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CANADA

Environment,
Energy and Forestry

# *Prince Edward Island Commercial Pesticide Vendor Safety Training Manual*


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**Notice**

This manual is provided for information only. Users of this manual rely on the contents of this manual at their own risk. This manual is not intended to be a representation of the current law on the subject of pesticide use. Users of this manual should always check with the appropriate authorities in their area to ensure Users are conducting their activities in a proper manner and in accordance with the laws of their jurisdiction. The Government of Prince Edward Island, as represented by the Department of Environment, Energy and Forestry, is in no way responsible for the activities of Users of this manual.



The use of any pest control product is not endorsed, recommended, or criticized by its being mentioned in this publication.

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# Introduction to Pesticides 1

## Introduction

As a vendor, it is important that you understand how pests affect our daily lives. They can damage crops and forests, causing economic loss. They can invade our homes and buildings, and impact human health. The use of chemical pesticides is a common strategy for dealing with many pests.

When used correctly, pesticides can aid in the production of cost-effective food crops and help prevent the spread of pests. They can be used to sanitize areas and help control diseases that can be transmitted to humans or animals (e.g., West Nile). Other pesticides can aid in the protection and maintenance of parks, forests, and rights-of-way. However, when handled or used incorrectly, pesticides can harm people, wildlife, and livestock. They can enter streams and rivers and contaminate drinking water supplies. They can also contamination soil, food, and feed.

As a vendor, you can help to protect your safety as well as the safety of employees, customers, and the environment if you know how to:

- Legally and safely sell, handle, and store pesticides
- Interpret information on the pesticide label
- Interpret federal and provincial legislation

This chapter introduces you to general terminology and information on pesticides.

## Learning Objectives

Completing this chapter will help you to:

- Identify the importance of safe pesticide use
- Apply safety guidelines for selecting and handling pesticides
- Use proper pesticide terms
- Identify pesticides and their uses
- Understand pesticide groupings
- Identify good sources of information on pesticides
- Understand compatibility and tank mixing

## Pest

**A pest** is any living organism that causes undesirable effects. Some plants or animals can be desirable in one location, but become a pest in another. Pests include injurious, noxious, or troublesome organisms in the following groups:

- Fungi
- Weeds
- Insects
- Mites
- Rodents
- Slugs and snails
- Birds
- Some forms of wildlife (e.g., racoons, coyotes, deer)

## Pesticide

**A pesticide** is any device, organism, or substance that is intended to prevent, destroy, control, repel, or manage a pest. Pesticides also include plant growth regulators, plant defoliants, and plant desiccants. Chemical pesticides are usually a mixture of one or more active ingredients (the chemicals that control the target pests) and several additives.

## Active Ingredient

The **active ingredient (a.i.)** is that part of the pesticide formulation that produces the desired or toxic effect against the pest. A pesticide can contain more than one active ingredient. The same active ingredient(s) can be found in different pesticides.

## Additives

**Additives** are the ingredients included in a mixture to make the product safer, more effective, more convenient to handle, or easier to apply.

## Carriers

**Carriers** are materials mixed with an active ingredient to make the product safer to handle, easier to apply, or better suited for storage. Materials used as carriers can include water, oil, solvents, or clay.

## Adjuvants

**Adjuvants** are added to pesticides in order to increase their effectiveness. They can help the pesticide spread more evenly to cover leaves, or better penetrate the outer layer of a plant or insect. Adjuvants can also help an insecticide stick to a plant in such a way that it may be contacted by an insect.

Adjuvants can be included in the formulation by the manufacturer or added to the spray tank by the applicator.

**Customers should never add an adjuvant unless the product label specifically advises them to do so.**

| Adjuvants | Function |
|---|---|
| Surfactants | improve the spreading, dispersing, and wetting properties of a pesticide. |
| Wetting agents | cause solutions or suspensions to make better contact with treated surfaces. |
| Spreaders | assist in the even distribution of a pesticide over the target. |
| Stickers | help the pesticide to stay on the plants or other surface. |
| Thickeners | reduce pesticide drift to other areas by increasing droplet size. |
| Anti-foaming agents | reduce foaming or spray mixtures that require vigorous agitation. |
| Buffers | slow chemical breakdown of some pesticides by lowering the pH of alkaline water. |
| Drift reducers | reduce pesticide drift |

Pesticide vendors must be able to:

- Interpret information on a pesticide label to assist customers and ensure proper product handling at the vendor site
- Legally and safely transport, store, display, handle, and sell pesticides to protect:
  - Themselves and other employees from hazards
  - The environment from contamination
  - The public from exposure

## Pesticide Terminology

As a vendor you should understand that pesticides can be identified by:

- Product name
- Common name
- Chemical name

Understanding these terms can reduce confusion when providing information on a pesticide.

## Product Name

The product name is the registered trade name or trademark chosen by the manufacturer. It is clearly displayed on the principal panel of the label, with the first, or all letters capitalized (e.g., Roundup, KILLEX). The product name often appears in large letters.

## Common Name

**Common name** refers to the name of the active ingredient(s) in a pesticide. It appears on a pesticide label in lower-case letters, usually next to the word "Guarantee." As a vendor you should read the label carefully, as the same active ingredient can be found in a number of pesticide products (e.g., 2,4-D).

## Chemical Name

**Chemical name** refers to the name of the chemical structure of the active ingredient(s) in a pesticide. It does not usually appear on a pesticide label, but does appear in the Material Safety Data Sheet for the pesticide.

Examples of pesticide products listed by their product, common, and chemical names are as follows:

| **ProductName** | **Common Name** | **Chemical Name of the Active Ingredient** |
|---|---|---|
| KILLEX LAWN WEED CONTROL | 2,4-D<br>mecoprop<br>dicamba | (2,4-dichlorophenoxy) acetic acid<br>2-(4-chloro-o-tolyoxy) propionic acid<br>3,6-dichloro-o-anisic acid |
| ROUNDUP | glyphosate | (phosphonomethyl) (glycine) |
| COOP LIQUID SEVIN | carbaryl | 1-napthyl methylcarbamate |
| RAID WASP AND HORNET KILLER | propoxur | 2-isopropoxyphenyl methylcarbamate |
| ROZOL RAT & MOUSE KILLER | chlorophacinone | 2-[2-(4-chlorophenyl)-2-phenylacetyl]indane-1,3-dione |

## Classifying Pesticides

Pesticides can be classified in a number of different ways. Most commonly, they are classified according to:

- Their target (the pests they control)
- Their mode of action (the way they control the pest)
- Their chemical structure

## Target Pest

Pesticides are often grouped according to the pest they control. Examples of selected pesticide groups classified by target pests are as follows:

| Pesticide | Target | Example |
|---|---|---|
| fungicide | fungi | Captan |
| herbicide | weeds | 2,4-D |
| insecticides | insects | Sevin |
| miticide | mites | Omite |
| rodenticides | rodent (rats, mice) | Warfarin |

## Mode of Action

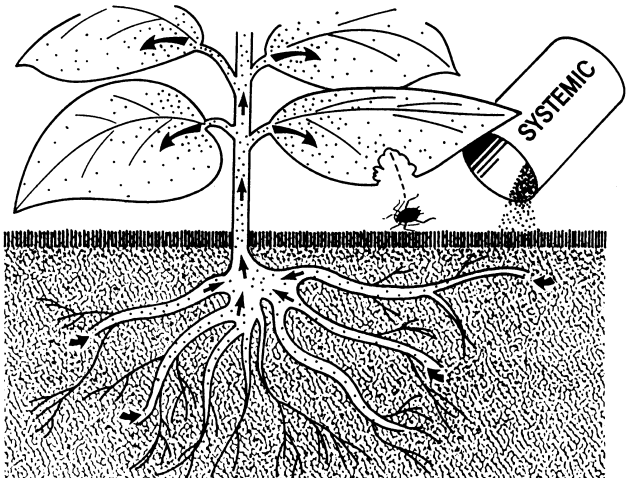
Pesticides can also be classified according to their mode of action—the way they enter or affect the target pest. Many pesticides can have more than one mode of action.

### Contact Pesticides

**Contact pesticides** control their targets by direct contact. For example, weeds are killed when enough of their surface area has been covered with a contact herbicide. Insects can be killed when sprayed directly, or when they crawl across surfaces previously sprayed with contact insecticides.

## Systemic Pesticides

**Systemic pesticides** control their targets by being absorbed into and moving within the pest being treated. Translocation is the process whereby a systemic herbicide moves throughout a treated plant. For example, target weeds that receive only a partial spray coverage will be killed by a systemic herbicide as it moves within the plant to untreated areas of leaves, stems, or roots. Target insects can be killed as they feed on the juices that carry systemic insecticides throughout a plant.




Some systemic insecticides are transported through treated animals. A systemic insecticide applied to the skin of an animal (e.g., beef cattle, dogs) will control internal parasites and pests throughout the animal's body.

**List of additional modes of action**

| *Group* | *Mode of Action* |
|---|---|
| Attractants | Pesticides that have a particular odour or scent that attracts insects to a trap for identification or control. |
| Eradicants | Fungicides that can kill a pest once the pest has infected a plant, but before the pest becomes well established. Eradicants provide better pest control than protectants, because they have an element of post-infection control. |
| Fumigants | Pesticides that work in the gaseous form and control pests when the pests breathe in gases, or the gases are absorbed into their bodies through another manner. |
| Growth regulators | Pesticides that, once taken in by the pest, act like a pest's own hormones, disrupting normal development and cause it to die before it can become fully developed. |
| Protectants | Fungicides that prevent disease infection by creating a barrier between the pest and the plant, thereby preventing the disease from becoming established. |
| Repellents | Pesticides that produce an odour, repelling the pest from the treated area or plants. |
| Stomach ingestion | Pesticides that poison the pest when eaten. |

## Chemical Structure

A third way of classifying pesticides is by their chemical structure. Pesticides in the same chemical class or family have similar chemical structures and, usually, a similar mode of action.

| Chemical Class | Example |
|---|---|
| organophosphates | acephate |
| carbamates | carbaryl |
| triazines | atrazine |
| phenoxys | 2,4-D |

## Pesticide Formulations

Pesticides are manufactured as formulations, which in turn can be in liquid, solid, or gaseous forms. A formulation is a mixture of active ingredient(s) and inert ingredients.

> **The active ingredient is the chemical part of the formulation that produces the desired effect on the pest**

Inert ingredients can include carriers, or adjuvants, that are mixed with the active ingredient. They are added to make a pesticide suitable for storage or handling, or to improve its effectiveness for controlling a pest.

## Types

There are three main types of pesticide formulations: liquids, solids, and gases. Many pesticides are available in different forms or types of formulations. The specific formulation of many pesticides is indicted by an abbreviation that appears on the product label.

| | |
|---|---|
| **D or DU** | Dust |
| **DF** | Dry Flowable |
| **DV** | Device |
| **EC** | Emulsifiable Concentrate |
| **F** | Flowable |
| **G or GR** | Granular |
| **L or LI** | Liquid |
| **LO** | Live Organism |
| **MS** | Microencapsulated |
| **P or PE** | Pellet |
| **PA** | Paste |
| **PF** | Pressurized |
| **PT** | Particulate |
| **S** | Solution |
| **SC** | Soluble Concentrate |
| **SG** | Soluble Granule |
| **SN or S** | Active Solution |
| **SP** | Soluble Powder |
| **SU** | Suspension |
| **TA** | Tablet |

| | |
|---|---|
| **WD** | Water Dispersible Granule |
| **WG** | Wettable Granules |
| **WP** | Wettable Powder |
| **WS** | Water Soluble Concentrate |

## Summary of Formulation Types

| Name | Description | Advantages | Disadvantages | Typical Use |
|---|---|---|---|---|
| **Solids** | | | | |
| **Dry Flowable Pesticides** | A wettable powder which is formulated into small pellets or granules. | Much less dusty than WP formulations and easier to handle | Requires agitation in spray tank | General use |
| **Dust or Powder** | A finely ground dry material of a low active ingredient concentration plus inert ingredients such as talc. No dilution needed before use. | Ready to use | Dusty. Drifts. Can easily be seen on surface | Spot treatment Animal powder |
| **Ear Tag/ Vapour Strips** | **Slow-release generator** - solid base material and a volatile liquid or solid toxicant(s). Slowly emits as a vapour, or releases on contact with skin (ear tag). | Ready to use | | Animal ear tags Fly control |
| **Granular** | A mix of dry, large free-flowing particles usually with a low concentration of active ingredient. | No mixing required. Ready to use. Drift minimal | Some dust. Requires special application equipment | Soil treatment for insect or vegetation control |
| **Particulate or Bait** | Mixture of large particles not recognized as a pellet or granular formulation. Mixed with edible material. | Easy to spot treat | Pets and children may eat it | Bait for insects or rodents |
| **Pellet** | Preformed mixture of active ingredient and inerts to form small solid pieces. | As above | As above | Baits to control rodents, slugs |
| **Seed Treatment** | A finely ground dry material containing a coloured dye | Added colour makes it easy to tell treated seed from untreated. | Care must be taken with dye | Seed treatment |

## Summary of Formulation Types (continued)

| Name | Description | Advantages | Disadvantages | Typical Use |
|---|---|---|---|---|
| **Tablet** | A preformed "tablet" composed of inerts and active ingredient | Easy to measure and use | Accessible to pets and children | Fumigant |
| **Wettable Powder (W.P.)** | Active ingredient plus a powder. Contains a wetting and dispersing agent. Forms a suspension in water. | Containers empty easily. No liquid spills | Dusty. Requires agitation to remain in suspension | General use |
| **Liquids** | | | | |
| **Aerosol** | A liquid with one or more solvents. Ready to use in pressurized containers | No mixing required. Low concentration of active ingredient | Pressurized containers are hazardous if punctured or heated | Flying insect control |
| **Emulsifiable Concentrate (EC)** | A clear solution with emulsifiers to be diluted in water. Final spray solution has a milky look | A high concentration of active ingredient in each container. Buy less bulk | Possibly flammable | General use |
| **Gel** | High assay semi liquid, emulsifiable concentrate | Used with Water Soluble Packaging | Cannot measure "undividable" amounts | Agriculture uses |
| **Micro-encapsulated Suspension** | A suspension with active ingredient in micro-capsules giving a slow release of active ingredient | See comments on EC's. Increases' the residue of active ingredient Reduces hazard to operator. | May be expensive | Insecticides |
| **Suspension or Flowable** | A cloudy liquid composed of solid particles of active ingredient (finely ground) in a liquid. Must be diluted | See comments on EC's. | Active ingredient may settle out of formulation. | General use |
| **True Liquid/Solution** | Active ingredient is in solution, usually water, and when mixed with water remains clear. | See comments on EC's. Requires little agitation when added to water in spray tank | Possibly corrosive | General use |
| **Gases** | | | | |
| **Fumigants** | Volatile liquids or solids packaged for release as a gas | Toxic to many forms of the pest at one time. Penetrates cracks and crevices | Area to be fumigated must be well sealed. Highly toxic. | Greenhouses. Mushroom houses. Other structures. Bulk containers. |

*Source: Grower Pesticide Safety Course Manual 1998, Ontario Ministry of the Environment*

## Liquid Formulations

Liquid formulations are listed as:

- Emulsifiable concentrates
- Flowables
- Microencapsulated suspensions
- Solutions
- Aerosols
- Ready-to-use pesticides

**Emulsifiable concentrates** are liquids that contain the active ingredient(s), solvents, and emulsifiers. They form milky spray mixtures when added to water. These formulations are suitable for low-pressure garden sprayers and are used for pest control on fruit, vegetables, and lawn plants. As a vendor, you should advise your customers that an emulsifiable concentrate formulation can:

- Harm plants when applied in high temperature
- Easily be absorbed through the skin. Customers need to wear gloves and long sleeved shirts when handling and applying these pesticides
- Drift when applied in high winds

**Flowables** are liquids. They consist of the active ingredient, in a solid form, suspended in a liquid. They must be diluted.

**Microencapsulated suspensions** are small capsules suspended in a liquid. The active ingredient is slowly released from the capsules.

**Solutions** are clear liquids composed of an active ingredient(s) dissolved in a solvent.

**Aerosols** are solutions packaged in a pressurized container. When the nozzle is depressed, the pesticide exits the container. Aerosols are usually sold in small size containers and are useful for treating only small areas. As a vendor, you should advise your customers that aerosols:

- Can be dangerous if overheated. Containers should never be burned, as they can explode
- Can be attractive to children and must be stored in a locked compartment
- Are always ready to use
- Are easy to store
- Have a long shelf-life

**Ready-to-use** liquids require no pre-mixing. This makes them safe and easy to handle by your customer. A number of domestic class pesticides come in this form. Household formulations generally have no unpleasant odours. Customers must take care when aiming the spray. As a vendor, you should advise your customers that ready-to-use sprays:

- Evaporate quickly
- Can be very useful for small and infrequent treatments
- Reduce the need for a customer to store concentrated pesticides
- Can be useful for the control of flying and crawling insects

## Solid Formulations

Solid formulations include:

- Dusts
- Baits
- Granular formulations
- Pellets
- Soluble granules
- Tablets
- Wettable and soluble powders

**Dusts** are dry material made up of an active ingredient(s) and an inert material. The inert material is talc, clay, or fine volcanic ash. Dusts are ready-to-use and can be applied with simple equipment. They provide customers with the ability to do spot treatments. Care must be taken when using them out doors as they can travel a long distance when applied in high winds. Dusts can be used to control:

- Lice, fleas, and other external parasites on pets and domestic animals
- Carpenter ants between walls
- Leaf-eating insects in the garden

**Baits** are an active ingredient mixed with an edible substance to attract the pest. There are liquid baits and solid baits. When the pest eats the bait it also consumes the pesticide. Baits are commonly used for the control of cockroaches, ants, and rodents. As a vendor, you should advise your customers that baits:

- Need to be handled with care
- Must be placed in specially designed bait stations
- Must be kept away from children, pets, wildlife, and domestic animals
- Can control pests that range over a large area

**Granular formulations** are a dry mixture of large, free-flowing particles. They usually contain a low concentration of an active ingredient. Some have systemic action, so these must
be absorbed by the roots. As a vendor, you should advise your customers that granular formulations:

- Are ready-to-use and can be applied with simple application equipment, such as a fertilizer spreader
- Are often used to control pests living on the surface or in the soil
- Need to be applied evenly
- Can pose a hazard to birds, if they remain too long on the surface

**Pellets** are a mixture of active ingredient and inert materials, formed into spheres or cylinders.

**Soluble granules** are similar to granules, but can be dissolved in a liquid.

**Tablets** are either an active ingredient alone, or an active ingredient and inert ingredients. They are formed into small blocks or spheres.

**Wettable powders and soluble powders** are dry materials containing a relatively high concentration of active ingredient, inert dust, and a wetting agent. They do not dissolve, but form a suspension when mixed with water. You should advise your customers that these powders:

- Are easy to store, transport, and handle
- Are generally safer to use on new growth or tender foliage than other formulations
- Are not rapidly absorbed through the skin
- Can be hazardous to health if concentrated dust is inhaled
- Can drift if applied in high winds
- Are used to control insects or fungi on fruit, garden, and lawn plants

## Gas Formulations

**Fumigants** can be available in a gas, liquid, or solid form. Carbon dioxide and ethylene oxide are compressed gases used as fumigants. Liquid fumigants become gases when applied. Solid fumigants are sold in dust, pellet, or tablet form. The gas is released on contact with the moisture in the air.

## Special Formulations

Special formulations are designed to meet certain needs. These include:

**Soluble packages** are pre-weighed amounts of a wettable or soluble powder in a package that dissolves on contact with water. Risk for the handler is reduced, since there is no need to measure or handle the pesticide.

**Impregnated wax products** are shaped as bars or pucks. The wax is impregnated with a herbicide. They are dragged or rubbed over the lawn to control broadleaf weeds. As a vendor, you should inform your customers that these products:

- Require no mixing
- Cannot drift
- Offer the ability to spot treat individual weed problem areas

## Compatibility

Compatible pesticides are essentially two or more products that can be mixed together to control a wider range of pests with a single application. Not all pesticides are compatible.

