracking), skin discoloration (reddening or yellowing) or itching.
- **When the substance is inhaled:** burning sinuses, throat and lungs, accompanied by coughing, hoarseness and upper respiratory congestion.
- **When the substance is ingested:** mouth and throat irritation, chest pains, nausea (stomach ache), diarrhea, muscle twitching, sweating, headache and weakness.

Some of the symptoms begin immediately upon exposure; others are delayed for several hours or even days.

Insecticides. Insecticides are the type of pesticide that the small animal manager will most commonly be using. Symptoms differ with various insecticides, but all depend on both the amount and duration of exposure. Insecticides of most concern are the organophosphates and carbamates, which inhibit cholinesterase, a chemical critical for normal functioning of the nervous system. Symptoms may begin almost immediately after exposure to a direct cholinesterase inhibitor. Symptoms may be delayed several hours. Onset

of symptoms more than 12 hours after exposure generally excludes organophosphate or carbamate insecticide poisoning, unless it is chronic poisoning from repeated exposures.

The most commonly reported symptoms, which often appear in progression and depend, in part, on whether the chemical was touched, inhaled or ingested, are:

- Headache.
- Visual disturbances (blurred vision).
- Pupillary abnormalities (primarily pinpoint pupils, but on rare occasions, dilated pupils).
- Greatly increased secretions such as sweating, salivation, tearing and respiratory secretions.

Normal Pupils



Constricted (pinpoint) pupils

More severe poisonings result 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 or coma, and death.

Groomers may be especially vulnerable to intoxication from pet insecticides if they are careless in their daily work practices. Inhalation and absorption through the skin are the most common means of insecticide exposure. Groomers dipping or spraying animals in a poorly ventilated area with skin exposure to the chemicals may expect to absorb considerable amounts of insecticide. The symptoms of over-exposure may not be noticeable in the early stages, but prolonged exposure may result in frequent headaches, irritability, lack of energy and depression.

Groomers and veterinary clinic personnel must take special precautions to protect their health when working regularly with pet dips and sprays. A basic understanding of the insecticides used in dips, sprays and collars is essential for those frequently using the products. Review the information found in Chapter 3, Pesticides.

Applicators can use EPA-approved flea and tick insecticides daily by following the products' label directions, wearing the appropriate PPE and working in a well ventilated workplace.

Cholinesterase Tests

Cholinesterase tests are used only for cholinesterase-inhibiting insecticides: organophosphates and carbamates. These classes of insecticides are found in products commonly used to control and manage small animal pests. Urine and blood analysis, together with symptoms, are used to diagnose most herbicide, fungicide and non-cholinesterase-inhibiting insecticide exposure and poisonings.

If you work with organophosphate or carbamate insecticides for an extended time (small animal managers/groomers, farmers, pesticide applicators, pesticide manufacturers, formulators), you should establish a regular cholinesterase test program with your doctor. For a groomer, such a program might consist of one (initial) cholinesterase test to determine a baseline level. This test should be made in the off-season (possibly when flea controls are not being applied.) Then, during a high-use period for insecticides, similar tests are conducted and the results are compared with the baseline level. Through this testing procedure, you can learn of any changes in cholinesterase levels when you are exposed to pesticides. When cholinesterase levels are low, your doctor may advise you to limit or possibly stop your exposure to these pesticides until the cholinesterase level returns to normal.

For more information, contact your doctor or the state health department.

First Aid

When you are working with pesticides, it is always best to work with someone. Arranging to have someone with you may sometimes be an inconvenience, and it may seem like an unnecessary precaution—until something happens.

If you are with someone who is exposed to a pesticide, immediately begin first aid treatment or assist the victim in any way you can. Always be careful not to contaminate yourself. If there is any cause to seek medical attention, either call a doctor or take the victim directly to a doctor. Take the pesticide label or labeled container with you.

First aid treatment varies according to the type of exposure. Become thoroughly familiar with all of the appropriate procedures. Learn them ahead of time—you probably won't have time to look them up if you ever need them.

