Lesson 6: Safe Use of Insecticides

Chemical control is a common part of insect management. It is important to know how to work safely with these materials. When using any type of pesticide, it is very important to **always** read and follow label directions exactly. Although the following information applies to any kind of pesticide, this lesson will be referring specifically to insecticides.

The Insecticide Label

The insecticide label contains important information. **Always read and follow the label directions exactly**. It is unlawful to use an insecticide in any manner or for any other purpose than those specified on its label. By reading the label, the individual will be able to determine the type of insecticide being used, the target insects, application techniques, the effects of the product on different plants and insects, the toxicity level, signal words, safety guidelines, disposal methods, and first aid procedures.

Insecticide Toxicity

Insecticide toxicity levels were established by the Federal Insecticide, Fungicide, and Rodenticide Act, also known as FIFRA. FIFRA regulates all stages of pesticide use, manufacture, registration, and transportation. The Missouri Pesticide Act meets these federal guidelines.

LD_{50}: Insecticide toxicity is measured by a standard test called the LD_{50} Test. The "LD" stands for "lethal dose" of a chemical. The lethal dose is determined as the amount of the chemical necessary to kill half (50%) of a test population, such as mice. The LD_{50} is expressed in milligrams per kilogram of body weight. The lower the LD_{50} number, the greater the chemical toxicity and the less it takes to kill. For example, an insecticide with an LD_{50} rating of 5 would be much more poisonous than an insecticide with an LD_{50} rating of 300. Table 6.1 shows the oral and dermal LD_{50} values of some common chemicals. For comparison purposes, the LD_{50} values of caffeine, aspirin, and table salt are given. This comparison does **not** imply that pesticides less toxic than these materials should be used unwisely.

Signal words: Signal words indicate how toxic the chemical is. They are located on the front panel of insecticide labels just below the statement "Keep Out of Reach of Children." There are three categories of signal words. Class I insecticides are labeled "Danger" or "Danger–Poison" with an accompanying drawing of a skull and crossbones. The letters are printed in red. Insecticides in this category are extremely toxic when taken into the body through the mouth, through the skin, and/or through breathing. In addition, these insecticides will cause severe eye and skin burning. Insecticides in Class I have an oral LD_{50} rating of 0–50. Some of the Class I insecticides are so highly poisonous that even a taste could kill an adult human.

Class II insecticides are labeled with the signal word "Warning." Insecticides in this category are moderately poisonous to humans and have an oral LD_{50} rating of 50–500. As little as a teaspoon taken by mouth of some of these pesticides could be deadly.

Class III insecticides have the signal word "Caution." These insecticides are slightly toxic to humans and have an oral LD_{50} rating of 500–5,000. As little as one ounce of certain of these chemicals taken internally could be fatal.

The insecticide label also contains warning statements such as "fatal if swallowed" or "may irritate eyes, nose, throat, or skin." These warning statements are meant to get your attention, not to indicate the only method of entry for the insecticide. Many insecticides could be harmful to the body if any contact at all is made. It is crucial to wear proper protective clothing whenever applying insecticides.

Pesticide Certification

Applicators may or may not need to be certified in order to handle a particular pesticide. Certification depends on the way the pesticide is used. Pesticides are classified as 100 percent general use, 100 percent restricted use, or a mixture of the two. This information will be clearly stated on the label of the container. A general use pesticide is defined as one not likely to harm people, wildlife, and/or the environment when used according to label instructions. Certification is not required in order to

Table 6.1 – LD_{50} Values of Chemicals

Chemicals	Oral LD_{50} (mg/kg)	Dermal LD_{50} (mg/kg)
Organochlorine Insecticides		
aldrin	39	98
chlordane	335	840
heptachlor	100	195
lindane	88	1,000
methoxychlor	5,000	>6,000
strobane	200	>5,000
Organophosphorus Insecticides		
abate	8,600	>4,000
carbophenothion	30	54
diazinon	108	900
dioxathion	43	235
malathion	1,375	>4,444
parathion	13	21
stirofos	>4,000	2,500
Carbamate Insecticides		
aldicarb	0.8	3
carbaryl	850	>4,000
carbofuran	8.7	>1,000
mesurol	130	450
zineb	>5,000	>2,500
Other Insecticides		
binapacryl	63	810
ethylene dibromid	146	300
napthalene	2,200	>2,500
permethrin	4,000	3,000
rotenone	60	>940
Other Chemicals		
Caffeine	174	—
Aspirin	750	—
Table salt	3,320	—

apply general use pesticides. Some examples of these pesticides are Malathion, Sevin, and Pyronone.

A restricted use pesticide can cause serious injury to people, wildlife, or the environment. These pesticides must be applied by someone who is well-trained, competent, and certified, or under the direct supervision of a certified pesticide applicator. Certification is required for handling restricted use pesticides. Some examples of these pesticides are Lannate, Nicotine, and Thiodan.