Pesticides that are not compatible can cause:

- loss of effectiveness;
- injury to treated plants or animals; and
- lumping or settling out of solids, thereby creating a mixture that can no longer be applied by the application equipment.

Some product labels will state that the pesticide is "compatible" with other pesticides. While pesticides should certainly never be mixed unless their compatibility is stated on the label, such statements are only indicators of physical compatibility. They do not guarantee that mixing will not affect the safety, efficacy, or residues of the pesticides that are mixed.

## Tank Mixes

Some combinations of pesticides are registered as "tank mixes", with clear mixing instructions on the labels and supporting data on physical compatibility, efficacy, safety, and residues.

> As a vendor you should advise customers to only use registered tank mixes.

## Sources of Information

There are a number of sources of information on the safe and effective use of pesticides. The label attached to each container is a legal document. It is also the best source of information for that pesticide. Pesticide vendors and applicators must be familiar with the label information. This information is the result of studies carried out by the manufacturer, and is reviewed and approved by Health Canada during the registration process. Failure to follow directions on the label is a violation of Canada's *Pest Control Products Act* (PCP Act) and regulations and the Prince Edward Island *Pesticides Control Act* and regulations.

Additional information on pesticides can be obtained from:

- Material Safety Data Sheets (MSDSs)
- Pesticide manufacturers
- Federal and provincial publications
- Federal and provincial pesticide legislation
- Trade associations
- Other qualified experts

**Information on proper handling, storage, and use of pesticides can be accessed at the following internet sites:**

**Pest Management Regulatory Agency (PMRA)** e-mail questions to:
PMRA_INFOSERV@hc-sc.gc.ca

PMRA Website:http://www.pmra-arla.gc.ca/english/index-e.html

**Croplife Canada Website**:
www.croplife.ca

**Provincial Website:**
www.gov.pe.ca/go/pesticides

# Pesticide Legislation 2

## Introduction

Pesticides are regulated by federal, provincial, and in some cases municipal governments to protect the vendor, the applicator, the public, and the environment. Federal laws deal mainly with the manufacture and registration of products for use in Canada. They also address the labelling of pesticides, and the import and export of products. Provincial legislation complements the federal legislation and regulates the life of a product once it enters a province. Provincial regulations address the transportation, storage, display, sale, handling, application, and disposal of pesticides. Provincial legislation is generally more restrictive in these areas than is the federal legislation. This type of management is sometimes referred to as "cradle to grave management." Federal and provincial legislation are based on current scientific knowledge.

## Learning Objectives

Completing this chapter will help you to:

- Interpret and apply federal pesticide law
- Interpret and apply provincial pesticide law
- Interpret and apply municipal pesticide law
- Access current laws

## Federal Legislation

### *Pest Control Products Act*

The major federal legislation regulating pesticides in Canada is the ***Pest Control Products (PCP) Act*** **and Regulations**. Responsibility for administering this legislation rests with the Pest Management Regulatory Agency (PMRA) of Health Canada. The regulations address human health, protection of

the environment, and pesticide performance or effectiveness in controlling a pest.

The main purposes of the ***PCP Act* and Regulations** are to ensure that:

- no person manufactures, stores, displays, distributes, or uses any pest control product under unsafe conditions;
- no person packages, labels, or advertises any pest control product in a manner that is false, misleading, or deceptive, or is likely to create a false impression about the pest control product; and
- no person sells in, or imports into, Canada a pest control product unless it is registered.

## Product Registration

Before a pesticide can be sold for use in Canada it must first be registered under the *PCP Act*. Prior to this registration, staff within the Pest Management Regulatory Agency are responsible for evaluating scientific data submitted by the manufacturer. This data includes:

- efficacy (effectiveness) under Canadian conditions;
- toxicology;
- food and feed residues;
- environmental chemistry and fate;
- environmental toxicology; and
- chemistry of the product.

Only after an extensive review based on the safety, efficacy, and merits of the product is a registration decision made. Once a pesticide is registered it is given a unique, product-specific Pest Control Product "registration" number (PCP number). This registration provides the manufacturer with the right to sell or manufacture the product in Canada.

The PMRA has established a Pest Management Information Service to provide information on the registration process, product labels, safety precautions, and alternative pest management practices. This service can be accessed by calling1-800-267-6315, by contacting the PMRA website at ***http://www.hc-sc.gc.ca/pmra-arla/english/index-e.html***, or by e-mail at ***pminfoserv@pmra.hwc.ca***

## Class Designation of Pesticides in Canada

Under the *PCP Act*, registered pesticides are assigned to a domestic, commercial, restricted, or manufacturing class, depending on their toxicity and intended use. The class designation of a pesticide appears on the label (*see* Chapter 3: Labelling).

## Domestic Class

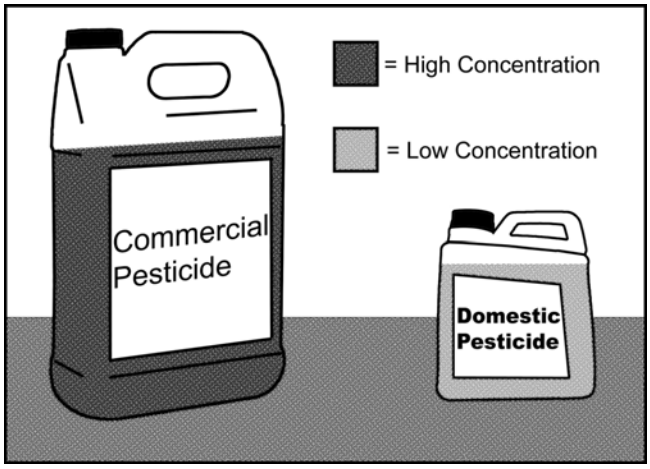
**Domestic class** pesticides are designed for use in or around the home. When label directions are followed, they can be safely handled with minimal personal protective equipment and without applicator training. Domestic pesticides are available in small packages, have a low toxicity, and pose minimal risk to users or to the environment. They are often sold in a ready-to-use form and are intended to be used as a single application or in a single season. Domestic pesticides have an acute oral $LD_{50}$ of more than 500 mg/kg and an acute dermal $LD_{50}$ of more than 1000 mg/kg.

## Commercial Class

**Commercial class** pesticides are designed for use in agriculture, forestry, industry, and other commercial operations.

**The terms Agricultural or Industrial, which often appear on a label, are substitutes for the term Commercial**.

While the active ingredients can be the same as those present in a domestic class pesticide, due to the size of the container or concentration of active ingredient, a commercial class pesticide typically poses a greater risk to the environment. Some products are classified as commercial because they are too toxic, persistent, or hazardous to be used by the general population. Applicators of commercial class pesticides require training on safe handling and application procedures, and on the use of personal protective equipment. Commercial class pesticides have an acute oral $LD_{50}$ of more than 50 mg/kg and an acute dermal $LD_{50}$ of more than 100mg/kg.




Pesticide concentration differs according to Classification

## Restricted Class

**Restricted class** pesticides are essentially commercial type pesticides that have additional restrictions on their label. Restrictions can be due to toxicity, application methods, or because they pose a particular concern to the environment. Limitations can involve product display, storage, distribution, or application, or stipulate the necessary qualifications of end users. Restricted class pesticides have an acute oral $LD_{50}$ of less than 50 mg/kg and an acute dermal $LD_{50}$ of less than 100mg/kg.

## Manufacturing Class

**Manufacturing class** pesticides are used in manufacturing, formulating, or repackaging and are not for use by general applicators.

## Other Federal Legislation

Other federal legislation regulates different aspects of pesticide use. This includes pesticide residues in foods, damage to migratory birds, fertilizer additives, and damage to fish or fish habitat.

### *Food and Drugs Act*

The *Food and Drugs Act*, administrated by Health Canada, is designed to protect the health of consumers by prohibiting the sale of food that contains any harmful or poisonous substance. Where food residues are concerned, safety to consumers must be proven by Health Canada prior to product registration under the *PCP Act*. Excessive pesticide residues on food can be prevented by following label rates, days-to-harvest intervals, number of applications per crop/season, and other label recommendations.

### *Migratory Birds Convention Act*

The *Migratory Birds Convention Act*, administered by Environment Canada, protects waterfowl and other migratory birds. It is an offence under this legislation to release pesticides or other substances that are harmful to migratory birds into any waters or any area frequented by migratory birds. If migratory birds are harmed, an applicator can be prosecuted under this legislation. If other animals are harmed, an applicator can be prosecuted under similar provincial legislation.

## *Fertilizers Act*

The *Fertilizers Act*, administered by Agriculture and Agri-Food Canada, regulates all fertilizers used in Canada, including those that contain pesticides. Before a fertilizer/pesticide mixture can be sold or used in Canada it must be registered under the *Fertilizers Act*. This legislation regulates the import and sale of fertilizer and supplement products by establishing standards, packaging, and labelling requirements. It also provides the authority to inspect and sample products for legal compliance.

## *Fisheries Act*

The *Fisheries Act* protects fish and fish habitat (spawning grounds, nursery, rearing, food supply, and migration areas). When using a pesticide in areas where there is a stream, pond, lake, etc., attention must be given to observance of the *Fisheries Act*. This Act considers any substance deleterious unless specifically exempted through an associated regulation.

## *Pesticide Residues Compensation Act*

The *Pesticide Residues Compensation Act* states that a producer will be paid for damages or losses if the sale of their produce is stopped because it contains more pesticide residue than the *Food and Drugs Act* allows. The producer must prove that the pesticide was applied according to the label directions in order to be considered for such compensation.

## *Feeds Act*

The *Feeds Act*, administered by Agriculture and Agri-Food Canada, provides regulations to prevent the contamination of feed. This legislation regulates the import, manufacture, and sale of feed products by prescribing standards, packaging, and labelling requirements as well as providing for the authority to inspect and sample products for legal compliance with the Act and its regulations.

## *Transportation of Dangerous Goods Act*

The *Transportation of Dangerous Goods Act* permits the handling, offering for transport, and transport of potentially dangerous goods only by people who are properly trained. Use of shipping documents, special labels and markings, and proper vehicle placards, as well as adherence to certain safety procedures, are additional requirements. The person who sends the dangerous goods, the person(s) who transports them, and the person who receives them all share responsibility for complying with this legislation. The supplier, manufacturer, and/or distributor can clarify necessary transportation requirements. As a vendor, you should inform your customers if the pesticides are considered dangerous goods and if documents, labels, or placards are required. Additional information on this Act is provided in Chapter 7: Transportation, Storage, and Disposal.

## *Canadian Environmental Protection Act* (CEPA)

The *Canadian Environmental Protection Act (CEPA)*, administered by Environment Canada, is designed to protect the environment as well as human life and health. The Act covers many different areas including:

- procedures to review and approve chemicals;
- mandatory reporting of adverse effects;
- export and import controls;
- recalls and clean-ups; and
- new inspection and enforcement powers.

*CEPA* could be applied if the situation arising was not regulated under the *PCP Act*.

## WHMIS

The **Workplace Hazardous Materials Information System**, commonly known as WHMIS, is a Canada-wide system. It is designed to provide employers and workers with information about the hazardous materials with which they work. Presently, pesticides are exempted from WHMIS rules on labelling and Material Safety Data Sheets (MSDS) because they are covered under the *Pest Control Products Act*.

**Vendors should know that the worker's "Right to Know" component is still a requirement for pesticide facilities.**

It is the responsibility of a supervisor to inform employees about any possible workplace dangers to their health and safety. It is an employee's right to obtain information about substances they are working with, including MSDSs where available. (*See* Chapter 3: Labelling, for additional information on MSDSs.)

## National Building Code of Canada

The National Building Code of Canada (NBC) provides minimum requirements for health, human safety, and structural sufficiency in new buildings. It establishes specific requirements for facilities that store hazardous materials, including pesticides. While not enacted in P.E.I., the NBC should be consulted before any new construction or the renovation of an existing pesticide storage facility.

## National Fire Code of Canada

The National Fire Code of Canada (NFC), 1990, provides minimum fire safety requirements for buildings, structures, and areas where hazardous materials, including pesticides, are used. It also ensures an acceptable level of fire protection and fire prevention in the ongoing operation of such buildings. The Code also requires fire safety plans in anticipation of emergencies.

## Provincial Pesticide Legislation

Each province has enabling legislation that governs the transportation, storage, sale, display, handling, mixing, application, and disposal of a pesticide within its boundaries. Legislation for the regulation of pesticides varies in approach among the provinces, but in all cases it is in addition to, and complimentary to, the federal *Pest Control Products Act.*

## Prince Edward Island

As a vendor, you must be familiar with all associated provincial laws in the province. A copy of the legislation that regulates pesticides in Prince Edward Island is appended.

**A copy of the legislation regulating pesticides in this province is appended.**

## *Pesticides Control Act*

Within Prince Edward Island, pesticides are regulated under the *Pesticides Control Act* and regulations. This legislation is managed by the Department of Environment, Energy, and Forestry. Copies of the *Act* and regulations can be obtained from the Pesticide Regulatory Program by:

- phone at (902 368-5000);
- email at pservices@gov.pe.ca; and
- website at www.gov.pe.ca/go/pesticides .

## Regulations for the Protection of the Environment

As a vendor, you must be familiar with provincial regulations that are designed to protect the environment. Regulations under the PEI *Pesticides Control Act* require that:

- Equipment used to apply pesticides must not be filled, washed, or flushed within 25 metres of an open body of water.
- Applicators must first obtain a permit if they wish to apply any pesticide to an open body of water. This includes the use of a larvicide to control mosquitoes and other biting flies.
- Wind speeds during the application of a pesticide must not exceed 20 km/h or the wind speed specified on the label, whichever is lower.
- Pesticide containers must not be discarded within 25 metres of an open body of water.
- Pesticide containers must not be burned or buried.

## Sale of Domestic Pesticides

The PEI *Pesticides Control Act* regulations separate domestic class pesticides into two categories: "self select" and "controlled purchase".

### Self Select Domestic Pesticide

A **self select domestic pesticide** is defined as any domestic class pesticide designated as a self select domestic pesticide in Schedule 8 of the PEI *Pesticides Control Act* regulations. For the most part, these products are marketed in a form requiring no preparation or dilution and in a volume or weight equal to or less than one litre or one kilogram, respectively.

You should refer to the regulations for specific examples of domestic pesticides that are categorized as self select. If a domestic pesticide does not meet the criteria for self select, then it is automatically assigned to the controlled purchase category.

### Controlled Purchase Domestic Pesticide

A **controlled purchase domestic pesticide** is defined as any:

- Domestic pesticide not designated in Schedule 8 of the PEI *Pesticides Control Act* regulations as a self select domestic pesticide.
- Fertilizer within the meaning of the *Fertilizers Act* (Canada) that contains a pesticide. This includes all fertilizer–pesticide combination products.

## Regulations Governing the Sale of Self Select Domestic Pesticides

A license is not required to sell self select domestic pesticides within PEI. Similarly, sales staff do not require a vendor certificate. However, self select domestic pesticides must be properly displayed and stored.

**Display and Storage**

Vendors must ensure that self select domestic pesticides are stored and displayed so that:

- They present a minimal hazard to children.
- They are not adjacent within 1 metre of commodities that are foodstuffs, feeds, or any other material intended for consumption by humans or animals.
- They are not adjacent within 1 metre of commodities that are household furnishings; or toiletries, clothes, bedding, or similar commodities.

## Regulations Governing the Sale of Controlled Purchase Domestic Pesticides

Anyone wishing to sell controlled purchase domestic pesticides within PEI, must first obtain a Domestic Pesticide Vendor Business License or a Non-domestic Pesticide Vendor Business License

**Domestic Pesticide Vendor Business Licence**

A Domestic Pesticide Vendor Business Licence may be issued to a person (or company) who meets the following requirements:

- They must employ, for every physical store or facility that plans to sell or supply a controlled purchase domestic pesticide, at least one person who holds a Domestic Pesticide Vendor Certificate or a Non-domestic Pesticide Vendor Certificate.
- They must ensure that only a person who holds a Domestic Pesticide Vendor Certificate or a Non-domestic Pesticide Vendor Certificate sells, or provides pesticide-related information or recommendations on, a controlled purchase domestic pesticide to another person.
- They must provide an estimate of the maximum size of display and storage areas for controlled purchase domestic pesticides required for the year the license is requested.
- They must pay the required fee, as outlined in Schedule 4 of the PEI *Pesticides Control Act* regulations.

**Domestic Pesticide Vendor Certificate**

A **Domestic Pesticide Vendor Certificate** is issued to a person who has successfully passed a written exam based on

the Domestic Pesticide Vendor Manual. A minimum passing mark of 75% is required. The certificate is valid for a period of five years from the date of writing the exam. A fee, as outlined in Schedule 4, is payable for the issue of this certificate.

**Requirements for Display of Controlled Purchase Domestic Pesticides**

Holders of a Domestic Pesticide Vendor Business Licence, who sell a controlled purchase domestic pesticide, must ensure that these pesticides are displayed such that:

- No person other than the licensee or the licensee's employees has ready access to the pesticide (i.e., dispensary system).
- They are not adjacent within 1 metre of commodities that are foodstuffs, feeds, or any other material intended for consumption by humans or animals.
- They are not adjacent within 1 metre of commodities that are household furnishings; or toiletries, clothes, bedding or similar commodities.

**Requirements for Storage of Controlled Purchase Domestic Pesticides**

Holders of a Domestic Pesticide Vendor Business Licence, who store a controlled purchase domestic pesticide, must ensure that these pesticides are stored such that all inside or outside storage areas have:

- No floor drain that leads into or drains directly or indirectly into a storm sewer, sanitary sewer, or watercourse.
- Adequate respiratory protection and adequate personal protective clothing nearby and readily available for emergency purposes.
- Controlled access for employees only.
- A placard affixed and maintained on the outside of each door leading into the compartment, room or structure in which the pesticide is stored bearing, in clearly visible block letters, the words "Warning" and "Authorized Persons Only"; and "Chemical Storage" or "Pesticide Storage".
- Sufficient security measures so that the express permission of the person responsible is required to enter

the compartment, room, or structure in which the pesticide is stored.

In addition, controlled purchase domestic pesticides cannot be stored or located within 1 metre of commodities that are:

- foodstuffs, feeds or any other material intended for consumption by humans or animals;
- household furnishings; and
- toiletries, clothes, bedding or similar commodities.

Finally, indoor storage areas must be properly vented to the outside environment.

## Sale of Non-domestic Pesticides

Anyone wishing to sell a non-domestic pesticide within PEImust first obtain a Non-domestic Pesticide Vendor Business License.

### Non-Domestic Pesticide Vendor Business Licence

A Non-domestic Pesticide Vendor Business Licence may be issued to a person (or company) who meets the following requirements:

- They must employ, for every physical store or facility, at least one person who holds a Non-domestic Pesticide Vendor Certificate.
- They must provide proof that the person for which the licence is intended owns, or has arrangements to use, a Phase III certified storage facility to store non-domestic pesticides.
- They must pay the required fee, as outlined in Schedule 4 of the PEI *Pesticides Control Act* regulations.

A Non-domestic Pesticide Vendor Business Licence expires on the last day of February of the year following the date of issue of the licence, or when the person for which the licence is issued no longer holds or employs at least one person who holds a non-domestic pesticide vendor certificate, whichever occurs earlier.

**Phase III Certified Pesticide Storage Facility**

A Phase III certified pesticide storage facility refers to a facility that is in compliance with the requirements of the Agrichemical Warehouse Standards Association (AWSA). Specific requirements for meeting these standards can be found in the *Warehouse Audit Protocols and User Guide* (January 2006). Copies of this guide can be obtained by writing: AWSA Project Management Office, 296 Jarvis Street, Unit 7, Toronto, ON M5B 2C5.

**Non-domestic Pesticide Vendor Certificate**

A **Non-domestic Pesticide Vendor Certificate** is issued to a person who has successfully passed a written exam based on the Commercial Pesticide Vendor Training Manual. A minimum passing mark of 75% is required. The certificate is valid for a period of five years from the date of writing the exam. A fee, as outlined in Schedule 4, is payable for the issue of this certificate.