Dermal Exposure

Observe the manufacturer's recommendations for first aid. In addition, and if the situation demands:

- Remove clothing, if it has been contaminated.
- Drench skin with water.
- Wash thoroughly, including hair if necessary. Detergents and commercial cleansers are better than soap.
- Rinse thoroughly, using lots of soap and water.
- Wash again and rinse.
- Dry and wrap the person in a blanket.
- Where chemical burns of the skin have occurred, cover the area loosely with a clean, soft cloth. Avoid the use of ointments, greases, powders and other medications.

Inhalation Exposure

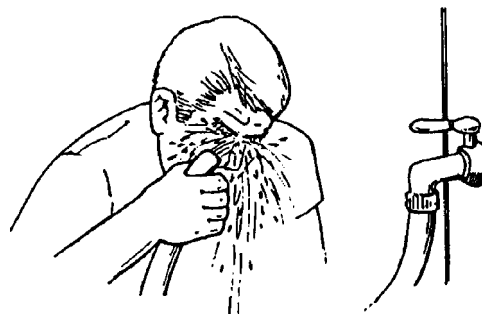
Observe the manufacturer's recommendations for first aid. In addition, and if the situation demands:

- Get to fresh air immediately.
- If you are with someone who has been poisoned, move the victim to fresh air immediately.
- Do not attempt to rescue someone who has been poisoned in an enclosed area if you do not have the proper respiratory equipment.
- Loosen all tight clothing.
- If breathing has stopped or is irregular, give mouth-to-mouth resuscitation.
- Keep the victim as quiet as possible.
- Prevent chilling (wrap in blankets, but do not overheat).
- If you are with a victim who is having convulsions, watch his/her breathing and protect the person from falling and striking the head. Keep the chin up so the air passages will remain free for breathing. Do not put anything in the victim's mouth.
- Do **not** give alcohol in any form to the victim.

Eye Exposure

Observe the manufacturer's recommendations for first aid. In addition, and if the situation demands:

- Hold eyelids open and wash eyes with a gentle stream of clean running water. **Use large amounts of water immediately—delay of even a few seconds greatly increases the possibility of injury.** Continue washing for 15 minutes or more.
- Do not use medications in the wash water—use pure water.



Use clean water to gently flush pesticides from the eyes for at least 15 minutes.

Oral Exposure

Observe the manufacturer's recommendations for first aid. In addition, and if the situation demands:

- If a pesticide has gotten into your mouth but has not been swallowed, rinse your mouth with large amounts of water.
- If the pesticide has been swallowed, the most important consideration is whether to induce vomiting—the decision must be made quickly and correctly. Where specific instructions are given, always follow label directions. Beyond that, never induce vomiting if:
 1. The victim is unconscious or is having convulsions.
 2. The pesticide is **corrosive**. A corrosive substance is any material, such as a strong acid or alkali (base), that causes chemical destruction of living tissues. Poisoning symptoms include severe pain and a burning sensation in the mouth or throat.

In attempting to induce vomiting, it is important to use safe and effective procedures. Vomiting should be induced for an **adult** with two tablespoons (1 ounce) of Syrup of Ipecac (this can be obtained from your pharmacist without a prescription) and two glasses of water. Induce vomiting in a **child** with 1 tablespoon (1/2 ounce) of Syrup of Ipecac and one glass of water.

If Syrup of Ipecac is not available, induce vomiting by drinking one or two glasses of water and then touching the back of the throat with your finger. **Salt water should not be used to induce vomiting.**

- The victim should be lying face down or kneeling forward while retching or vomiting, thus preventing vomitus from entering the lungs and causing further damage.
- Collect some of the vomit for the doctor—it may be needed for chemical tests.
- **Do not waste a lot of time attempting to induce vomiting—get to a hospital as soon as possible.**

Where the label identifies specific antidotes, this information is intended for use by a doctor. Antidotes should not be administered except under the direction of a physician or other medical professional. Taken improperly, antidotes can be more harmful than the pesticide itself.

The name, address and telephone number of the physician, clinic or hospital emergency room that will provide care in the event of a pesticide poisoning should be clearly posted at all work sites.

SAFETY: PROTECT YOURSELF FROM PESTICIDES

The greatest risk to the pesticide applicator occurs during application and mixing and loading of pesticide concentrates. Though application of diluted material is usually less hazardous, the hazard increases when significant drift occurs or when appropriate safety and application procedures are not followed. The danger of exposure also exists when people are cleaning up pesticide spills, making equipment repairs and entering treated areas prematurely.