Pesticide certification is given to people who take a special training course set up by the State of Missouri Department of Agriculture. After completing the instructional process, applicants must then pass a test in the safe handling and use of pesticides. Finally, a license is issued

to each person who successfully completes the pesticide training session.

There are two types of licenses for certified pesticide applicators: private applicator and commercial applicator. Private applicators administer restricted use pesticides onto their own land, onto land they rent, or onto the property of another person with whom they trade services. A certified private pesticide applicator's license is valid for 5 years and then must be renewed.

Commercial applicators are hired to apply restricted use pesticides on the property of others. Commercial applicators are trained and tested like private applicators, but receive additional instruction to specialize in various areas. A certified commercial pesticide applicator's license is valid for 3 years and then must be renewed.

Safety Guidelines for Using Insecticides

Since insecticides may be absorbed through the skin, eyes, and ears, inhaled and/or swallowed, insecticides must be handled very carefully. First and foremost, always read and follow insecticide label directions **exactly**. Label directions will not only indicate the application procedures, but the pre-harvest interval and safe re-entry time as well. The pre-harvest interval is the time required between applying the insecticide and the date when the crop can be safely harvested for human consumption. Safe re-entry refers to the time needed between the time an insecticide is applied to an area and the time you need to wait before the area can safely be entered again. Before applying an insecticide, all people, pets, and foodstuffs need to be removed from the area. Never smoke, eat, or drink when applying insecticides.

Protective clothing should always be worn and protective equipment always used to prevent exposure to external irritant insecticides. The following are standard safety clothing and procedures:

◊ Wear clean long trousers and a long-sleeved shirt, or coveralls made of closely woven cloth.

◊ Wear unlined rubber gloves and rubber boots made of neoprene.

◊ Wear shirt sleeves outside of the gloves and wear pant legs outside of the boots to prevent insecticides from entering.

◊ Wear close-fitting eye goggles or a face shield.

◊ Wear a wide-brimmed waterproof hat, one that is easy to clean or is disposable.

◊ Wear a respiratory device that prevents internal poisoning whenever applying an insecticide.

◊ Clean clothing and equipment as directed by the insecticide label or by the poison control center recommendations.

Respiratory devices: Insecticides give off fumes and some quickly become gases. This poses a great threat of injury or death by inhalation to insecticide applicators. Respiratory devices cover the mouth and nose and filter the air of harmful substances. Although they are recommended whenever using insecticides, they are especially important when working in confined or closed areas. Be sure that every respirator carries a seal of approval for insecticide use from the National Institute for Occupational Safety and Health (NIOSH) as well as from the Mine Safety and Health Administration (MSHA). Carefully read the accompanying instructions for the use and care of each respirator. There are several different types available depending on the spraying conditions.

◊ Cartridge respirator – used for occasional exposure to most insecticides.

◊ Gas mask or canister respirator – used when the applicator is exposed to an insecticide for a relatively long period of time or is exposed to high concentrations of insecticides for a short period of time, and working in a confined or closed area.

◊ Self-contained breathing apparatus – used if the oxygen supply is low or the insecticide vapor concentration is high.

Precautions should always be taken to avoid insecticide drift. Insecticide drift occurs when the insecticide tends

to drift away from the target area. This can be avoided by always following the label directions, using the proper equipment for the job, and not spraying when it is windy.

After applying insecticides, remove clothing and take a shower with plenty of soapy water; shampoo and rinse the hair well. Wash insecticide exposed clothing separately from other clothing. If disposable clothing is worn, dispose of it properly.

If insecticides are applied on a regular basis, a health watch program should be established with a physician. Inform the doctor about the type of insecticides being used. Then the doctor can review the chemical formulations, poisoning symptoms, and treatments. In addition, the physician can stock a supply of the necessary drugs needed for treatment. Being prepared in case insecticide poisoning occurs is important because there are no drugs to prevent it.

Applicators who work regularly with carbamate or organophosphate insecticides should set up a cholinesterase testing program with their physicians. Cholinesterase is a biological enzyme that is part of the body's nervous system. Carbamate and organophosphate insecticides can cause serious health hazards by interfering with the availability of cholinesterase in the body. Therefore, the doctor should perform a cholinesterase test in January to establish a "base line level" for each applicator. Then periodic retests must be taken to check cholinesterase levels.

If the applicator's cholinesterase level falls too low, then the doctor will limit or stop the patient's contact with these two types of insecticides.