**Requirements for Sale and Purchase of a Non-domestic Pesticide**

As a vendor, you can only sell or offer to sell a non-domestic pesticide to a purchaser who:

- holds a valid pesticide applicator certificate;
- holds or is authorized to use a pesticide purchase permit;
- holds a pesticide applicators permit; or
- holds a pesticide applicator business licence.

**Pesticide Purchase Permit**

A pesticide purchase permit is issued by the Minister to a holder of a pesticide application business licence, or to the operator of an agricultural operation or golf course, that employs at least one person who holds an appropriate pesticide applicator certificate.

**Record of Sale of a Non-Domestic Pesticide**

As a vendor, you are required to prepare a written record of each pesticide sale. This record must be prepared within 24 hours of the sale and indicate the name, number, and expiry date on the purchaser's pesticide applicator certificate, pesticide purchase permit, or pesticide applicator business license

For the sale of a Schedule 1 (restricted) pesticide, in addition to the information required for the sale of any non-domestic pesticide, you are also required to record the number of the purchaser's pesticide application permit.

Provision of Annual Sales Data

As a vendor, you are required to provide to the Department of Environment, Energy and Forestry sales data for all controlled purchase domestic and non-domestic pesticides sold to retail customers during the previous calendar year. This data must be provided not later than January 31st following the year of sale. For each pesticide, vendors are required to provide the trade name, *PCP Act* registration number, and unit measure sold.

**Excluded and Exempted Pesticides**

As a vendor, you should be aware that any pesticide used as indicated in Schedule 2 of the PEI *Pesticides Control Act* regulations is excluded from all regulatory requirements.

You should also be aware that any domestic pesticide noted in Schedule 7 of the PEI *Pesticides Control Act* regulations is exempt from the posting of use and notification of use requirements as explained in Regulations 24 and 25.

The purpose of this exemption is to encourage the use of these low risk pesticides by both commercial and private applicators.

**Transportation and Disposal of Domestic and Non-Domestic Pesticides**

For information on the transportation and disposal of pesticides *see* Chapter 7: Transportation, Storage, Display, and Disposal.

## Municipal Legislation

A municipality can have specific by-laws and building codes. These can place restrictions on your storage facility, including:

- where it can be located;
- how it is constructed; and
- how it is operated.

Municipal by-laws can also affect your customers, by limiting the use of certain pesticides. An example is By-law (P-800), as passed by the Halifax Regional Municipality in 2000. This law attaches conditions to the use of pesticides on outdoor trees, shrubs, flowers, and other ornamental plants and turf, on both residential and municipal properties.

You should be familiar with any municipal pesticide-related by-laws and codes within PEI, so you can discuss them with your customers.

# Labelling 3

## Introduction

Any pesticide sold or used in Canada must first be registered by the Pest Management Regulatory Agency (PMRA) of Health Canada. It is then given a Pest Control Product (PCP) Number. Each registered pesticide must also have a label attached. The label provides information on the contents of the container. It also has directions on the legal and safe use of the pesticide. This information is based on studies carried out by the manufacturer. These studies focus on human health, protection of the environment, and effect against the pest.

## Learning objectives

Completing this chapter will help you to:

- Recognize the legal status of a pesticide label
- Apply proper actions if a label is damaged or missing
- Interpret and apply label information
- Interpret and apply information found on a Material Safety Data Sheet

## Legal Requirements

The pesticide label is a legal document. It is defined in the *Pest Control Products Act* as:

> "any legend, word, mark, symbol or design applied or attached to, included in, belonging to or accompanying any control product"

Information on the label identifies the manufacturer and tells how a pesticide must be used.

As a vendor, you should be aware that it is illegal:

- To use a pesticide in a way that is not stated on the label.
- To use a pesticide in an unsafe manner.
- To tell a customer that a pesticide can be used for any purpose that is not on the label.

Vendors must also ensure that all pesticide containers have a valid Canadian label, indicating the Pest Control Product (PCP) Number or registration number. Vendors should immediately notify their supplier if a shipment of pesticide does not contain a Canadian label. **It is illegal to sell or distribute any pesticide until it has been properly labelled.**

The label must be kept on the container and in good condition. If a label becomes illegible, a vendor should contact the supplier for a replacement and place the new label on the package. **It is illegal to sell a pesticide if the label is damaged or missing.**

In addition to the label, manufacturers sometimes provide extra pesticide information (e.g., pamphlets, brochures, advertising). They may also print information on the wrapper, or on stickers or tags that are attached to the container. As a vendor, you should advise your customers that this information is not a legal substitute for the label.

## Components of a Label

A pesticide label provides basic information on:

- Product use
- Limitations
- Disposal
- First aid
- Contents
- Precautions
- Formulation
- Toxicology

A pesticide label has two main parts. The front is called the principal display panel, and the back, the secondary display panel.

## Principal Display Panel

The nine components on the principal label panel (*see* Figure 3.1) are:

1. Product name or trade name
2. Class designation
3. Net contents
4. Directions to read the label
5. Warning to protect children
6. Warning or precautionary symbols
7. Guarantee statement
8. Registration number (*PCP Act* number)
9. Name and address of the registrant


**Figure 3.1 Principal display panel**

## 1. Product or trade name

The product or trade name is selected by the manufacturer and includes three things:

- The **brand name** or **trade name** that is registered with Health Canada. ( CONTROL-ALL is the registered trade name of this pesticide.)
- The **formulation** of the pesticide. This information will either be printed out or shown as an abbreviation. This product is a liquid—an **Emulsifiable Concentrate (E.C.)**; and
- a **description of its use**. This product is a **herbicide** used to control weeds.

## 2. Class designation

This provides information on the class to which a pesticide has been assigned, and indicates who can use the product. There are four class designations:

- **Domestic.** These pesticides:
  - are registered for use in or around the home;
  - are packaged in small containers;
  - are designed to have a low risk to the user or the environment when used properly;
  - require users to follow safe handling procedures; and
  - can be handled safely using a minimum of personal protective equipment.

- **Commercial** (may also be called **Agricultural or Industrial**).These pesticides:
  - are registered for use in commercial, agriculture, forestry, or industry operations;
  - are not for general use around the home;
  - have low to medium toxicity, but must be handled carefully to prevent injuries;
  - usually require the use of personal protective equipment; and

- require users to follow safe handling procedures.

- **Restricted.** These pesticides can:
  - have special, detailed label instructions regarding their use;
  - impact non-target organisms or the environment;
  - have limits as to where they can be used; and
  - require a provincial application permit.

- **Manufacturing.** These pesticides are used to manufacture or formulate end-use products and are not available to the general public.

## 3. Net contents

This tells how much of the pesticide is in the package and is shown in metric units. This label shows there are 10 litres (10 L) in this package.

## 4. READ THE LABEL BEFORE USING

The *Pest Control Products Act* requires that this warning be on the front panel of all pesticides.

## 5. KEEP OUT OF REACH OF CHILDREN

This warning must be on either the primary or secondary panel of all pesticides.

## 6. Precautionary symbols and words

The *PCP Act* Regulations contain symbols and words to show the hazards of using a pesticide.

### Precautionary Shapes

The shape of each precautionary symbol (*see* Figure 3.2) has a particular meaning:

- the **octagon** indicates an **extreme hazard** and has the word **danger** associated with it;

- the **diamond** indicates a **moderate hazard** and has the word **warning** associated with it; and
- the **inverted triangle** indicates a **slight hazard** and has the word **caution** associated with it.

| | Warning Symbol | Signal Word |
|---|---|---|
| **Triangular shape means low hazard** |  | Caution |
| **Diamond shape means moderate hazard** |  | Warning |
| **Octagonal shape means high hazard** |  | Danger |

**Figure 3.2 Precautionary Shapes**

## Precautionary Pictograms

Similarly, there are pictograms for each of the precautionary symbols (*see* Figure 3.3). The combination of shape, word, and picture indicates the type and severity of the hazard associated with a given pesticide.

- the **skull and cross bones**, which indicates **poison**;
- the **flame**, which indicates **flammable**;
- the **hand**, which indicates **corrosive;** and
- the **exploding grenade,** which indicates **explosive**.

| Hazard Symbols | Signal Words |
|---|---|
|  | POISON |
|  | CORROSIVE |
|  | FLAMMABLE |
|  | EXPLOSIVE |

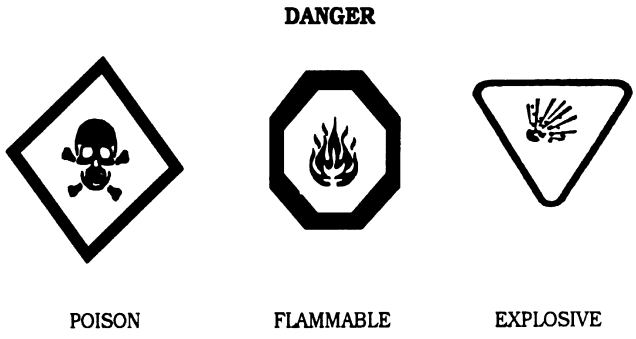
**Figure 3.3 Precautionary Symbols and Words**

## Multiple Symbols

If a pesticide is dangerous in more than one way, all the hazard symbols and signal words must appear on the label. However, only one warning signal word is required. This warning will be for the most dangerous hazard.

**The example below shows that fire is the most dangerous hazard**.

**Example**




### No Symbols or Signal Words

If a pesticide label does not have hazard symbols and/or signal words, then the product's hazards are such that the label does not require them. However, basic precautions are still necessary and the user or handler should proceed with care.

## 7. Guarantee

The guarantee provides the common name of the chemical that forms the active ingredient in a pesticide.

**The active ingredient is the part of the pesticide that actually controls the pest**.

There can be more than one active ingredient in a pesticide, in which case more than one common name will appear on the label. The **chemical name** is the name of the chemical structure of the active ingredient. It is occasionally used on the label in place of the common name if no common name exists.

The guarantee also shows the **concentration**, or how much of the chemical is in the pesticide. The concentration can be measured:

- by the weight per unit volume. This label shows that the active ingredient is the chemical **HEXALWIRE**. There are 500 grams of the chemical in each litre of this pesticide product **(500 g/L)**; or

- as a percentage by weight. Another label could show the concentration of the chemical as a percentage. For example, a guarantee of 40% means that in each 100 parts of a pesticide, 40 parts are active ingredient.

- 

**The *PCP Act* number is specific to the formulation in any pesticide container and can be cross referenced by a doctor to find information on how to best treat exposed individuals.**

## 8. Registration Number (*P.C.P. Act* number)

This number, which shows that the pesticide has been registered by PMRA, identifies the product to the government and the manufacturer. The PCP number must be shown on the principal display panel of every pesticide label. It may appear

as REG. NO. 12345 *P.C.P. ACT* or Registration Number 12345 *Pest Control Products Act*. Any pesticide sold or used in Canada must have a *P.C.P. Act* Registration Number.

**In Canada it is illegal to sell or use pesticides that are labelled with *Environmental Protection Act (E.P.A.)* numbers.**

## Secondary Display Panel

## 9. Name and address

The name and address of the company or organization that registered the pesticide must be on the label. This company or organization is called the registrant.

The seven components on the secondary display panel (*see* Figure 3.4) are:

10. Directions for use;
11. Precaution statements;
12. Disposal;
13. First aid instructions;
14. Toxicological information;
15. Notice to user; and
16. Notice to buyer.

For small size containers of domestic class pesticides the following components may appear on the lower half of the secondary display panel:

- name and address of the registrant/agent;
- net contents;
- *PCP Act* registration number; and
- guarantee.

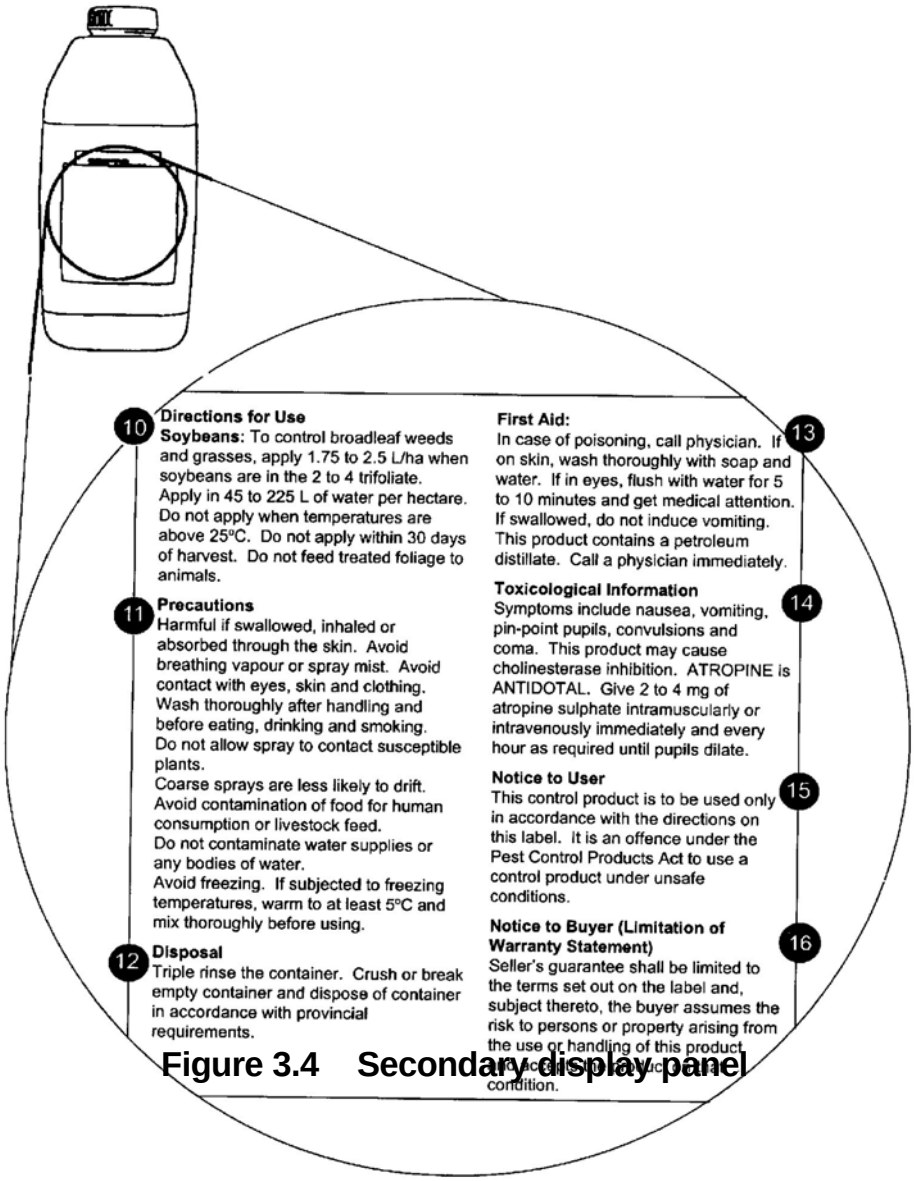



**Figure 3.4 Secondary display panel**

## 10. Directions for use, use area, and limitations

The directions for use include information about:

- what pest the pesticide can be used on (weed, insect, disease, etc.);
- what crops or animals it can be used on;
- how much to use and how to mix it;
- how to apply the pesticide;
- rate of application;
- proper equipment to be used;
- how to protect the crop;
- when not to use the pesticide;
- when to harvest (pre-harvest interval, days-to-harvest);
- re-entry period (the length of time to stay out of the treated area); and
- any other restrictions.

> It is important that vendors make customers aware if any of the following statements appear on a specific label.

### Aerial Application Statement

Pesticides cannot be applied by air unless the label states specific instructions for such use. The aerial applicator must follow the specific use instructions for mixing and application (buffers, rates, crop, etc.). All other labels must have the statement "Do not apply by air".

**NOTE: It is illegal within PEI to apply any pesticide using an aircraft.**

### Crop Rotation Statement

Some pesticide labels have crop rotation statements. If there is a carry-over situation with a product, the label will state that the user should conduct a bioassay before planting any crops other than those named on the label.

## Forest and Woodlands Management Statements

Forest and Woodlands Management areas are categorized as follows:

**Forest or forest management - Restricted:**

- Wooded areas or sites to be planted to forest of more than 500 hectares;

**Woodlands management - Restricted:**

- 500 hectares or less of wooded areas or sites to be planted to forest; and

**Woodlands management - Commercial:**

- 500 hectares or less of a wooded area, i.e., tree nurseries, rights-of-way, and seed orchards.

## Total Number of Applications

Some pesticide labels will state the total number of applications of the product that can be made during a use season. These statements may be necessary to prevent unacceptable food residues, damage to vegetation, soil residues, or the development of pest resistance. Label statements will vary with the pesticide.

## Buffer Zones

Buffer zones are areas left untreated so as to protect an adjacent area. The need for a buffer zone during application is reviewed by the PMRA on a pesticide-by-pesticide basis. Decisions are based on the organism that needs to be protected, the environmental concentration that will affect the organism, and the methods of application used. Label statements will vary with the pesticide.

Each pesticide is different, and each label is different. Read the label carefully to obtain and understand all related information.

"Overspray or drift into important wildlife habitats such as shelterbelts, wetlands, woodlots, vegetated ditches, ponds, or lake banks, and other cover on the edges of fields should be avoided. A 10 m buffer zone should be observed adjacent to aquatic habitats, such as streams, ponds, rivers and lakes, and to areas that drain into these habitats."

**Example of a Buffer Statement**

## 11. Precautionary statements

This section identifies hazards that can result from using a pesticide. It tells how to use a pesticide safely and how to protect the applicator and others from danger when mixing, applying, storing, and disposing of the pesticide Precautionary statements can relate directly to human health or to environmental concerns. As a vendor, you should be familiar with these statements.

## 12. Disposal

This section explains how to safely dispose of a pesticide container once the product has been used. (*See* Chapter 7: Transportation, Storage, and Disposal, for details of provincially approved methods for disposal.)

## 13. First aid

This section tells what to do if someone is poisoned or injured by a pesticide. The customer should always read this section carefully before using any pesticide.

## 14. Toxicological information

This section gives information on the signs and symptoms of poisoning. It also tells a doctor what antidote to use, and any ingredients that can influence the treatment. It is important to give this information to medical authorities in case of an accident. Additional, pesticide-specific information can be obtained by cross referencing the *P.C.P. Act* Registration Number.

## 15. Notice to user

This section tells the person using the pesticide to follow the directions on the label. **It is against the law to use a pesticide in an unsafe way.**

## 16. Notice to buyer

This section is not on all pesticide labels, but can be present in the form of a Seller's Guarantee, which states that the seller's guarantee is limited to the instructions on the label, and that the buyer accepts all risks associated with the use of the pesticide.

# Reading the Label

As a vendor, you should be familiar with the label information regarding the registered uses of those pesticides that you offer for sale. You should also advise customers to **READ THE LABEL BEFORE USING ANY PESTICIDE**, and that they are required by law to follow the instructions on the label.

> As a vendor, you should read the label before selling a pesticide to make sure that it is registered for the intended use of the customer. All uses must be stated on the label. If a use is not listed on the label, it constitutes an improper application and an illegal use of that pesticide. Occasionally, a new use will not immediately appear on the label. Contact the Pest Management Information Service (1-800-267-6315) for clarification.

As a vendor, you should advise customers to check for any special application or safety equipment that may be required (e.g., some pesticides specify the requirement for neoprene safety gloves), and to confirm that the product can be used safely under certain application conditions.

As a vendor, you should examine the label to see if there are any special storage instructions that you, or your customers, must consider. For example, some pesticides must not be subjected to below-freezing temperatures.

As a vendor, you should read the label for instructions on the disposal of unwanted pesticides or pesticide containers. Proper disposal will prevent health risks and environmental damage. You should also ensure that your customers are aware of the container recycle services offered.

Pesticide labels are legal documents. Therefore, as a vendor, you must make sure that all employees who deal with pesticides take the time to read and fully understand label information. Understanding and interpreting all areas of label information will help you to assist your customers in making effective and environmentally sound decisions regarding pesticides. It is, therefore, very important that all sales staff be familiar with the information contained on the labels of the pesticides offered for sale through a vendor facility. Staff should take every opportunity to reinforce the need for customers to read the pesticide label before they transport, store, handle, or apply a pesticide.