Personal protective equipment (PPE) is clothing and devices that are worn to protect the human body from contact with pesticides or pesticide residues. Personal protective equipment includes such items as coveralls or protective suits, footwear, gloves, aprons, respirators, eye-wear and head gear. Remember:

$$\text{RISK} = \text{toxicity} \times \text{exposure}$$

To reduce risk, choose pesticides with lower toxicity and reduce exposure by wearing PPE. Pesticide labeling lists the minimum personal protective equipment you must wear while

handling that pesticide. Sometimes the labeling lists different requirements for different activities.

The following is a brief discussion of the various types of protective clothing and equipment, and a review of some important considerations for their selection.

Clothing

At a minimum, protective clothing should include a long-sleeved shirt and long trousers that are clean and made of a tightly woven fabric or a water repellent material. A T-shirt and shorts are not adequate protection when applying pesticides. Common denim provides good protection. Specific items of protective clothing are described in the following sections. For more information, see Extension bulletin E-2150, "Choosing Clothing for Pesticide Safety."

Choosing Chemical-resistant Materials

Always read the pesticide labeling to see what materials are resistant to the pesticide product. The Extension agents, pesticide producers, or personal protective equipment manufacturers and distributors may also offer guidance. Refer to the MSDS sheets to obtain information that may help in the selection process.

Remember, all PPE has a limited life (length of time it will provide adequately protection). Protection, durability and longevity differ among materials. How they are used, the length of time, and the type of chemicals to which they are exposed affect their performance. Replace your PPE frequently.

Neoprene, nitrile, polyvinyl chloride (PVC) and butyl rubber are chemical-resistant materials available in various thicknesses as gloves, coveralls, hoods, boots and other PPE. Each varies in the ability to withstand chemical permeation. Select the material that best suits your particular needs. Latex rubber has natural pores and holes and is not recommended for protection against chemical exposure.

Coveralls, Aprons, Raincoats

Coveralls, whether disposable or reusable, vary in their comfort and durability and in the degree of protection they provide. Coveralls should be made of sturdy material such as cotton, polyester, a cotton-synthetic blend, denim or a non-woven fabric. A liquidproof apron, raincoat or rainsuit should be worn when pouring and mixing concentrates and when using highly toxic pesticides—coveralls usually do not provide adequate protection against spills and splashes of these

chemicals. Wear a rainsuit whenever mist or spray drift are likely to substantially wet work clothes or coveralls. Liquidproof aprons and rainsuits should be made of rubber or a synthetic material resistant to the solvents in pesticide formulations. The apron should cover the body from the chest to the boots.

Gloves

Wear unlined, chemical-resistant gloves when handling or applying pesticides. Gloves should be long enough to cover the wrist and should not have a fabric wristband. Check gloves carefully to be sure there are no holes—fill them with water and squeeze. Each exposure to a pesticide reduces the gloves' ability to protect you the next time you wear them. Gloves are intended to be disposable—replace them often. Be certain gloves are approved for use with the chemicals you intend to use. Some rubber products react with certain solvents and become sticky as the rubber dissolves. If this occurs, dispose of the gloves and use gloves approved for use with the specific pesticide. For most jobs, wear shirt sleeves outside of the gloves to keep pesticides from running down the sleeves into the gloves. But if you are working with your hands and arms overhead, put the gloves outside of the sleeves and turn up the cuff of the gloves to catch material that might run down your arms. Wash chemicals off the gloves with soap and water before removing them so you don't contaminate your hands when removing the gloves.