Disposal of Insecticides and Containers

Always try to mix the correct amount of insecticide solution for each application to avoid the need to dispose of any extra chemical. Any extra insecticide solution must be disposed of safely to avoid harming people, animals, or the environment. The U.S. Department of Agriculture and the U.S. Environmental Protection Agency have set up specific guidelines for insecticide disposal. The State of Missouri Department of Natural Resources can help with questions and problems concerning the safe disposal of insecticides and insecticide containers. The address and phone numbers are as follows:

Missouri Department of Natural Resources
Division of Environmental Quality
PO Box 176
Jefferson City, MO 65102
Business phone: (573) 526-3315
Emergency response phone: (573) 634-2436

Carefully read and follow the instructions for precautions and/or disposal methods on the insecticide container label. **Never** flush insecticides down the drain or into sewers. If there are additional areas having the same insect problem, apply the extra insecticide on those areas as well. If this is not possible, then take the excess insecticide and/or insecticide containers to a landfill that has a permit for toxic waste disposal. This should also be done for outdated or unwanted insecticides. Keep in mind that many solid waste landfills do not have this special permit and, therefore, are not legally able to handle insecticides. Federal regulations require that organic insecticides be disposed of by burial or by burning.

Do not leave insecticides or insecticide containers at the place where the chemicals were applied. Never reuse insecticide containers. Keep all insecticide containers out of the reach of children. Any insecticides leftover should be kept in tightly closed containers in a storage facility.

Symptoms of Insecticide Poisoning

Since different insecticides affect people differently, there are no standard symptoms of insecticide poisoning. Symptoms will vary depending on the type of insecticide, amount and length of exposure, the time interval between exposures, and the general health of the victim.

Insecticide poisoning may be divided into external irritants, internal poisons, or a combination of both. External irritant insecticides may cause swelling, stinging, redness, blisters, and/or rash when splashed on the skin or external body tissues, such as eyes, ears, and mouth. Insecticides causing internal poisoning are dangerous when swallowed, inhaled, or absorbed through the skin.

These may cause such symptoms as headache, nausea, vomiting, and diarrhea. Some insecticides can cause both external irritation and internal poisoning at the same time.

Insecticide poisoning symptoms may be similar to symptoms of other illnesses, such as the flu. However, flu medicine should not be used to relieve these symptoms as they may make insecticide poisoning much worse. Therefore, it is important to talk with a doctor who can diagnose the difference and prescribe proper treatment.

First Aid Procedures for Insecticide Poisoning

When you think an insecticide poisoning has occurred, **always act immediately**. The amount of time between the insecticide poisoning and getting to the doctor may make the difference between life and death for the poisoning victim. It is extremely important to stay calm and take quick action. Follow these steps:

1. Protect yourself from contamination. Wear protective clothing and/or equipment. You won't be able to assist anyone else if you are not protected yourself.

2. Without endangering yourself, remove the victim from the contaminated area.

3. Remove contaminated clothing from the victim.

4. Flood the affected area with a generous amount of water.

5. Contact the Poison Control Center or a doctor and administer first aid procedures as indicated. Keep the insecticide label handy for reference.

First Aid Kit

First aid supplies should always be near any place where insecticides are handled. The container used for the first aid supplies should keep the supplies clean and be easily accessible

A first aid kit should contain items such as the following:

◊ Adhesive tape
◊ Assorted adhesive and gauze bandages
◊ Blanket – enclosed in plastic to keep clean and dry
◊ Merthiolate
◊ Syrup of ipecac
◊ Teaspoon
◊ Two quarters – taped to the inside cover of the first aid kit for phone calls

Poison Control Center

The local Poison Control Center number should be located by the phone for easy access. In Missouri, the Poison Control Center is staffed 24 hours a day by medical professionals. These professionals will ask questions about the victim and about the insecticide. It is important to have the insecticide label or container close by when contacting the center.

The statewide center may refer calls to a local hospital specifically equipped to treat poisoning emergencies. Information about Missouri's statewide center and its toll-free number are given below.

Missouri Regional Poison Control Center
Cardinal Glennon Memorial Hospital
1465 South Grand Avenue
St. Louis, MO 63104
Telephone: 1-800-222-1222

Summary

To avoid toxic chemical injury to humans, animals, and/or the environment, it is crucial to read and follow all label directions for the insecticide being applied. Depending on the insecticides to be applied, the applicator may be required to have a certified pesticide applicator's license.

Appropriate clothing and protective equipment should always be worn when applying insecticides. Insecticides should always be handled with care and disposed of properly.

Credits

Guidelines for Insecticide Use. Lexington: University of Kentucky, Department of Entomology, 1989.

Guidelines for the Control of Insect and Mite Pests of Foods, Fibers, Feeds, Ornamentals, Livestock, and Households. Washington, DC: United States Department of Agriculture, U.S. Government Printing Office, 1982.

Insect Control Recommendations. Columbia: University of Missouri Extension, 1990.

Pest Management Strategies in Crop Protection. Washington, DC: Congress of the United States, Office of Technology Assessment.