**Remember, the pesticide label is the most readily available source of emergency response and first aid information in the event of a pesticide spill or poisoning**.

## Material Safety Data Sheets

Material Safety Data Sheets (MSDSs) provide information about health hazards, personal safety, and environmental protection that may not be on the label. Material Safety Data Sheets are organized into nine sections. The order in which the sections appear can vary from manufacturer to manufacturer.

1. **Product identification** section gives the product name, chemical name, and primary use of the product. It also gives the name, address, and emergency telephone numbers of the manufacturer and supplier.

2. **Hazardous ingredients** section explains what the active ingredient is, and can tell what other ingredients are included. It gives the chemical registration numbers and transportation classification for the product.

3. **Physical data** section includes information on appearance, odour, specific gravity, pH, boiling point, etc.

4. **Occupational procedures/ preventive measures** section explains what personal protective equipment must be used, i.e., eye protection, skin protection, and respiratory protection. It also gives safe handling and storage procedures.

5. **First aid and emergency procedures** section explains what to do if someone is exposed to the product. Follow these instructions in an emergency, but always call for medical help.

6. **Fire and explosion hazard** section gives the temperature of the flash point and the ignition point for the product. The section also gives specific procedures to use when fighting a fire.

**Vendors should give the local Fire Department the MSDSs for all of the products in the storage facility.**

7. **Toxicity/health effects** section tells how human health may be affected by exposure to the product. It also gives results of the manufacturer's research on the product. This toxicological data can help a doctor deal with an emergency.

8. **Reactivity data** section gives any special chemical properties of the product. It will also provide the recommended temperature for storage of the pesticide.

9. **Preparation date and group** section tells who prepared the MSDS and when it was prepared. MSDSs must be updated at least every 3 years. **As a vendor, you should make sure you use only the most recent MSDS.**

**Vendors should make sure their MSDSs were prepared within the last 3 years.**

## Availability

Material Safety Data Sheets may be obtained from:

- pesticide manufacturers;
- the Canadian Centre for Occupational Health and Safety at 1-800-263-8466 or www.ccohs.ca ;
- pesticide vendors;
- North American Compendiums Ltd., P.O. Box 39, Hensall, Ontario N0M 1X0 ( 1-800-350-0627 or fax 519-263-2936); and
- the Agrichemical Warehouse Standards Association (AWSA) (www.awsacanada.com) or a member of CropLife Canada (www.cropro.org).

## Summary

The label on a pesticide is a legal document. It gives important information about the pesticide in the container. Each piece of information is there for a special reason and must be followed exactly. As a vendor, you need to be familiar with this information. You should also make sure that customers are aware of the importance of reading and understanding label information.

Material Safety Data Sheets (MSDSs) are not legal documents. However, they do provide an additional source of information on a pesticide. MSDSs detail hazards, precautions, and emergency response information. It is important that emergency responders have ready access to the MSDS for each pesticide carried. MSDSs should also be made available for customers.

# Pesticides and Human Health 4

## Introduction

Pesticides are designed to kill or otherwise control living organisms and, as such, must be treated with respect. As a vendor, you can play an important role in ensuring that pesticides are handled, as well as applied, safely and responsibly. This begins with appropriate staff training and includes becoming familiar with the information on pesticide labels. This knowledge will help staff to assist customers in choosing the least toxic pesticide that is effective against a particular pest. It will also help them to explain safety procedures that should be followed to reduce exposure.

Breathing or swallowing pesticides, or spilling or splashing pesticides into the eyes or onto the skin, can result in injury. The nature and extent of injury depend on the toxicity of the chemical as well as the dose (amount of material) that enters the body's tissues.

Some pesticides are very toxic and cause poisoning at low doses (a few drops of these are capable of causing severe illness or death). Other pesticides are so mildly toxic that a large quantity would have to be consumed before signs of illness would be detected. Because potential hazards exist, however, anyone working with pesticides should avoid exposure to their skin, lungs, digestive tract, or eyes. All pesticides must be treated with respect. It is difficult to accurately predict what effects can result from long-term, repeated exposure to even the least hazardous of pesticides.

## Learning Objectives

Completing this chapter will help you to:

- Understand why pesticides must be handled carefully
- Identify the routes and causes of pesticide exposure
- Understand acute and chronic toxicity
- Recognize symptoms of acute and chronic pesticide poisoning
- Calculate and assess risk (exposure X toxicity)
- Understand the importance of testing for cholinesterase inhibition.

It is important that you remember to wear proper personal protective equipment any time you handle a pesticide. This should include off-loading of pesticide deliveries, movement into storage, placement on display, and loading for the customer.

## Exposure to Pesticides

Usually the most harmful levels of pesticide exposure result from accidents, some of which are caused by carelessness. Many of these accidents result in injury or poisoning. Spills, fires, or explosions in pesticide storage facilities can seriously endanger employees, emergency workers, and people living or working nearby. Persons involved in transporting pesticides risk possible injury if pesticide containers rupture and spill their contents, or are involved in a fire. Pesticide spills during transport can also pose hazards to the public. Personal protective equipment and prompt emergency procedures can greatly reduce the chances of serious injury when a person is involved in an accident.

### Staff

**Pesticide exposure for vendor staff is most likely to occur as a result of contact with concentrated product from a leaking container or from a spill.**

## Amount of Exposure

The amount of pesticide a vendor can be exposed to depends on:

- **The vendor's attitude**. As a vendor, you must practice good hygiene and good work procedures.
- **The protective equipment used**. As a vendor, you can reduce exposure by using suitable, clean, and properly maintained PPE.
- **The organization of the storage facility and display area**. As a vendor, you can create a safer work place by having the storage and display areas well organized.
- **The safety practices followed**. As a vendor, you should follow proper safety practices to reduce the potential for exposure (e.g., promptly clean up all spills).

## Customers

As a vendor, always advise your customers to read and follow label recommendations regarding the proper protective equipment to wear when mixing and loading a pesticide, and to adhere to any stated reentry times. People can also be exposed to small doses of a pesticide if they eat contaminated food; touch recently treated pets, or foliage; or contact contaminated application equipment or clothing.

**The most likely way for a customer to encounter pesticides would be to come into contact with concentrated product during mixing or loading, or with diluted product when entering or working in a treated area too soon after application.**

## Routes of Exposure

Exposure can occur through inhalation, ingestion, dermal absorption, or ocular absorption.

### Inhalation

**Inhalation** refers to the absorption of airborne particles of a substance. Vapours or gases can be inhaled and then enter the body through the lungs. Once a pesticide reaches the lungs, it is absorbed almost completely and poisoning can result. Inhalation exposure increases within enclosed spaces.

**Prevention and protection**

The chance of inhaling a pesticide can be reduced by:

- wearing a properly fitted, pesticide-grade respirator when necessary (e.g., handling certain products or cleaning up spills); and
- not smoking when off-loading pesticides or when working in a pesticide storage area.

### Ingestion

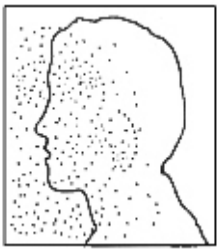
**Ingestion or oral exposure** refers to the intake of a substance by mouth. It can result from accidental ingestion, suicide attempts, or contamination of food. The most common occurrence of an oral intake is when a pesticide is moved from its original container, stored in food or beverage containers, and then accidentally swallowed. Because the stomach and the intestines absorb chemicals quickly, such poisonings can be very serious. Some pesticides can also severely burn the mouth, throat, and stomach. For these pesticides the label will indicate "**Do Not Induce Vomiting**."

**Prevention and protection**

The chance of being exposed to a pesticide through ingestion can be reduced if you:

- store a pesticide only in its original container, and away from children or unauthorized persons;
- never store a pesticide in food or drink containers;
- wash your hands and face after handling a pesticide container and before eating, drinking, or smoking; and
- never store food, drink, or tobacco products in areas where pesticides are stored or handled.

## Dermal Absorption



**Dermal absorption** refers to the intake of a substance through the skin. It can result from contact with a concentrated pesticide from direct exposure, handling a damaged container, or wearing contaminated clothing. Absorption is affected by skin condition, location of the exposure, and the pesticide. The body will take in a pesticide more easily through a cut, scrape, or abrasion, or if a product stays on the skin for a long period of time.

Skin on different areas of the body also absorbs a pesticide at different rates. The scrotal area, armpits, small of the back, head, or any area where moisture/perspiration occurs tend to be most absorptive.

**Absorption rates for the insecticide parathion**

| | |
|---|---|
| ear canal | 47% |
| scalp | 32%, |
| palms of the hand, | 12% |
| forearm | 8.6%, |
| eyes and scrotal area | 100%. |

The actual pesticide formulation can also affect the amount of exposure and penetration.

- **Volatile formulations** can pose greater respiratory danger;
- **Solvents** can increase the rate of absorption;
- **Emulsifiers** can allow the pesticide to pass through the skin more quickly;
- **Stickers** can cause the pesticide to stick more easily to the skin, clothing, or personal protective equipment; and
- **Spreaders and wetting agents** can cause the pesticide to quickly spread out and contaminate larger areas of skin, clothing, and personal protective equipment.

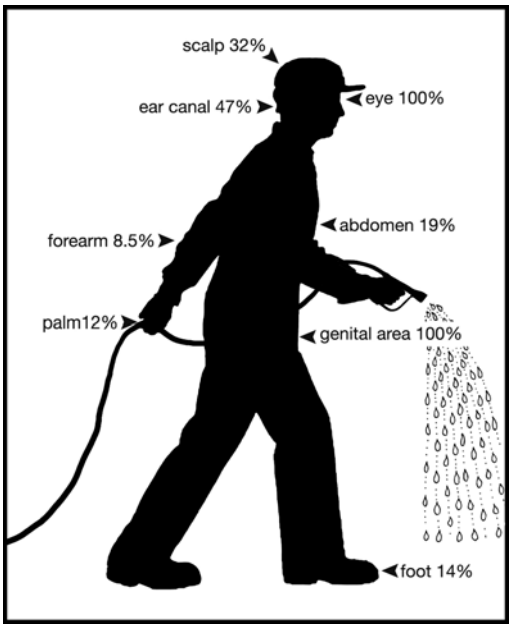



**Figure 4.1 Absorption rates for the insecticide parathion**

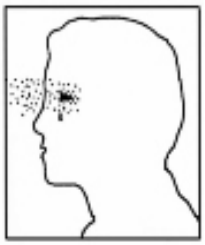
**Generally, dermal exposure, especially to the hands and forearms, poses the greatest threat to both a pesticide vendor and an applicator.**

**Prevention and protection**

The risk from exposure to a pesticide through the skin can be reduced by:

- always wearing appropriate personal protective equipment, including chemical-resistant gloves, when handling pesticides and empty containers and when cleaning up a spilled pesticide;
- immediately washing the hands and face before eating, drinking, using the toilet, or smoking after having handled a pesticide or pesticide container;
- being careful not to contact contaminated clothing;
- not wiping the face or eyes with contaminated gloves or clothing;
- immediately washing with an abundance of water any area where a pesticide has spilled on the body, and removing all contaminated clothing; and
- not storing personal protective equipment, clean clothing, or personal items in areas where a pesticide is stored or handled.

## Ocular Absorption



**Ocular absorption** refers to the intake of a substance through the eyes. Although the eyes form only a small part of total body skin, their many blood vessels easily absorb a pesticide. Some pesticides can irritate the eyes and some can cause temporary or permanent blindness. Exposure can result from splashes or spills, drift, or rubbing the eyes. Special attention should be given to eye protection.

**Prevention and protection**

The need for eye protection is particularly important when handling a concentrated pesticide. Ocular exposure can be reduced by wearing eye protection (e.g., safety goggles or a splash shield). Also, washing the hands thoroughly after handling a pesticide will reduce the risk from direct exposure through rubbing the eyes.

## Toxicology

People exposed to some types of pesticides can suffer short-term or long-term health problems. Poisoning symptoms or injury sometimes result from a single exposure to a large quantity of pesticide. In other cases, symptoms do not occur until a person has been exposed repeatedly to small doses of a pesticide over a period of time.

**It is quite common for individuals to vary in their sensitivity to the level of pesticide exposure.**

Some people can show no reaction to a dose that causes severe illness in others. A person's age and body size often influences their response to a given dose—thus infants and young children are normally affected by smaller doses of a pesticide than are adults. Also, adult females are often affected by lower doses than are adult males.

## Toxicity

**Toxicity** is the harm a particular pesticide can cause to an organism. Toxic effects can vary with sex, health, age, weight, route of exposure, or exposure to other pesticides.

### Acute toxicity

**Acute toxicity** is the response that occurs within a few hours to a few days after exposure. Acute toxic effects can result from a single dose, a single exposure, or from multiple doses received within 24 hours. Acute toxic effects are often reversible.

#### Measuring Acute Toxicity

The acute toxicity of a pesticide is indicated on the product label using precautionary symbols, words, and statements. Primarily, toxicity is measured by the $LD_{50}$ or $LC_{50}$.

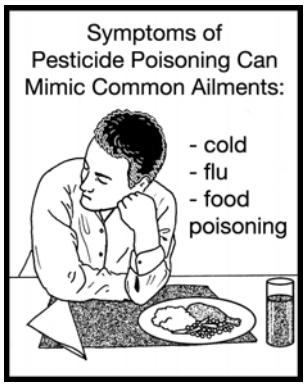
An $LD_{50}$ only **estimates** the toxicity of a pesticide to people.

An $LD_{50}$ can be determined for oral or dermal exposure routes.

**$LC_{50}$ stands for lethal concentration 50, which is the concentration (expressed in parts per million) of a pesticide in the air or water sufficient to kill half of the test animals exposed to the pesticide. The smaller the number, the more toxic the pesticide.**

**$LD_{50}$ stands for lethal dose 50, which is the amount of a substance (mg/kg) that will kill 50% of test animals exposed to the pesticide. The smaller the number, the more toxic the pesticide.**

**The smaller the $LD_{50}$ and the $LC_{50}$ number, the more toxic the pesticide.**




**Symptoms of acute pesticide poisoning**
Some poisoning symptoms can be vague and are often confused with common ailments (flu, excess heat, hangover, food poisoning, etc.); other symptoms are quite severe and debilitating. Acute pesticide poisoning symptoms can appear within a few minutes of exposure or not for many (up to 96) hours after exposure.

**Mild symptoms** include headache; fatigue; loss of appetite; dizziness; weakness; nervousness; nausea; perspiration; diarrhea; loss of weight; thirst; moodiness; and irritation of the skin, eyes, nose, or throat.

**Moderate symptoms** include nausea, trembling, loss of muscular co-ordination, excessive saliva, blurred vision,

constricted throat or chest, laboured breathing, flushed or yellow skin, abdominal cramps, vomiting, diarrhea, mental confusion, perspiration, rapid pulse, and cough.

**Severe symptoms** include vomiting, loss of reflexes, difficulty with breathing or an increased breathing rate, muscle twitching, tiny pupils, convulsions, unconsciousness, thirst, and fever.

As a vendor, you should be able to recognize poisoning symptoms based on the type of pesticide being handled. All pesticides do not have the same poisoning symptoms. The symptoms are shown on most pesticide labels or MSDSs. Their presence should trigger a warning to immediately eliminate exposure. Then, quickly take preventative action or apply first aid procedures.

**As a vendor, you should be familiar with the toxicological information for all pesticides that you handle or sell. Toxicological information can be required by medical staff should a poisoning occur.**

**If anyone on the site is acting or feeling unusual or exhibiting poisoning symptoms, immediately consult a doctor or call the local Poison Control Centre**.

## Chronic Toxicity

**Chronic toxicity** refers to the adverse response that occurs and persists over time after an exposure(s).Chronic effects are often irreversible, and can result from a single exposure or from repeated exposures. Symptoms resulting from chronic or long-term exposures may not develop for many days, months, or even years.

Chronic effects of pesticide exposure can include skin irritation, reduced body weight, organ damage, tumors, nerve damage, or birth defects. Chronic effects can occur in three situations:

- as a complication of acute exposure;
- as a slowly progressive condition; and
- as the development of undesirable effects, years after exposure.

## Risk

Risk is the chance that someone or something will be harmed by a pesticide.

RISK = TOXICITY × EXPOSURE

**The greater the toxicity, the greater the risk**. Both the type of active ingredient and the concentration of active ingredient affect the toxicity of a pesticide. Some active ingredients are more toxic than others.

**Higher concentrations of the same active ingredient increase toxicity.** Those responsible for handling and/or mixing a pesticide are at a high risk because they are dealing with a product in a concentrated form.

**The higher the exposure, the greater the risk.** High exposure, even to a pesticide having a low toxicity, can create risk. An unprotected vendor or applicator, who works throughout the entire spray season with a pesticide having a low toxicity, is still at some risk.

Eliminating or minimizing exposure to a very toxic pesticide minimizes risk. As a vendor, you should advise your customers that risk can be minimized by choosing a less toxic pesticide and/or by reducing exposure.

## Cholinesterase

Exposure to organophosphorous (OP) and carbamate insecticides can affect the central nervous system, thereby causing a lowering of cholinesterase levels.

To transmit a message throughout the nervous system, a signal must pass from one nerve cell to the next across gaps called synapses. When the message reaches each synapse a chemical, called acetylcholine, is released to carry the message to the next nerve cell ( *See* Figure 4.2).

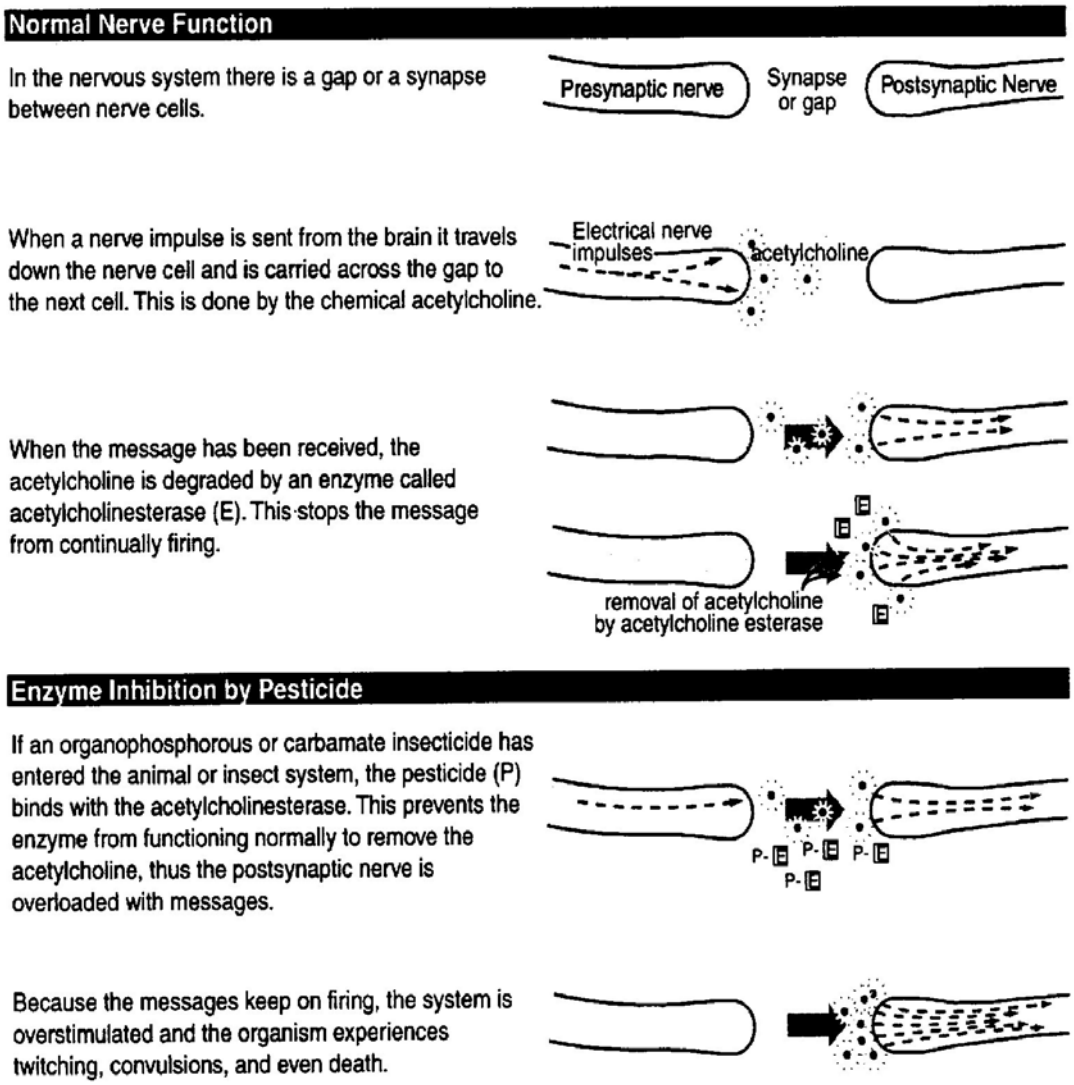



**Figure 4.2 Normal and Enzyme Inhibited Nerve Function**

Once the message arrives, cholinesterase breaks down the acetylcholine. This clears the synapse and leaves it ready to receive the next message. If organophosphorus (OP) and carbamate insecticides are present in the body, they bind with the cholinesterase. Therefore, the cholinesterase is not available. When there is insufficient cholinesterase available to break down the acetylcholine, messages continue to be sent to the nerve cells over and over again and the entire nervous system can be affected. This may cause many symptoms, including trembling, twitching, convulsions (fits), breathing and heart difficulties, and even death.

| Common Name | Trade Name | Chemical Group |
|---|---|---|
| acephate | Orthene | OP |
| azinphosmethyl | Guthion | OP |
| chlorpyriphos | Dursban&Lorsban | OP |
| dimethoate | Lagon & Cygon | OP |
| pirimicrb | Pirimor | carbamate |
| carbaryl | Sevin | carbamate |
| carbofuran | Furadan | carbamate |

## Cholinesterase Testing

Cholinesterase blood testing is a common method used to determine whether or not an individual is suffering from exposure to these classes of pesticides. If a person handles or applies organophosphorus or carbamate insecticides on a regular basis throughout the season, they are advised to have a cholinesterase blood test. Any doctor can arrange these tests.