Hats

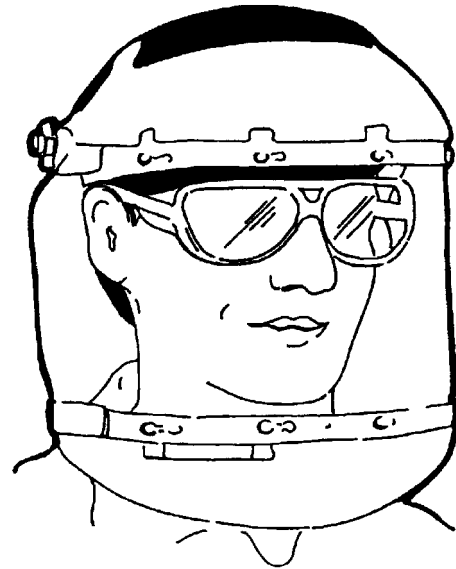
Wear head covering when handling pesticides. A hat should be liquidproof and have a wide brim to protect the face, ears and neck. Hats should be either disposable or easy to clean with soap and water—they should not contain any absorbent materials such as leather, straw or cloth. Baseball caps do not provide adequate protection.

Shoes and Boots

Boots should be unlined and made of rubber. Because of their absorbency, never wear boots of leather, canvas or cloth when handling pesticides. Wear trouser legs outside the boots to prevent pesticides from running down the leg and into the boot. Wash your boots after each use. Replace them after repeated chemical exposure and wear.

Goggles and Face Shields

Wear tight-fitting, non-fogging goggles or a full-face shield when there is any chance of getting pesticide in your eyes. This is especially important when pouring or mixing concentrates or handling dusts or toxic sprays. Those who wear contact lenses may want to consult an eye doctor or physician before using pesticides.



Goggles provide a secure shield around the entire eye area, protecting against hazards coming from many directions. Wear goggles with indirect ventilation when exposed to splash hazards. Face shields that are cupped inward toward your throat give better protection than straight face shields. Goggles and face shields should be kept clean at all times. Wash them with soap and water, and sanitize by soaking equipment for two minutes in a mixture of 2 tablespoons chlorine bleach in a gallon of water. Rinse thoroughly with a clean cloth and allow to air dry. Pay particular attention to the goggle headbands. They are often made of absorbent materials and require regular replacement.

Respirators

For many toxic chemicals, the respiratory (breathing) system is the quickest and most direct route of entry into the circulatory system. From the blood capillaries of the lungs, the toxic substances are rapidly transported throughout the body. Respiratory protective devices vary in design, use and protective capability. In selecting a respiratory protective device, first consider the degree of hazard associated with breathing the toxic substance, and then understand the specific uses and limitations of the available equipment.

Select a respirator that is designed for the intended use, and always follow the manufacturer's instructions on use and maintenance of your respirator for various chemicals or groups of chemicals. Select only equipment approved by the National Institute of Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA). The NIOSH approval numbers begin with the letters TC.

You can check the fit of a respirator by placing your hands over the cartridges, inhaling and holding your breath. The respirator should collapse and stay collapsed on your face. Also, check the information provided by the cartridge manufacturer to determine when the respirator cartridges will expire. Be aware that beards and other facial hair keep the respirator from sealing around your face and therefore make the respirator useless.

After each use of the respirator, remove all mechanical and chemical filters. Wash and sanitize the face piece using the same procedure recommended for goggles. Store the respirator face piece, cartridges, canisters and mechanical filters in a clean, dry place, preferably in a tightly sealed plastic bag. Do not store your respirator with pesticides or other chemicals.

The following table suggests additional considerations for pet groomers to consider when striving for improved working and breathing conditions.

Laundering Pesticide-contaminated Clothing

Wash all protective clothing and equipment at the end of each day of use. Store and wash pesticide-contaminated clothing separately from the family laundry. Remember to wear gloves during these handling and laundering steps and be sure to check the label for any specific instructions. Note: Discard clothing that has become saturated with a concentrate.



Some residues may be removed by hosing the contaminated clothing with water or presoaking it in an appropriate container. Washing in hot water removes more pesticide from the clothing than washing in cooler water. The hotter, the better. Cold water might save energy, but it is relatively ineffective in removing pesticides from clothing.