**Everyone has a different base-line level of cholinesterase so it is necessary to have the blood tested before handling, using, or otherwise being exposed to these products. The initial test will establish a person's normal, or base level, blood cholinesterase.**

Follow-up testing will indicate whether there has been exposure and thus allow time for preventative action to be taken. These blood tests also help a doctor to diagnose pesticide poisoning, and serve as a warning that more safety precautions are needed.

**A decrease in cholinesterase indicates that an individual has been exposed to organophosphorus or carbamate insecticides as a result of failing to wear or maintain the proper personal protective equipment, or failing to wash thoroughly after handling these products.**

Early detection of exposure is important. If the cholinesterase level after exposure is less than half of the base-line or normal level, then a person may be showing signs of pesticide poisoning. Such individuals must be removed from any further exposure to organophosphorus and carbamate insecticides until their respective cholinesterase blood levels return to normal.

# Safety 5

## Introduction

As noted earlier, pesticides can harm and even kill people or pets. They can also damage a wide variety of beneficial organisms as well as the environment. As a vendor, you must practice safety whenever you handle a pesticide. Safety is critical for all activities involving pesticides, including selection and purchase, transportation, storage, mixing and loading, application, equipment cleanup and maintenance, and disposal.

## Learning Objectives

Completing this chapter will help you to:

- Apply information related to health and safety in the workplace
- Identify and select proper personal protective equipment
- Use dermal and respiratory protective equipment
- Properly clean, maintain, and store personal protective equipment

## Responsibility and Attitude

Anyone who could come into contact with a pesticide should be familiar with safety practices. As a vendor, you should work to prevent harm to yourself, other staff, customers, and the environment. For example, it is your responsibility to control access to pesticide display and storage areas. This can be done by restricting entrance, locking doors, and posting warning signs. This is not only a legal requirement, but sets a good example for how customers should themselves store a pesticide. Persons responsible for laundering contaminated clothing must also be aware of proper handling procedures.

Anyone handling a pesticide must regularly review safety procedures because:

- familiarity with a pesticide or procedure can cause vendors or applicators to become careless or complacent;
- safety procedures or pesticide information can have changed since information was last reviewed; and
- repetition encourages the automatic adoption of safety procedures.

## General Precautions

Common safety practices for all types of pesticide use/handling include:

- Never eat, drink, or smoke when handling a pesticide (e.g., transporting, mixing, loading, applying, disposing, etc.,)
- Do not carry food or smoking items when handling a pesticide
- Always wash before eating, drinking, smoking, or using the toilet
- Shower thoroughly, washing body, hair, and under the fingernails at the end of each day after handling a pesticide
- Always carefully read and follow label information and directions
- Do not wear contact lenses when handling a pesticide
- Immediately remove contaminated clothing and wash any spilled pesticide off the affected area
- Wear clean, proper fitting protective clothing

## Training

Employers, supervisors, and employees must work together to reduce injuries on the job. Each has their role to play in making the workplace safe. Employers have the principal role in dealing with health and safety issues. They meet this responsibility when they:

- Establish and maintain safe working conditions
- Train staff to work safely (e.g., while stacking and transporting pesticide, cleaning up a spill, etc.)
- Ensure that the proper personal protective equipment is available, and that employees correctly wear and maintain it

- Provide information and training to employees about the pesticides they handle
- Have copies of MSDSs available and train staff on their use

## Protection

Although personal protective equipment (PPE) is sometimes cumbersome and uncomfortable to wear, it is vital that individuals do everything possible to maximize protection from exposure to a pesticide.

Guidelines on protection usually appear on the label under the heading "PRECAUTIONS." Some label precautions can be quite specific, such as the following:

- "Wear goggles or a face shield, rubber gloves, long trousers, long-sleeved shirt, and boots high enough to cover the ankles."
- "Wear full protective clothing, goggles, and rubber (natural or synthetic) gloves when handling this material. If exposure by inhalation of dust or spray mist is likely to be encountered, wear an appropriate respirator mask."
- "Wear clean neoprene gloves and clean waterproof protective clothing. Wear an appropriate respirator."

While some labels give complete instructions on PPE, others do not tell exactly what one should wear; they simply imply that some protection is needed.

Statements like the following mean that PPE should be used.

- keep from breathing dust or fumes;
- avoid skin contact; or
- keep out of eyes.

Often, more personal protective equipment can be needed than is mentioned on a pesticide label.

**If a pesticide label has a "DANGER - poison" symbol, always wear extra protection.**

In addition to reading the safety precautions on the label, always assess the precaution symbol. A DANGER, WARNING, or CAUTION symbol will indicate the toxicity of the pesticide (*see* Chapter 3:Labelling, for more detail.)

**Individuals should wear at least the following when handling most pesticides**

- **coveralls**
- **unlined, chemical-resistant boots**
- **unlined, chemical-resistant gloves**

Individuals can encounter some situations that require extra precautions, including:

- eye or face protection (mixing);
- waterproof hat (application);
- respirator (mixing and application);
- waterproof apron (mixing); or
- waterproof pants and jacket (mixing or application).

## Personal Protective Equipment

The protection used for a particular job should be based on the pesticide label precautions, the pesticide toxicity, and the possibility of being exposed to a pesticide. You should always read the label on a pesticide container and follow all directions concerning personal protective equipment.

The PPE used must be able to handle the rigours of the work and the length of exposure. It is important to have equipment that fits correctly and comfortably.

Additional information on PPE for use with a specific pesticide can be found on its Material Safety Data Sheet (MSDS), or obtained from the manufacturer or wholesale company representatives. (*See* Chapter 3, Labelling, for sources of MSDSs.) General information on personal protective equipment can be obtained from:

- pesticide pamphlets;

- safety equipment suppliers;
- applicator handbooks; and
- pesticide application trainers.

**Personal protective equipment used for handling a pesticide should not be used for any other purpose.**

The personal protective equipment needed when handling a pesticide depends upon the risk involved during its use.

## Dermal

The skin is the major route through which a pesticide can enter the body, with the hands being the most highly exposed part of the body.

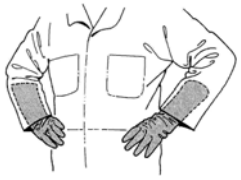
### Gloves

You should never touch a pesticide or a pesticide container with your bare hands. Always wear unlined, chemical-resistant gloves when handling a pesticide, rinsing or disposing of pesticide containers, or washing safety equipment.

**Gloves should be unlined and made of rubber, neoprene, polyvinyl chloride, or polyethylene.**

As a vendor, you should have available the type of gloves recommended for the pesticides distributed. **Do not use gloves made of leather, cloth, or canvas, or gloves having a cloth lining.** These materials are difficult to clean and they can absorb a pesticide, thereby keeping chemical in contact with the hands.

You should check your gloves for holes or leaks before putting them on and when washing them following use. Trap air inside the glove and put it in water to check for holes. Discard any gloves that are even slightly damaged, as gloves with holes will increase the chance of exposure to the hands and could trap pesticide in contact with the skin.



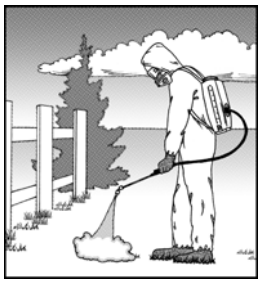
Coveralls worn over the gloves

You should keep the sleeves of coveralls over the top of the gloves to prevent any solution from running inside the gloves. For maximum protection, fold down the top of your gloves to make a cuff. With the gloves under the sleeves, the cuffs prevent pesticide from running down the gloves onto your arms when your hands are raised.

**Gloves must be:**

- clean;
- made of an appropriate chemical-resistant material for the pesticide, such as neoprene, nitrile, butyl rubber, or PVC-supported (not leather or cloth);
- unlined;
- long enough to cover the wrist and lower forearm; and
- in good condition (no holes or tears).

### Coveralls



Anyone who handles a pesticide should at least wear a long-sleeved shirt and long-legged trousers, or a coverall-type garment. Disposable coveralls specifically designed for pesticide use can be worn. Selected clothing should be clean (pesticide free), easy to wash, and have a tightly woven fabric. It should be waterproof (e.g., splash pants) if a pesticide is likely to substantially wet the work clothes or coveralls.

**Boots**

Waterproof, unlined, knee-high boots of rubber or neoprene should be worn when there is the need to clean up a spill. As a vendor, you should also advise your customers to wear this type of boot when applying a pesticide to their lawn. Leather or fabric covered boots should never be worn when handling a pesticide. They absorb pesticides easily and are impossible to clean. Pant legs should be worn outside the boots so that the pesticide does not run into the boots. Applicators should thoroughly wash the outside of the boots and remove them immediately after use.

**Hats**

Head protection should be worn when applying a pesticide overhead. This is because the head and neck area can absorb a pesticide much easier than most other body locations. Hats should have a wide brim, be made of non-absorbent materials (hard hat or rain wear), and be easy to clean.

**Baseball type caps and straw hats do not provide suitable head protection when handling a pesticide.**

**Apron**

As a vendor, you should advise your customers to wear a liquid-proof, chemical-resistant apron when measuring, mixing, or loading a pesticide.

## Ocular

Eyes need special consideration. Absorption of a pesticide through the eyes is nearly 100%, and contamination can range from eye irritation to severe damage.

### Goggles

As a vendor, always wear goggles if there is any chance of getting splashed pesticide liquid or dust in your eyes. You should also advise your customers to wear eye protection if there is a chance of exposure when applying a pesticide (e.g., aerosol cans). **Prescription eyeglasses do not provide adequate protection**, and goggles will fit over most eyeglasses. Do not use goggles having cloth or foam headbands or ventilation holes.

Do not wear contact lenses when handling a pesticide as they are permeable to vapours and gases. They can also keep the pesticide in contact with the eyes.

### Face shield

Face shields protect the face and eyes from direct contact with a splashed pesticide. Some face shields attach to hard hats. You should wear a face shield when handling damaged containers.

## Inhalation

### Respirators

A respirator is sometimes required to prevent pesticide exposure through inhalation. A respirator is a unit that covers the mouth and nose to prevent pesticide spray droplets, particles, or vapours from entering the lungs. Wearing respiratory protection is important because once in the lungs, a pesticide can enter the blood stream rapidly and completely. If inhaled in sufficient amounts, a pesticide can cause damage to your nose, throat, and lung tissue.

As a vendor, you should wear a respirator when the label so states or when you might be exposed to a harmful level of a pesticide in the air. Respirators must:

- have a CSA approval, MSHA-NIOSH approval (MSHA - Mines, Safety, Health Association, NIOSH - National Institute of Occupational Safety & Health), or a British

Health & Safety Executive (BHSE) approval for pesticide use;
- have an appropriate cartridge or cannister for specific pesticide use;
- fit properly;
- be clean; and
- contain cartridges that are not over-saturated.

**Fitting a respirator**

Respirators are available in different shapes and sizes. For proper protection it is essential that you select one that fits properly.

A tight seal cannot be achieved if the wearer has a beard or other facial hair, as the hair prevents direct contact between the face and the edge of the respirator.

You should do a fit test each time the respirator is put on. Follow the manufacturer's instructions for respirator fit or use one of the two following tests:

- Place the palm of your hands over the exhalation valve cover and exhale gently. If the face piece bulges slightly and no air leaks between your face and the face piece are detected, a proper fit has been obtained. If air leakage is detected, reposition the respirator on the face and/or readjust the tension of the elastic straps to eliminate the leakage. Repeat this fit test.

- Place flat pieces of paper or the palms of your hands over the open area of the cartridge cap, inhale gently, and hold breath for 5 to 10 seconds. If the face piece collapses slightly, a proper fit has been obtained. If air leakage is detected, reposition the respirator on your face and/or readjust the tension of the elastic straps to eliminate the leakage. Repeat this fit test.

**Types of respiratory protection**

Types of respirators available include:
- cartridge;
- canister;

- air-powered purifying; and
- self-contained breathing equipment.

The first three respirators do not supply any oxygen and therefore should never be used in an oxygen-deficient atmosphere.

**Dust masks provide protection only from dust particles. They are not respirators and should never be used in their place.**

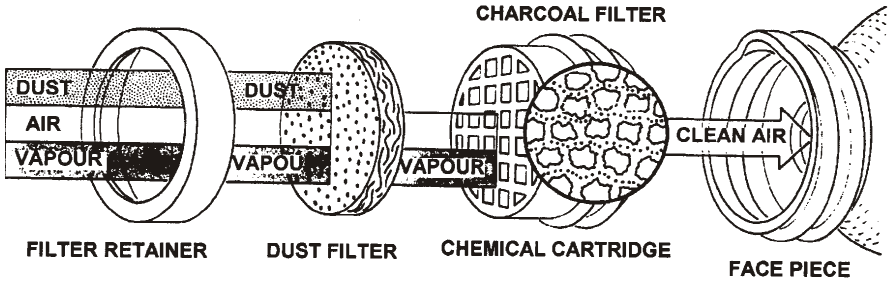
**Half face respirator**

**Cartridge respirators** are the most common type of respiratory protective equipment used when handling a pesticide. They consist of a half mask or full mask, and some are now disposable. Special pre-filters and cartridges are needed for protection against pesticides.

The pre-filters only remove dust, small particles, and spray droplets.

The cartridges, which contain activated charcoal, provide protection from the pesticide vapours.

**TWO STAGE PESTICIDE RESPIRATOR**




**TWO STAGE CARTRIDGE**

**Canister respirators** incorporate a full face piece and a canister of charcoal. Their large-volume canister allows for use in higher vapour concentrations, where cartridge respirators may not be sufficient. Be sure to use a canister that provides protection from organic vapours.

**Powered respirator**

**Air-powered purifying respirators** use an electric pump to draw air through a charcoal cartridge, where a filter removes particulates. The purified air is delivered to a tight fitting face mask or a loose fitting helmet. These can be a more comfortable option to the half mask or full mask respirators. This is especially true on hot days or when you need respiratory protection for long periods of time.

**Self-contained breathing equipment** supplies air from a tank on the wearer's back via a tube on the headpiece. These respirators are used for the application of fumigants, or for use in emergencies such as a fire or a major pesticide spill.

**Changing cartridges**

As a vendor, you should recommend that your customers consult the respirator directions for recommended use times. Replacement cartridges and pre-filters should protect you against the type of pesticide being handled. Pre-filters and cartridges should always be used together. Filters should be changed:

- At the start of each new application season
- If, when properly fitted, you notice a chemical smell or taste
- After you have been working in an area containing a lot of vapours (e.g., cleaning up a spill in the storage area)

## Cleanup and maintenance

Personal protective equipment will retain residue after use so you must handle all pieces carefully to prevent contamination during removal and cleanup.

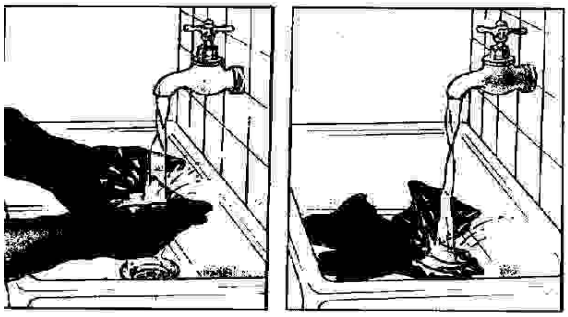
Personal protective equipment should be cleaned at the end of each day of use or when a job is finished. Manufacturer instructions for cleaning personal protective equipment should always be followed. Cleanup should be done at the application site, whenever possible.

**Cartridges should be changed at least once a year. A respirator is no longer providing appropriate protection and should be changed if the applicator can smell or taste chemical.**

## Gloves

Clean your gloves as follows:

- leave gloves on while removing and cleaning the rest of your personal protective equipment;
- wash gloves before taking them off;
- turn the gloves inside out while removing them; and
- wash thoroughly with detergent and rinse well after each day of use/application.



Check your gloves frequently for leaks, discard leaky ones, and replace gloves on a regular basis.

**Gloves should be kept on while you remove your personal protective equipment, then washed with soap and water before they, in turn, are removed.**

### Body covering

Clean your body covering as follows:

- wear protective gloves;
- rinse off waterproof clothing before removal;
- discard heavily contaminated clothing;
- use disposable plastic garbage bags for temporary storage of pesticide-contaminated clothes prior to washing; and
- wash clothing daily.

### Laundering

Laundry instructions are as follows:

- wear the proper gloves to handle contaminated clothing;
- use chemical-resistant gloves to handle contaminated clothing;
- use a pre-wash additive on contaminated areas;
- pre-soak and launder contaminated clothing separately from normal laundry;
- avoid overcrowding clothes in the washing machine;
- re-rinse clothing using the pre-soak cycle;
- use hot water, full water level, and normal wash cycle;
- use a heavy duty detergent, bleach, or household ammonia (do not mix these cleaners);
- repeat wash cycles may be required to remove some chemicals;
- hang clothes out to dry so as to prevent possible contamination of the dryer; and
- run the empty washing machine through a full cycle again after use, using hot water and detergent to rinse it thoroughly.

Follow the manufacturer's instructions for care/disposal of disposable coveralls.

### Respirators

Clean your respirators as follows:

- Wear the proper gloves when handling contaminated respirators
- Inspect respirators regularly for damage
- Make sure all valves, mechanical pre-filters, and charcoal cartridges are properly positioned and sealed
- Remove pre-filters and cartridges/canisters after each day of use and place them in a clean, sealed plastic bag. This prevents the cartridge from being used up when not in use
- Wash the respirator face piece in warm water using a mild detergent, then rinse well
- Prolong the life of charcoal cartridges/canisters by removing them from the respirator and keeping them in a clean, air-tight container when not in use

## Storage

As a vendor, you should advise your customers to store personal protective equipment separate from the pesticide storage area, but also away from regular clothing. A cool, dry storage area close to where the pesticides are stored will help extend the life of protective clothing. This also allows for quick access in case of an emergency. Keeping waterproof clothing (e.g., gloves, boots, etc.) away from sunlight will help to extend its life. Keep charcoal cartridges/canisters in a clean air-tight container.

# The Environment 6

## Introduction

Pesticides have the potential to harm the environment if they move from the target site. If this happens, they can harm air, soil, and water. As a vendor, you should understand the processes that affect a pesticide once it is released. By understanding these processes, you can help reduce damage to the environment. It is the legal responsibility of everyone who handles a pesticide to minimize potential damage to the environment.

## Learning Objectives

Completing this chapter will help you to:

- Identify, interpret, and manage environmental risk
- Understand the processes that affect a pesticide once it is released into the environment
- Prevent a pesticide from contaminating air, soil, and water
- Identify sources of information on pesticides and the environment for your customers

## Environmental Risk

Every time a pesticide is applied there is some risk to the environment. The degree of risk depends upon persistence, mobility, non-target toxicity, and volume. The environmental risk associated with the use of a pesticide can be expressed in the form of the following equation.

***Environmental Risk = Persistence x Mobility x Non-target Toxicity x Volume Used***

Environmental risk is minimized when any of these risk factors is close to zero.

## Persistence

**Persistence** describes how long the active ingredient of the pesticide remains active in the environment. A pesticide that remains active in the environment for a long period of time is described as persistent. The relative persistence of pesticides is usually compared by determining their half-life.

**Half-life is the time required for one-half of the initial concentration of the pesticide to degrade in some part of the environment.**

A product is considered to be highly persistent if it's half-life is greater than one year. The herbicide picloram, once commonly used to control vegetation along powerline rights-of-way, is an example of a highly persistent pesticide. The herbicide 2,4-D is considered to be slightly persistent, with a half life of about 2 to 3 weeks. Products with a half-life measured in hours or days are said to be non-persistent (e.g., pyrethrins).

**The more persistent a pesticide, the longer the active ingredient is available and so the higher the risk it poses to the environment.**

A pesticide with an active ingredient that is persistent is good for long-term pest control. The down-side to this is that a persistent pesticide can also have the ability to cause environmental damage over a long period of time.

A persistent pesticide is more likely to move from the application site into local water supplies. Hexazinone (Velpar L) registered for vegetation control on blueberries, is an example of a moderately persistent pesticide. Trace amounts, associated with its use in nearby blueberry fields, have been found in groundwater throughout the Maritmes.

## Mobility

**Mobility** is the ability of the active ingredient of a pesticide to move away from the site of application. Movement can be through the soil, water, or air. Factors such as chemical family, soil type, soil conditions, and climate can influence both the mobility and the persistence of a pesticide in the soil.

The more easily a pesticide is able to move away from the site of application, the higher the risk to the environment.

## Non- target Toxicity

**Non-target toxicity** refers to the unintended harmful effect of a pesticide on any organism other than the pest. The risk to the environment increases if the non-target toxicity of the product is high.

## Volume

**Volume of use** refers to the total amount of the product used in the environment. The larger the volume of product that is used, the higher the potential for environmental damage.

## Pesticide Fate

As soon as a pesticide is released into the environment, its fate is determined by its various physical and chemical properties as well as natural environmental processes. These factors include:

- breakdown/degradation
- volatilization;
- adsorption;
- runoff;
- desorption
- absorption

- bio-concentration or bio-accumulation
- bio-magnification
- leaching; and
- vapour drift and spray drift.

These factors ultimately determine what impact the pesticide will have on the environment. Given the sensitive nature of the natural environment, it is important that vendors are knowledgeable concerning the processes listed above, and are prepared to assist customers when selecting crop protection products.

**Physical and Chemical Properties**

Both the physical and chemical properties of a pesticide influence the environmental risk associated with its use. Important pesticide properties are listed in Table 6.1.

| | |
|---|---|
| Degradation | how a pesticide breaks down in the environment. |
| Bio-accumulation | how pesticides accumulate in body tissues. |
| Volatility | how a pesticide changes into a vapour when exposed to air. |
| Adsorption | how a pesticide binds to soil particles. |
| Absorption | how pesticides move into organisms or soil structures. |

**Table 6.1 Pesticide properties that influence environmental risk**

## Degradation

The breakdown of a pesticide in the environment is known as degradation. As a vendor, you should understand that the rate of pesticide breakdown is affected by numerous environmental factors, including temperature, moisture, and

pH. This breakdown can occur through microbial activity, chemical activity, or photodegradation.

**Microbial degradation** is the most common type of pesticide breakdown. Soil microorganisms use a pesticide as a food source, thereby breaking it into basic compounds such as water and carbon dioxide. Temperature, pH, soil moisture, presence or absence of oxygen, soil fertility, and the chemical or physical properties of a pesticide all affect microbial breakdown.

**Chemical degradation** is simply a chemical reaction that occurs between a pesticide and other chemicals in the environment, such as water. This type of degradation generally splits a pesticide into less hazardous compounds. The rate of chemical degradation depends upon the temperature, pH, moisture, and the specific pesticide.

**Photodegradation** refers to the break down of a pesticide by sunlight. If they are to be effective, products that break down very rapidly when exposed to sunlight must be incorporated into the soil shortly after application.

The speed with which degradation occurs is measured by the pesticide's half-life. That is the time it takes for one half of the initial amount of a pesticide to break down in the environment. For example, 2,4-D has a half-life in soil of about 2 to 3 weeks. If it were applied at the rate of 1 L/ha, 2 to 3 weeks later there would only be 0.5 L/ha (or half of the original amount) of the product left in the environment.

**Half life is the time it takes for one half of the initial amount of a pesticide to break down.**

## Bio-accumulation

**Bioconcentration (or bioaccumulation)** is defined as the movement of a chemical from the surrounding medium into an organism. If the chemical is more soluble in fat than in water, it can accumulate in the fatty tissue of aquatic organisms at a higher concentration than found in the surrounding water.

Most of the examples of bioconcentration of chemicals from the environment are observed in aquatic ecosystems; however, some also occur in terrestrial ecosystems.

## Biomagnification

**Biomagnification** is the increase in concentration of a toxic chemical, including some pesticides, to higher trophic (feeding) levels in a food chain. Biomagnification from one feeding level to another (algae to fish to osprey) is dependent on the bioconcentration of the chemical in the lower trophic levels and, for this reason, bioconcentration or bioaccumulation and biomagnification are related. Biomagnification occurs when units of a chemical that persisted in the algae are transferred to the fish, and then magnified up the food chain to the osprey. This can result in the osprey accumulating a large quantity of a toxic chemical, thereby resulting in serious problems.

## Volatilization

**Volatilization** is the process whereby a solid or a liquid substance evaporates into a vapour (gas). The rate at which a pesticide evaporates depends upon the product and the environmental conditions (temperature, relative humidity, and wind speed). Hot, dry, windy weather increases the volatilization. Small spray droplets are more easily volatilized than are larger drops.

**When pesticide vapours move from the target and into the air during or after an application, this movement is called vapour drift.**

As a vendor, you should be prepared to advise your customers that vapour drift of a herbicide can cause damage to non-target plants some distance from the point of application. You should also make them aware that a volatile product can be less effective if it is applied on a hot day. This is because some of the active ingredient can be changed into a vapour (gas) and thus will no longer be available to affect the pest.

## Adsorption

**Adsorption** refers to the binding of a chemical to soil particles or other material. The degree to which a pesticide binds to the soil varies with the type and concentration of the pesticide. It also varies with the soil type, moisture, pH, and texture. Soils high in organic matter or clay are the most adsorptive. Most soil-bound pesticides are less likely to leach or be broken down by microbes. However, a pesticide can be easily moved by wind or water when bound to soil particles.

**Desorption** occurs when bound pesticides are released from the soil or other material. These released pesticide residues are then more readily available for uptake and effect on the environment.

## Absorption

**Absorption** is the movement of pesticides into organisms (e.g., plants, animals) or structures (e.g., soil, wood). Absorption of a pesticide into an organism is not always detrimental since many of these organisms can degrade the pesticides into nontoxic compounds. Usually, a pesticide will not be absorbed if it has adsorbed to the soil.

## Natural Environmental Processes

You should also understand that there are natural processes that can determine what happens to a pesticide, and where it ends up, after it is released into the environment.

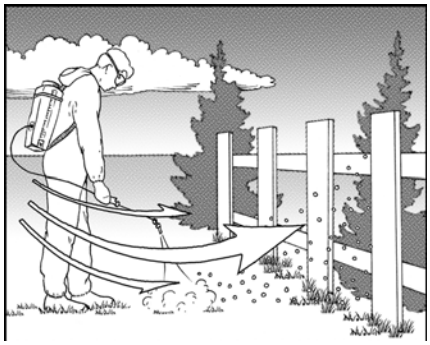
These natural processes include:

- spray drift;
- surface runoff;
- leaching; and
- soil erosion via wind and water.

## Spray Drift

**Spray drift** refers to the airborne movement of spray droplets away from a treatment site during an application. Spray drift is affected by:

- spray droplet size. **The smaller the droplets, the more likely they will drift.** Therefore, factors that decrease droplet size (e.g., too high equipment pressure, too small a nozzle size, high air temperatures, low air humidity) will increase drift;
- air movement. The more that air moves, the more pesticide spray will drift; and
- the distance between the nozzle and the target. The greater the distance, the more that air movement can affect the spray (e.g., an attempt by a customer to spray high up into a tree may result in spray drift.)



**Spray drift**

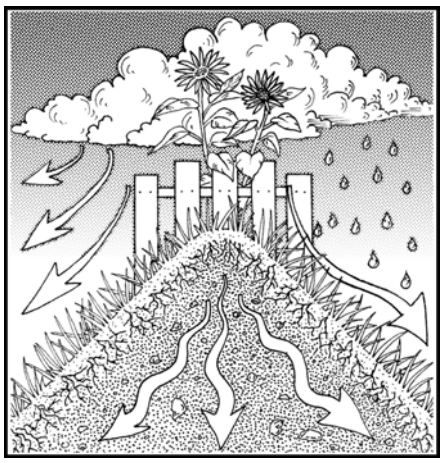
## Surface Runoff

**Surface runoff** is the movement of water over a sloping surface. A pesticide can either be mixed in the water or bound to soil particles that move with the water. The pesticide's characteristics (formulation, solubility, etc.) will affect the amount of pesticide in the runoff. The amount of runoff depends on:

- the slope of the surface;
- the texture and type of the surface (e.g., grass vs bare soil);
- the moisture content of the surface material;
- the amount of additional moisture (rainfall, irrigation, etc.); and

- the type and amount of surface vegetation and root development.

Runoff from a treated area or an area contaminated by a pesticide spill can pollute surface water, groundwater, and soil. A loss of product can occur when it rains before a liquid pesticide has had time to dry on the soil or vegetation. Even many months after application, heavy rains can carry a persistent pesticide or a pesticide adsorbed on soil particles in the run-off water.



## Leaching

**Leaching** is the movement of a pesticide with water through the soil. Leaching can occur downward, upward, or sideways. Leaching increases when:

- pesticide solubility increases;
- the soil has a low water-holding capacity;
- the soil has a low organic content; and
- additional water is added (rain, irrigation).

## Soil Erosion

**Soil erosion** occurs when a soil surface is worn away by water or wind. Any pesticide that has adsorbed to soil particles can be carried by the wind or run-off water to locations considerably distant from the application site.

Given the sensitive nature of the natural environment, it is extremely important that you as a vendor are knowledgeable concerning these factors, and are prepared to assist your customers with the selection of a pesticide.

## Pesticides in Water

As a vendor, you should be aware that both surface water and groundwater can be contaminated by a pesticide. Once water is contaminated with a pesticide it can become toxic to aquatic or terrestrial wildlife, and to domestic animals or to humans.

**Surface water** is visible water (water at the soil surface in open bodies such as streams, rivers, ponds, lakes, and oceans).

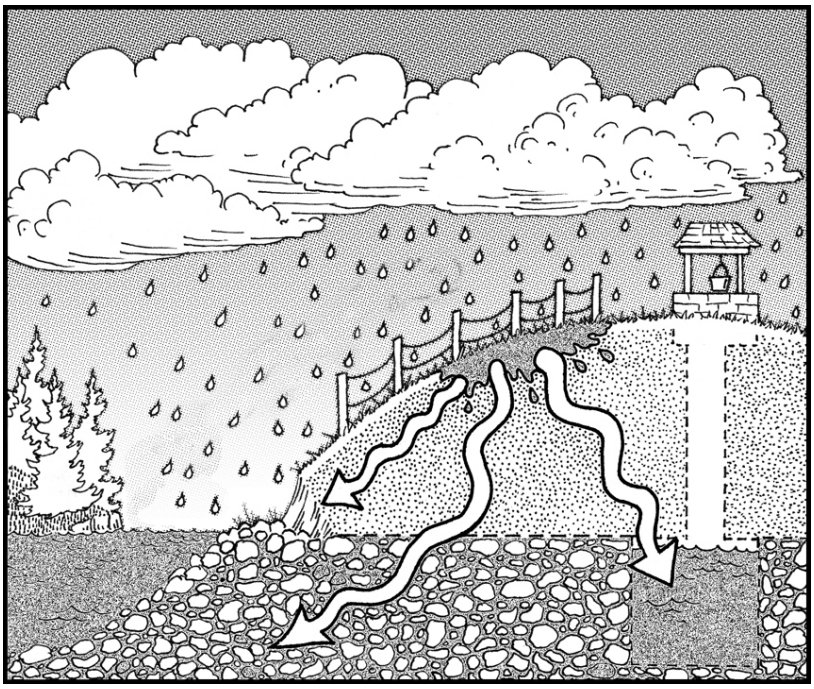
**Groundwater** is found below the surface of the earth, generally saturated in zones of rock, sand, or gravel. Such zones are known as aquifers. The water table is the level below which all the spaces are filled with water. The water table can be near the surface or at depths of hundreds of feet. Much of the water used for consumption by livestock and people comes from groundwater and, if contaminated, associated negative effects can persist over a long period of time.

## Contamination

A pesticide can enter surface water and groundwater in several ways:

- natural processes, including runoff, leaching, and erosion;
- spray drift and/or vapour drift during application;
- using an application rate higher than is recommended on the product label;
- pesticide spills during transportation, mixing and loading, storage, application, or disposal;
- container leaks and/or flooding while pesticides are in storage; and
- improper disposal of excess spray mix, unwanted waste pesticides, and pesticide containers.

You should understand that once water is contaminated, organisms living in or using the water can be affected. These can include humans, domestic animals, fish, plants, birds, wildlife, insects, etc. Contaminated water can affect them directly (contact or drinking) or indirectly (impact on food supplies or recreational activities). It is difficult (often impossible) and very expensive to decontaminate ground and/or surface water.



**Pesticides can move in the soil and contaminate surface and groundwater**

## Pesticides in Soil

You should be aware that soil can be contaminated in the same way as water. This can be the result of:

- a spill associated with mixing and loading;
- improper disposal of a pesticide mixture or container; or
- exceeding the label-recommended rate of application.

## Contamination

Soil contamination can be short lived or last for a long time depending on how quickly a pesticide is inactivated by biological, chemical, or physical means. The following factors can affect the persistence of a pesticide in the soil:

- chemical class or family;
- type of formulation;
- strength (concentration) of formulation;
- ability to form persistent byproducts;
- weather conditions; and
- soil conditions (e.g., organic matter, pH, texture).

Breakdown is slowest under dry, cool conditions.

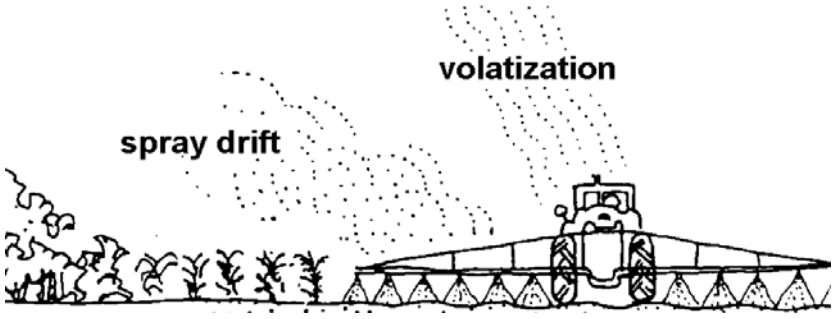
## Persistent Pesticides in the Soil

Vendors should be prepared to advise their customers that although highly persistent herbicides are advantageous in cases where long-term vegetation control is needed (e.g., the management of vegetation on rights-of-way and industrial sites), they must be used with care since there is a greater chance of off-site movement through leaching and erosion. Applicators should also be aware that damage to trees some distance from the treatment area can occur.

**Highly persistent herbicides or insecticides can limit future uses of a property. Persistent products have a greater chance of contaminating the environment, and may damage sensitive or susceptible crops planted the following season.**

## Pesticides in Air

As a vendor, you should inform your customers that spray droplets, dust, mists (spray drift), or vapours (vapour drift) can be added to the air during the application of a pesticide.




**Spray drift and vapour drift**

## Contamination

Once in the air, a pesticide can be transported to water bodies, non-target organisms, or the soil. It can also be concentrated within enclosed spaces and harm applicators, bystanders, or non-target organisms.

## Pesticide Impact on Natural Ecosystems

The careless or needless use of a pesticide can alter or destroy an ecosystem.

### Animals

Wild or domestic animals, including birds, can be harmed by numerous pesticides. As a worst case they can die from direct exposure to a product. Due to the accumulation of pesticides in their tissues, they can also suffer adverse weight loss, reproductive failure, or be unfit for human consumption. Contaminating nests, dens, or burrows; destroying wildlife habitat; or destroying their food supply can also harm animal and bird populations. Soil organisms can be harmed by pesticides in the soil.

You should understand how a pesticide can negatively impact animals and be prepared to advise your customers to:

- be sensitive to the presence of wildlife and their young;
- read and follow all pesticide label information;
- use a pesticide only when necessary;
- select the least toxic and least persistent of the registered and recommended pesticides;
- use a target-specific pesticide to minimize impact on desirable organisms;
- be aware of the effects that granular pesticides and treated seed can have on wildlife, and ensure that such products are properly used and stored;
- avoid using products that are known to move away from the area of application through drift or runoff; and
- leave buffer zones around sensitive areas.

## Beneficial Insects

Pollinators (bees), insect predators, parasites, and decomposers are a beneficial part of the natural ecosystem and can help to naturally control pest populations.

The widespread use of a non-selective insecticide can kill beneficial insects as well as target pests. If the number of beneficial insects is decreased, the natural balance is upset and surviving pests can quickly increase in number.

You should be aware of the role that beneficial insects play in the natural ecosystem, and be prepared to discuss this with your customers. Negative impacts can be decreased by:

- minimizing pesticide use;
- choosing the pesticide least harmful to beneficial insects;
- not treating the edges of treatment sites, thereby providing for areas where insect predators can take shelter; and
- minimizing drift onto areas that house beneficial insects.

## Pollinators

You should also be prepared to assist your customers to protect bees, which are a special group of beneficial insects,

and essential for the survival of many plants. An applicator can help protect bees by:

- 
- letting nearby beekeepers and local beekeeper associations know when hazardous pesticides will be applied;
- not applying pesticides that are toxic to bees on blooming crops;

- mowing cover crops and weeds to remove blooms prior to spraying;
- applying pesticides later in the evening when bees are more likely to be in the hives;
- selecting a pesticide product that is least harmful to bees; and
- taking necessary steps to minimize spray drift and vapour drift.

## Fish and Other Aquatic Organisms

Fish and other aquatic organisms can be harmed when a pesticide enters the surface water. This can happen through drift, runoff, soil erosion, leaching, or the deliberate or careless release of a product.

**Fish can be harmed indirectly if a pesticide destroys food sources, disrupts their ability to reproduce or feed, or damages aquatic vegetation, thereby resulting in a loss of protection or an increase in the water temperature.**

Selected pesticides (e.g., pyrethroids) are known to be very toxic to fish and aquatic organisms, and all carry special warning notices on their labels.