Six Steps to Breathing Easy in the Grooming Shop

1.	Identify possible lung irritants in your shop. For example: animal dander, animal antigens, animal hair, bacteria, chemicals and other synthetic products.
2.	Reduce the amount of lung irritants. For example: use a hair removal system, keep your shop clean, use proper ventilation when using chemicals, and adjust your shop size to recommended standards (150 sq. ft. per groomer).
3.	Obtain regular medical care. Explain to your physician your profession and the hazards you are exposed to when you work.
4.	Limit or eliminate smoking.
5.	Recognize signs and symptoms of lung disorders, including shortness of breath, wheezing, coughing, sneezing and chest tightness.
6.	Start prevention BEFORE symptoms appear.
Adapted from the National Dog Groomers Association	

Laundry detergents—whether phosphate, carbonate or heavy-duty liquids—are similarly effective in removing most pesticides from fabric. However, heavy-duty liquid detergents typically remove oil better and therefore are more effective than other detergents in removing emulsifiable concentrates. The ease of pesticide removal through laundering does not depend on toxicity but on the formulation of the pesticide. **Bleach or ammonia may possibly help remove or break down certain pesticides. Never mix bleach and ammonia because they react to form chlorine gas, which can be fatal for those who inhale it.**

Wash clothing at the highest water level. After washing, it is important to rinse the washing machine by running it through the complete cycle using hot water and the same detergent. Line-drying clothing is recommended for two reasons. First, it eliminates the possibility of residues collecting in the dryer; second, residues of many pesticides will break down when exposed to sunlight. Wash hands and arms after the laundering procedure. Keep protective clothing separate from the pesticide storage area. For more laundering information, see Extension bulletin E-2149, “10 Tips for Laundering Pesticide Soiled

Clothing.” Magnets that can be placed on the washing machine with these instructions are also available as Extension bulletin E-2413.

Personal Care After Application

After cleaning application equipment and protective clothing, personal cleanup is next. In particular, wash your hands and face thoroughly with soap and hot water before eating, drinking or smoking. Shower and change clothing as soon as possible. Be sure to scrub your scalp, neck, and under your nails.



Chapter 5 – Review Questions

Write the answers to the following questions and then check your answers with those in the back of this manual.

1. What is the difference between toxicity and hazard?
2. The scalp, ear canal and forehead are especially vulnerable to dermal exposure to pesticides. True or False? What could you wear to protect these areas?
3. Pesticide residues are absorbed through the skin at relatively the same rate on different parts of the body. True or false?
4. _____ are the most common victims of oral exposure.
5. Give an example of inhalation exposure and oral exposure.
6. Toxicity from small, repeated exposures to a pesticide over a period of time is called _____. Toxicity from one exposure is _____.
7. Which LD50 is representative of a highly toxic pesticide?
 - a. 640 mg/kg
 - b. 5,800 mg/kg
 - c. 12,840 mg/kg
 - d. 380 mg/kg
 - e. 46 mg/kg
8. The signal word on a pesticide label indicates the pesticide's:
 - a. effectiveness.
 - b. toxicity.
 - c. compatibility.
 - d. formulation.
 - e. ability to cause tumors.
9. Which signal word(s) would indicate the product is least toxic to an applicator?
 - a. DANGER
 - b. CAUTION
 - c. WARNING
 - d. DANGER-POISON
 - e. Skull and crossbones
10. Where can the applicator find out what he or she needs to know to apply pesticides safely?
11. Insecticides of most concern are the _____ and _____ which inhibit cholinesterase.
12. _____ is a chemical critical for normal functioning of the nervous system that may be inhibited by some insecticides.
13. Who should receive regular cholinesterase testing?
14. What pesticide-related document should you take with you when you take a pesticide poisoning victim to the doctor?

15. List the first aid measures you should do when someone has been dermally exposed to pesticides.
16. Never induce vomiting in a pesticide poisoning victim if:
- the victim is a child.
 - the victim is unconscious or is having convulsions.
 - the pesticide involved is corrosive.
 - all of the above.
 - b and c only.
17. List the first aid measures you should perform when someone has inhaled a pesticide.
18. To reduce the risk of human pesticide poisoning, the applicator should choose pesticides which have lower _____ and reduce _____.
19. A T-shirt, shorts and baseball hat provide adequate protection for someone applying pesticides. True or False?
20. Gloves and boots worn when handling most pesticides should be made of:
- canvas
 - leather
 - lined rubber
 - unlined rubber
 - none of the above
21. How frequently should protective clothing be laundered?
22. Pesticide-contaminated clothing should be washed separately from the family laundry in hot water with laundry detergent. True or False?