Fish and aquatic organisms can be negatively impacted by pesticides. You should understand that fish can be protected if pesticides are prevented from directly or indirectly contaminating water sources. Always advise your customers to:

- use the correct pesticide application rate;

- frequently calibrate and maintain application equipment;
- observe buffer zones during tank filling or mixing and application;
- avoiding spraying in high winds and just prior to rain;
- fill the sprayer away from water bodies and to use a nurse tank. (Make a habit of bringing the water to the sprayer rather than the sprayer to the water source.);
- prevent the back flow of contaminated water through the filler hose into the water supply. (Keep the end of the filler hose above the water level in the spray tank at all times, never leave the tank unattended, and use an **anti-backflow device** (e.g., spring-loaded check valve); and
- wash and/or park spray equipment away from a well, steam, lake, or the ocean.

**People who damage fish or fish habitat as a result of pesticide use can face prosecution and severe penalty under the federal *Fisheries Act.***

## Plants

Chemicals that damage or injure plants are said to be phytotoxic, and injury can occur to both target and non-target plants.

Most pesticide damage is caused by herbicides. However, in some cases the damage to non-target plants can result from the use of an insecticide or fungicide. As a vendor, you should be aware of any possible non-target sensitivities noted on a pesticide label. You should also advise your customers to protect non-target plants by taking steps to prevent the movement of pesticides onto non-target areas.

## Additional Information Sources

As a vendor, you should make your customers aware that more information can be obtained on pesticides and the environment by contacting:

- qualified extension specialists;
- pesticide suppliers or manufacturers; and
- the provincial regulatory authority.

# Transportation, Display, Storage, and Disposal 7

## Introduction

To minimize risk to you, your customers, and the environment, pesticides must be transported, stored, displayed, and disposed of properly. As a vendor, you must handle pesticides responsibly. You should also take every opportunity to encourage your customers to do the same.

## Learning Objectives

Completing this chapter will help you to:

- Transport pesticides safely
- Store and display pesticides safely
- Properly dispose of empty containers and unwanted pesticide

## Transportation

### Federal Legislation

There are no federal laws that regulate the transport of a domestic pesticide. To properly transport domestic pesticides always follow basic safety guidelines.

### *Transportation of Dangerous Goods Act*

Transportation of Commercial and Restricted Class (non-Domestic) pesticides are regulated by the *Transportation of Dangerous Goods (TDG) Act*. This legislation is the responsibility of Transport Canada, but it has also been adopted and administrated under provincial legislation. Vendors should consult the provincial pesticide regulatory authorities for details.

### Other Requirements

In all other situations, consult appropriate provincial

regulations to find out whether some or all of the following items are needed.

**1.** Shipping documents, which indicate the shipper, receiver, technical shipping name, product classification, product identification number (P.I.N), degree of hazard, and emergency telephone numbers.

**2. A hazard warning label** on every pesticide package.

**3. Placards** with product identification numbers and symbols on the outside of vehicles (not required when carrying less than 1,500 kg of a product on a vehicle licenced as a farm vehicle, other than pesticides that are explosive or produce a poisonous or flammable gas) (*See* Figure 7.1 for details.)

**4.** Appropriate packaging of dangerous goods during transport.

**5. Training of persons** involved in the transport of dangerous goods.

**6.** Reporting of accidents that represent a danger to health, life, property, or the environment.

All companies that handle pesticides for manufacturing, formulating, or wholesale and all commercial pesticide applicators that transport pesticides from storage areas to application sites or to other storage sites should be familiar with the requirements for the specific pesticides they handle.

Classes and quantities of dangerous goods that require special handling and transport procedures are identified in the *Transportation of Dangerous Goods Act* Regulations. Some pesticide products are included in those classes of dangerous goods known as "gasses" (Class 2), "flammable liquids" (Class 3), "poisonous substances" (Class 6.1), or "products hazardous to the environment" (Class 9.2). ( *See* Figure 7.1.)

The transport of non-Domestic pesticides may also be regulated by individual provinces. Vendors and purchases should familiarize themselves with the legal requirements of their province. ( *See* Chapter 2, Pesticide Legislation, for details.)

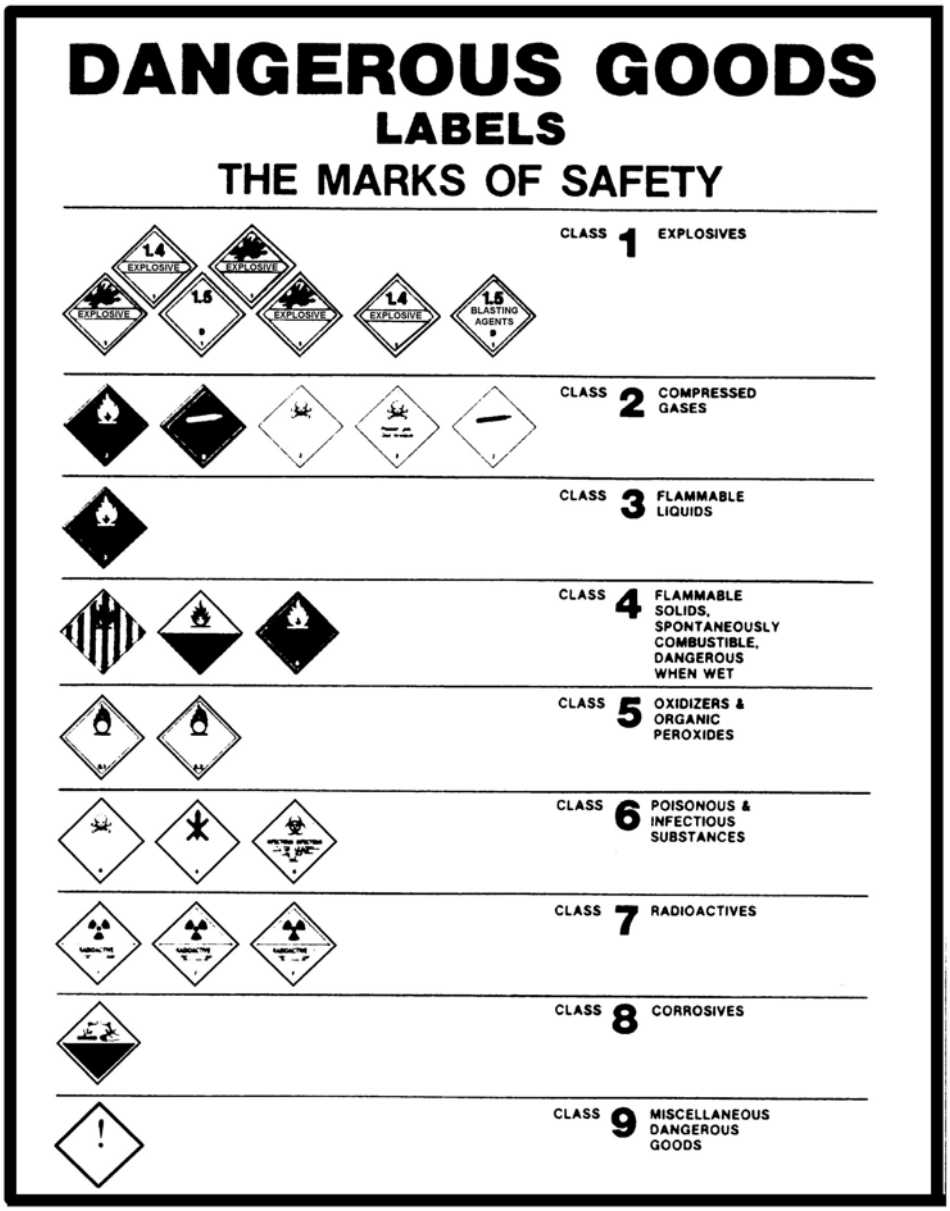



**Figure 7.1 Classification of Dangerous Goods**

## Exemptions from *TDG Act*

Pesticides are exempt from some federal and provincial requirements for dangerous goods, but only in the following situations. :

- *TDG Act* Regulations do not apply to pesticides in a quantity less than or equal to 1,500 kg gross mass in transport on a road vehicle licensed as a farm vehicle if:
  (a) the pesticides are transported solely on land for a distance less than or equal to 100 km; and
  (b) are to be or have been used for agricultural purposes.

- *TDG Act* Regulations do not apply to pesticides in a quantity less than or equal to 3,000 kg gross mass in transport on a road vehicle if:
  (a) the pesticides are transported solely on land between a retail outlet and the residence of the purchaser or the place of use for a distance less than or equal to 100 km; and
  (b) are to be or have been used for agricultural purposes.

- Documentation, placarding, and special training under *TDG Act* Regulations, are not required to a solution of pesticides in transport on a road vehicle if:
  (a) the pesticides are transported solely on land for a distance less than or equal to 100 km;
  (b) the pesticides are in a means of containment that has a water capacity less than or equal to 6 000 L, and is used to prepare or apply the pesticides.

**NOTE: These are the <u>only</u> situations under which an individual does not have to follow the *Transportation of Dangerous Goods Act* Regulations.**

**There is NO EXEMPTION if the pesticide being transported is classified as an explosive, or a poisonous or flammable gas (e.g., methyl bromide).**

## Provincial Legislation

Under the provincial *Pesticides Control Act* and regulations, it is illegal to transport a concentrated pesticide in, or on, a vehicle together with commodities that are:

- foodstuffs, feeds, or any other material intended for consumption by humans or animals;
- household furnishings; or
- toiletries, clothes, bedding, or similar commodities.

unless the pesticide being transported is separated from these commodities in a manner sufficient to prevent their contamination or likely contamination by the concentrated pesticide.

## General Guidelines for Transporting a Pesticide

To promote the safe transport of pesticides and to minimize exposure, you should:

- Carefully inspect each pesticide container before selling it to a customer and make sure that the container is not damaged or broken
- Make sure that liquid containers are not leaking and that the caps are tight
- Make sure the container is packed securely and in an upright position
- Make sure the approved label is in good condition, and on all containers
- Advise your customers to transport any pesticide separate from food, pet or animal feed, fertilizer, clothes, or household items
- Place all pesticide containers in an enclosed compartment that is securely affixed to the vehicle; never place them in the cab or passenger area.
- Advise the customer if there are specific requirements for placarding.

- Advise the customer that pesticide products must not be left unsupervised in a vehicle unless:
  - the vehicle is in a place not accessible to the public;
  - the pesticide is locked in an enclosed part of the vehicle (but not the cab or passenger area); or
  - the vehicle has a placard which says, “Chemical Storage Warning - Authorized Persons Only”.
- When offering a delivery service, make sure all employees handling pesticides are trained and know the transport requirements for the product, that the contingency plans for accidents and spills are in the vehicle, and that the vehicle is equipped with a fire extinguisher and spill recovery kit.
- Make sure paper and cardboard containers are protected from moisture

## Display

### Self Select Domestic Pesticides

All vendors must ensure that self select domestic pesticides are displayed so that:

- They present a minimal hazard to children
- They are not adjacent within 1 metre of commodities that are foodstuffs, feeds, or any other material intended for consumption by humans or animals
- They are not adjacent within 1 metre of commodities that are household furnishings; or toiletries, clothes, bedding or similar commodities

### Controlled Purchase Domestic Pesticides

The holder of a Domestic Pesticide Vendor Business Licence must ensure that they display controlled purchase domestic pesticides so that:

- No person other than the licensee or the licensee’s employees has ready access to the pesticides
- They present a minimal hazard to children
- They are not adjacent within 1 metre of commodities that are foodstuffs, feeds, or any other material intended for consumption by humans or animals

- They are not adjacent within 1 metre of commodities that are household furnishings; or toiletries, clothes, bedding or similar commodities

### Non-Domestic Pesticides

The holder of a Non-domestic Pesticide Vendor Business Licence must ensure that those non-domestic pesticides that are allowed on display, are displayed so that:

- No person other than the licensee or the licensee's employees has ready access to the pesticides
- They present a minimal hazard to children
- They are not adjacent within 1 metre of commodities that are foodstuffs, feeds, or any other material intended for consumption by humans or animals
- They are not adjacent within 1 metre of commodities that are household furnishings; or toiletries, clothes, bedding or similar commodities

## Storage

Proper storage of a pesticide by you and your customers can:

- prevent cross contamination with other products;
- minimize clean up cost from a spill or fire involving a pesticide;
- help to protect employees, the general public, emergency responders, pets, and the environment; and
- extend the shelf life of a pesticide.

## Provincial Legislation

As a vendor, you must follow all provincial legislation governing the storage of a pesticide.

### Storage of Self Select Domestic Pesticides

Self select domestic pesticides must be stored so that:

- They present a minimal hazard to children
- They are not adjacent within 1 metre of commodities that are foodstuffs, feeds, or any other material intended for consumption by humans or animals

- They are not adjacent within 1 metre of commodities that are household furnishings; or toiletries, clothes, bedding or similar commodities

## Storage of Controlled Purchase Domestic Pesticides

A company that holds a Domestic Pesticide Vendor Business License must store all controlled purchase domestic pesticides such that:

- only the license holder and his/her certified employees have ready access to the (indoor or outdoor) storage area and the pesticides stored therein;
- appropriate WARNING, AUTHORIZED PERSONS ONLY, and PESTICIDE STORAGE signs are prominently displayed on the outside of each door providing access to any indoor storage area and in close proximity to any outdoor storage area;
- the storage area has no floor drains leading to a storm sewer, sanitary sewer, or watercourse;
- recommended respiratory and personal protection equipment are kept near the area and readily available for emergency purposes; and
- pesticides are not stored adjacent within 1 m of human food, animal feed, household furnishings, personal toiletries, clothes, bedding, or other similar commodities.

Indoor storage areas must be properly vented to the outside environment.

## Storage of Non-Domestic Pesticides

A company that holds a Non-domestic Pesticide Vendor Business License must store all non-domestic pesticides only in a Phase III approved storage facility.

### Phase III Certified Pesticide Storage Facility

A Phase III certified pesticide storage facility is a facility that is in compliance with the requirements of the Agrichemical Warehouse Standards Association (AWSA), under Crop Life

Canada. These standard apply to all sites in Canada that store non-domestic plant protection products

This industry-managed program is regulated through the Agrichemical Warehouse Standards Association. Licences are renewed every 2 years, following approval from qualified auditors.

Specific requirements for meeting the standards can be found in the Warehouse Audit Protocols and User Guide (January 2006). Copies can be obtained by writing: AWSA Project Management Office, 296 Jarvis Street, Unit 7, Toronto, ON M5B 2C5.

## Good Practice Guidelines for Pesticide Storage

In addition to legislated requirements for the storage of a pesticide, facility managers should:

- read and follow storage instructions on pesticide labels and MSDSs;
- store pesticides only in their original container/packaging and with the original label intact;
- store pesticides in a dry area;
- check containers regularly for leaks, tears, rust, or loose lids;
- keep an inventory of the quantity, type, and age of the pesticides in storage. Keep this list up-to-date, handy, and outside of the storage site;
- have adequate lighting so products are easily recognized;
- keep containers/packages upright and off the floor;
- have areas in and around the storage site posted as **"no smoking"** areas;
- provide the local fire department with a copy of the site map, a list of products that might be stored, and the MSDSs as requested;
- invite the local fire department to visit the site;
- keep emergency response equipment near (but not in) the storage facility;
- at all times keep access routes to/from the site clear for emergency equipment;

- keep a list of emergency telephone numbers (e.g., fire department, medical personnel, and poison control centres) posted near the storage area;
- follow all federal/provincial Building, Fire, and Electrical Codes;
- follow the manufacturer's suggested stacking heights, and make sure that stacked tiers are stable and secure;
- keep enough space between rows to permit a visual inspection of containers for corrosion and leaks;
- never refuse a shipment of damaged goods. Secure damaged containers and follow procedures for the disposal of unwanted pesticide. Decontaminate the transport vehicles/equipment and other containers; and
- keep Material Safety Data Sheets, technical bulletins, product labels, and other information up-to-date and readily available for customers and all employees. (*See* Chapter 3: Labelling, for additional information on MSDSs.)

**Storage Facility**

## Bulk Storage

On a regular basis, vendors should check all pumps, valves, etc., located on bulk pesticide storage containers and immediately replace damaged or worn parts. Make sure that all bulk storage tanks have dikes or retaining walls and an impervious base to collect any pesticide in the case of a spill.

Ensure also that all liquid transfer systems are designed to prevent overflow while filling operations are under way, and have a system to contain and dispose of tank and pump washing water.

### Temporary Storage

Many of the principles that apply to permanent pesticide storage facilities would also apply to temporary storage facilities. Vendors and customers must follow provincial regulations or requirements.

## Disposal

### Disposal of Waste or Unsold (vendor) Pesticide

From time to time you can have unwanted pesticide concentrate that requires disposal. The preferred option is to return the product to your distributor or the manufacturer. If the pesticide must be destroyed, contact your provincial pesticide regulatory authority for proper direction.

You may also find that as a result of damaged containers or spill cleanups that you have waste pesticide that requires disposal. Chapter 10: Emergency Response provides direction on the safe clean up of spilled pesticide. While waiting to properly dispose of this product, you should:

- cover all drums containing pesticide materials and label each with the wordings “Danger - spilled pesticide” or “DANGER" and the name of the pesticide;
- consult appropriate provincial/industry authorities for advice on proper disposal, and a licensed hazardous waste disposal company to arrange for pick-up and disposal. Remember to follow all requirements under Canada’s *Transportation of Dangerous Goods Act* regarding proper transport and disposal documentation.

**Never take drums to a garbage dump unless authorized to do so by staff of the PEI Pesticide Regulatory Program.**

## Disposal of Waste (customer) Pesticide

As a service to your customers, you may choose to accept and store unwanted pesticide. To minimize the accumulation of unwanted or excess pesticide, you should advise your customers to:

- plan their pesticide needs carefully;
- purchase only the amount of pesticide required to do the treatment;
- take an inventory of pesticide remaining at the end of each season;
- and use this old inventory before purchasing new pesticide.

You should also be prepared to assist your customers:

- in calculating the amount of pesticide required to complete a treatment (*See* Chapter 9: Pesticide Application);
- by reminding them that the safest way to dispose of a pesticide is to use it according to label directions;
- by taking back unopened pesticide containers; and
- by advising them to follow label directions for proper methods to dispose of unwanted product.

## Disposal of Surplus Tank Mixture

Vendors should remind customers to make every attempt to minimize the amount of excess product left in the spray tank at the end of a treatment. Vendors may be asked to assist customers in determining the total amount of product required to do a treatment, how to accurately measure the area to be treated, or how to calibrate the application equipment.

Product left in the tank at the end of an application should be applied according to label directions on another site that requires an application of this pesticide.
Customers should contact their appropriate pesticide regulatory authority for more information on product disposal.

**A customer must NEVER re-spray the treated area with undiluted spray mix. Spraying an area twice will DOUBLE THE RECOMMENDED PESTICIDE APPLICATION RATE.**

## Disposal of Empty Domestic Pesticide Containers

You, and your customers, should be familiar with how to properly dispose of empty domestic pesticide containers. Remember:

- To read the label and follow all precautionary statements
- That a pesticide container must not be used for anything other than the original intended purpose
- That, before disposal, pesticide containers must be clean, triple rinsed, and contain no liquid material
- That cleaned containers can be wrapped in newspaper and placed with regular domestic garbage

## Disposal of Empty Non-Domestic Pesticide Containers

Vendors should contact their appropriate provincial regulatory authority for information on the proper method of disposal for empty pesticide containers, and be prepared to advise customers to read the label and follow all precautionary statements.

In Prince Edward Island the recommended way to dispose of empty, rinsed, plastic pesticide containers is to return them to an authorized pesticide vendor for recycling.

**Vendors should advise their customers that it is a violation of both provincial regulations and industry guidelines to use empty pesticide containers, including large plastic drums, for anything other than their original intended purpose. Such drums should not be used or sold as garbage cans, flotation devices, etc.**

## Container Recycle Program

Most licensed pesticide dealerships accept plastic containers during normal business hours. Containers must be clean, rinsed (triple or jet), and contain no liquid material.

Container lids must be removed and, if possible, pesticide labels should also be removed. Dealer personnel must inspect each container to make sure that it is acceptable for recycling. Containers collected in the Maritime Region are chipped, and the plastic chips are shipped to be made into products such as plastic fence posts.

**A plastic fence post made from recycled containers is a better gift to future generations than are containers abandoned throughout the natural environment.**

## Rinsing of Pesticide Containers

You should advise your customers that once the last of a pesticide has been applied or added to the application equipment, the empty container should be rinsed **(triple rinsing for plastic or metal containers, and a single rinse for bags with plastic or foil liners)** to remove any remaining product. Even after rinsing, trace amounts of a pesticide can remain. All containers should be punctured or crushed so that they cannot be used again for any other purpose.

## Burning of Pesticide Containers

You should advise your customers that the burning of plastic containers or other hazardous substances is prohibited by law within Prince Edward Island. Low-temperature burning generally does not destroy remaining pesticide, but rather results in it being vaporized. The vapours can then drift to other areas, posing a hazard to public health and the environment. Breathing the smoke from these fires can be harmful.

## Burying of Pesticide Containers

The burying of empty pesticide containers, even if they have been properly rinsed, is also legally prohibited within the province. While properly rinsed containers pose little environmental threat, their decomposition rate is very slow. A plastic container can take several centuries to break down.

# Pest Management 8

## Introduction

The goal of pest management is to manage pests effectively, economically, and safely. Pest management typically involves the suppression of pest numbers to an acceptable level. It does not involve eradication, or the total elimination of a pest population.

**As a vendor, you should be able to provide advice to your customers with respect to the nature of the pesticides you sell.**

**You should also be able to interpret the information on a pesticide label.**

**You are discouraged from recommending pest control strategies, or specific pesticides, to customers UNLESS you otherwise qualify as a pest control specialist.**

## Learning Objectives

Completing this chapter will help you to:

- Understand and apply the elements of integrated pest management (IPM)
- Understand the various types of pests
- Understand the various types of pesticides
- Manage pesticide resistance

## Integrated Pest Management (IPM)

In Canada, the Expert Committee in Integrated Pest Management proposed the following definition of IPM in 1995:

> **"Integrated Pest Management (IPM) is a decision making process that uses all necessary techniques to suppress pests effectively, economically, and in an environmentally sound manner."**

IPM does not attempt to eliminate all pests. By using methods that have the least potential to harm people and the environment, IPM tries to reduce a pest population to the level where the damage or the nuisance is acceptable. As a vendor, you should encourage your customers to use an integrated pest management approach to address their pest problems.

Some of the immediate benefits of IPM include:

- enjoying more cost-effective pest control;
- slowing the development of pest resistance; and
- reducing dependence on one type of control.

IPM also addresses consumer and government concern about the careful use of pesticides. Consumer fears are now limiting pesticide use, and this trend is likely to accelerate unless the public believes that pesticides are being applied in a responsible manner.

## Elements of IPM

There are six elements in a typical IPM program. These include:

1. **Pest Prevention**: Pest problems are minimized through careful planning and site management.
2. **Pest Identification**: Pests and beneficial organisms are identified.

3. **Pest Monitoring**: Pest and beneficial organism populations are monitored (counted). The extent of damage caused by the pest is also assessed.
4. **Injury and Action Thresholds**: Injury and action thresholds are used to decide when to undertake pest control measures.
5. **Selection of Management Methods**: Management methods or treatments are assessed. These can include cultural, biological, physical, mechanical, behavioral, or chemical methods. The goal is to adequately control pests with minimal impact on the environment.
6. **Evaluation**: The effectiveness of pest management activity is assessed.

## Pest Prevention

1. **Pest Prevention** is important because avoiding pest problems is often more economical and gives better and longer-term results than does relying on treatments. Reducing pest problems through preventative steps also makes any pest treatments undertaken more effective, if indeed they are required. Cultural or physical control methods could be considered preventative. This would include selecting disease- or insect-resistant plants, managing growing conditions to produce healthy plants, cleaning to eliminate food sources for pests, or screening buildings to keep out pests.

## Pest Identification

2. **Pest Identification**, which involves the correct identification of pests, minimizes the chance that beneficial species will be mistaken for problem ones.

   If an unknown pest is causing a problem, then it should be identified BEFORE a customer undertakes activity to control it. The key to planning a successful pest control program involves knowing the life cycle of the pest and the conditions that favour its development.

Similarly, proper identification can indicate when treatments are not required (e.g., if certain beneficial species are present in sufficient numbers).

Learning about the pest will help your customers:

- plan an effective prevention program;
- know what to look for and where to look to assess a problem; and
- apply controls at the right time and place to be most effective.

If you or your customer cannot identify a pest, help should be obtained so that a correct identification can be made. Information on pest and beneficial species identification and biology are available from:

- government or scientific publications;
- government or other diagnostic services, including pest monitoring service firms;
- pest control representatives (e.g., pest management firms, technicians, pesticide company sales/technical reps, etc.);
- government pest management specialists;
- universities and colleges; and
- local Internet or other electronic references.

*Reference information only*

*Knowledge of the biology of pests and beneficial species will help when making management decisions. Important biological information includes the following:*

- *knowing the life cycle and stages of growth of the pest allows treatments to be made when the pest is most susceptible (there may only be a very short window of time during which a treatment will be effective);*
- *knowing how rapidly the pest species reproduces helps determine the timing and number of treatments;*

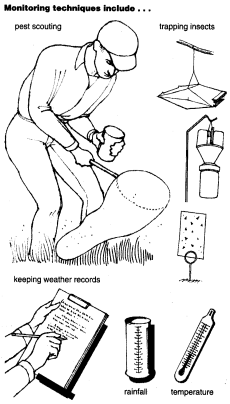
- *knowing how rapidly beneficial species reproduce helps in deciding whether treatments may be required;*
- *the life cycle of the host may be important since certain treatments can harm the host if applied at the wrong stage; and*
- *the behaviour of the pest may influence the timing or choice of a treatment (e.g., the pest may only be present at certain times of the day or night or in certain locations).*

## Pest Monitoring and Field Scouting

**3.** **Pest monitoring and field scouting are** a vital part of IPM. When making pest management decisions, proper monitoring can provide information about pest populations and sites (e.g., the need for treatments and when they will be most effective).

### Pest Monitoring

As a vendor, you should advise your customers that in the Atlantic Region provincial and federal agencies conduct pest monitoring programs for specific pests in important crops. They frequently issue status reports and predict infestation levels to assist producers to make pest management decisions. The nature of the monitoring program varies with the pest and the crop involved.




**A good monitoring program can :**

- significantly reduce the need for treatments;
- improve the success of pest management programs; and
- reduce treatment costs.

You should advise your customers to do regular inspections to find out the extent of a pest problem. Regular inspection can also indicate whether a problem is getting better or worse. A basic monitoring program will involve a regular (daily or weekly) visual inspection, coupled with the taking of notes. Plant damage might indicate that the pests that caused the

damage are gone. In this case a treatment will not be required. Therefore, even a small amount of time spent by your customers on monitoring can pay off by showing whether or not there is still a need for treatment.

Sampling tools to aid with monitoring, such as insect traps, sticky boards, etc., are available. You should advise your customers to make frequent, close, visual examinations to:

- detect problems while pest numbers are still low and easier to control;
- assess the size of the pest population and the extent of damage;
- identify beneficial organisms present;
- identify conditions that contribute to the pest problem; and
- determine whether control treatments are working.

*Reference information only*

*Monitoring consists of making regular inspections and writing down the results (making records). Monitoring includes checking, and often counting, to determine:*

- *pest damage;*
- *pest presence, species, and abundance (does the pest population exceed the injury threshold?);*
- *weather conditions (do they favour pest development, such as diseases?);*
- *the pest's life stage (is it at a stage susceptible to a particular management method?);*
- *the host's stage and condition (is it suitable for the management action being considered?); and*
- *beneficial organism presence, species, and abundance (are there enough to keep the pest population below the injury threshold?).*

*In addition to monitoring for the pest itself, it is important to also monitor the presence of beneficial predator and/or pollinator insects and to record (or have ready access to) local weather conditions. The presence of large numbers of beneficial predators is a key consideration when making decisions about insecticide applications. Likewise, the presence and activity of pollinators should be confirmed so that the most appropriate insecticide can be chosen and the application timed to minimize harm to the beneficial species.*

*Daily weather patterns, especially temperature, rainfall, and humidity, can have a significant impact on the spread and virulence of plant pathogens, so accurate weather records are very useful in predicting the seriousness of disease outbreaks and making decisions about fungicide applications. On a seasonal basis, weather also plays a role in determining the development of insect and weed infestations.*

## Field Scouting

Informed decisions about the application of pest management measures in a particular field require careful and timely monitoring within the field itself. Traditionally this has often done by the farmer, but more and more frequently producers are coming to rely on the services of professionally trained crop scouts to carry out this task and to provide recommendations on necessary control measures when they are warranted.

As a vendor, you should be aware of field scouting services available within your region, and be prepared to advise your customers of the services offered for the crops grown.

*Reference information only*

*Careful and appropriate scouting of a field is essential to gain an accurate picture of the pest problem and to estimate its potential severity. Specific scouting techniques vary considerably, depending upon the crop, the pest, and their stages of development.*

***Scouting for weed pests***

*The goal is to assess the severity of known weed species and to provide early warning of new species that may be invading. When scouting for the latter, note species present in field margins and other adjacent non-cropped areas. Scout fields in advance of potential herbicide application windows (pre-seeding, early post-emergent, pre-harvest, post-harvest, late fall).*

***Scouting for insect pests***

*The goals are to identify the insects present in order to determine which, if any, may present a problem and to assess their numbers and the extent of damage already caused. Assessments may be based on insect numbers and the stage of insect/crop development or the extent of crop damage, depending on the species. Assess populations of highly mobile insects by estimating their number per square metre. Insects with limited mobility can be counted by pulling plants and shaking the insects off onto the ground or a small ground sheet. Sampling for small, mobile, difficult-to-see insects is best done with a sweep net. Infestations can be estimated indirectly by examining roots, crowns, leaves, stems, and seeds for signs of insect damage. Pheromone, light, or stick traps are used to trap adult insects and the results used to estimate the potential damage that may be caused by the next generation.*

***Scouting for diseases***

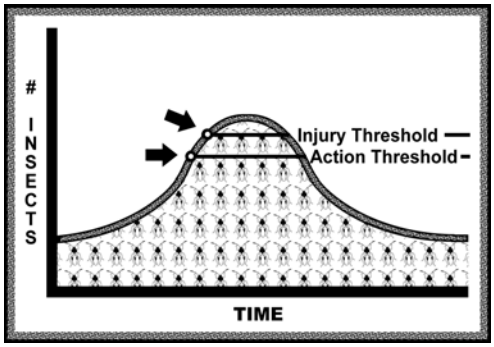
*Great care must be taken in the gathering of samples so that a disease is not further spread to other areas of the field. Many factors can cause plant reactions that resemble disease symptoms. Examine roots, crowns, stems, leaves, fruits, and seeds for symptoms. In many cases, only a qualified diagnostic lab can make accurate diagnosis. Where seed- borne diseases are a concern, a sample of each seed lot should be submitted to an accredited seed diagnostic laboratory to determine the level of infection.*

## Injury and Action Thresholds

**4.** **Injury and action thresholds** are used to decide when to apply control treatments.

The **injury threshold**, sometimes called the injury level, occurs when a pest population reaches numbers such that it causes unacceptable, nuisance, injury, or damage sufficient to justify treatment.

The **action threshold**, sometimes called the treatment threshold or action or treatment level, is the point at which treatment should take place in order to prevent the pest population from reaching the injury threshold.




**Action and Injury Thresholds**

Deciding when to take action and apply a treatment is based on information obtained by regularly monitoring the pest situation. The key idea is that treatments are made only when and where monitoring shows they are needed. They are not made on a pre-set schedule. This also helps to ensure that a pesticide will not be used just because it is a certain time of year.

To establish injury and action thresholds, pest managers can access information available from:

- government and scientific publications;
- pest management specialists;
- universities or colleges; and
- grower organizations.

## Management Methods

**5.** IPM involves using all available information to select **the best management methods** and then apply them in a co-ordinated approach. As a vendor, you should advise customers that specific information about management methods for different pests is available through extension specialists, government publications, colleges, and universities. Most treatments fall into the following general methods:

**Cultural method -** includes treatments that can prevent pests from developing or spreading. They typically disrupt the pest or host life cycle, or make the environment less favourable for survival of the pest. Your customers can apply cultural methods by:

- rotating crops;
- tilling the soil;
- providing optimum growing conditions;
- implementing sanitation practices;
- removing food or shelter for the pests; and
- planting genetically improved or pest-resistant varieties.

An example would be to only plant certified seed that has been proven to be able to resist diseases or to do crop rotation.

**Legal method** - laws may limit the development of pest populations by restricting human activities (e.g., quarantine, import/export of plant material, etc.).

**Mechanical/physical method** - includes treatments that use equipment, devices, or the manipulation of environmental factors such as temperature and humidity to prevent the spread of pests or reduce pest populations. This category includes the use of mechanical cultivators, mowers and brushing equipment, traps, screens, vacuums, freezing, heat applicators, and sound and other repellent devices.

**Biological method** - includes treatments that use living organisms to control or kill the pest. Biological treatments include:

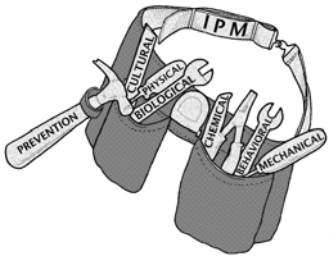
- introducing predators, parasites, or micro-organisms to attack pests;
- conserving naturally occurring predators and parasites; and
- using grazing animals to consume weeds.

The use of parasites or predators involves careful planning since these are effective only at certain locations and times. They can also have an impact on plant or animal species that are not pests.

**Genetic method** - involves the protection of the host and/or control of the pest by using organisms having special genetic traits (e.g., resistance to disease).

**Behavioural method** - includes treatments that take advantage of a pest's natural behaviour to suppress the population. These include using natural pheromones (which are chemicals produced by insects to repel or attract other insects of the same species) to disrupt mating patterns or to attract pests to a trap, or releasing sterile males to inhibit pest reproduction.

**Chemical method** - includes treatments that use naturally derived or synthesized pesticides to kill, attract, repel, or alter the growth of pests.




**Selection of Management Methods**

## Pesticide Types

If the applicator has chosen chemical control, the following are some terms that should be understood.

**Selective pesticides** are toxic to some pests, but have little or no effect on other pests or non-target organisms.

**Non-selective pesticides** are toxic to a wide range of pests, beneficial species, and other non-target organisms.

**Residual pesticides** continue to be effective on a treated surface or in the treated area for an extended period following application (long-term control).

**Persistent pesticides** remain active in the environment for a long time. Sometimes they can accumulate in animal or plant tissues.

**Non-persistent pesticides** do not remain active in the environment for more than 1 year.

## Evaluation of Results

**6.** **Evaluation** is necessary to assess the effectiveness of a pest control treatment. Evaluation involves:

- making post-treatment observations on pests and non-targetorganisms;
- comparing post-treatment observations with pre-treatment monitoring records to determine treatment effects;
- reviewing treatment records, including methods, dates, times, rates, costs, etc.;
- obtain feedback from clients or site users, if possible, about treatment effectiveness; and
- identifying any possible improvements to pest management, including preventative actions that could be taken.

# Pest Types

## Weeds

A weed is a plant that grows where it is not wanted. Weeds become a pest when they:

- compete with cultivated plants (e.g., potatoes, cereal grains, vegetables, lawn grass) for light, water, and nutrients;
- reduce crop yields;
- harm people, pets, or livestock;
- are alternate hosts for other pests;
- are aesthetically unpleasing; or
- affect structures or equipment.

## Weed Types

**Annual weeds** complete their life cycle within 1 year. This means that in 1 year, they will germinate from a seed, grow, flower, produce more seeds, and then die. Most annuals produce many seeds to ensure their survival. Annuals can be divided into two main groups; summer annuals that germinate in the spring, and winter annuals that germinate in the fall.

**Biennial weeds** live more than 1 year but less than 2 years. They grow from seeds that typically germinate in the spring. The first year they store food, usually in short fleshy roots, and produce only leaves. The following season the plant uses the stored food and grows vigorously, produces seeds in the summer or fall, and then dies.

**Perennial weeds** live more than 2 years. Often no seed is produced the first year; thereafter seeds can occur every year for the life of the plant. Almost all perennial weeds spread by seed. Many also spread via other plant parts such as creeping stems; rhizomes (a root-like underground stem); underground bulbs; or a broken piece of root. Perennial weeds can be shallow rooted or deep rooted.

**Perennials (e.g.,crab grass, quack grass ) are often the most difficult weed type to control.**

## Weed Identification

Weeds need to be identified in order to determine the best way to control them. If you or your customers are not able to positively identify a weed, you should advise them to obtain assistance from a weed control specialist.

**Identifying leaf stages**

It is important for an applicator to have correctly identified desirable plant (crop, turf) and weed leaf stages because some herbicide labels refer to these for timing of the pesticide application. Often, herbicides are only effective when desirable plants and weeds are at certain stages of growth. For example, a herbicide label may recommend application at the three-leaf or trifoliate stage. Use of the herbicide before or after this stage will reduce its effectiveness and could result in poor weed control and/or injury to crops. Regular monitoring of the growth of weeds and surrounding plants can help to ensure that herbicides are not applied past the stage when they will be effective. Vendors should advise their customers, if necessary, to obtain assistance from weed control specialists when attempting to identify leaf stages.

## Weed Management

Direct your customers to a qualified specialist if they need to obtain assistance on weed control options. Examples of management options include the following:

**Cultural control**, which emphasizes competition to discourage weeds, includes:

- use of nurse or companion crops (a fast-growing crop planted along with a slower growing crop to compete with the weeds. The nurse crop can be mowed when the slower crop is established); and
- increasing the ability of desired plants to compete against weeds by using good cultural practices (e.g., optimum fertilizer rates, watering, etc.).

**Mechanical (physical) control**, which disrupts weeds, includes:

- cutting weed tops prior to seed production;
- tillage and band weeding;
- mowing, burning, or other sanitation practices; and
- using mulch to suppress seed germination.

**Biological control** includes:
- grazing a field prior to weeds going to seed; and
- releasing pest-specific insects or other natural agents.

**Chemical control** includes the use of pesticides, typically herbicides or plant growth regulators.

## Herbicides

Herbicides are classified according to selectivity, mode of action, timing of application, and residual effectiveness.

### Selectivity

**Selectivity** explains what plants will be controlled.

A **selective herbicide** will kill or damage certain plants, but not others. For example, a herbicide registered for weed control in a lawn will control broadleaf weeds but not the grass itself (e.g., Killex).

A **non-selective herbicide** will kill or damage all of the plants (grass and broadleaf weeds) in a treated area (e.g., Roundup).

Some herbicides are both selective and non-selective depending upon their rate of application (e.g., the active ingredient, glyphosate when used in forestry).

### Mode of Action

**Mode of action** explains how the herbicide kills a plant.

**Contact herbicides** kill plant parts contacted by the chemical. They are very effective against annual weeds, but only "burn off" the tops of perennial weeds. They exhibit very little or no movement within the plant itself. This makes them less effective than systemic herbicides for control of biennial and perennial weeds, as the product usually does not penetrate to the roots.

A contact herbicide must remain on the plant for some time. They will not be effective if they are washed off by rain or if the treated leaves are mowed too soon following treatment. Reglone (with the active ingredient diquat) is an example of a contact herbicide.
**Systemic herbicides** enter the roots or above-ground parts of plants and move throughout the plant. Control may not become visible for a week or more after treatment. They are very effective in controlling perennial weeds as they kill the entire plant, including the root. A product containing the active ingredient 2,4-D is an example of a systemic herbicide. Roundup is another example of a systemic herbicide.

If too much of a systemic herbicide is applied to the leaves, it may kill the leaf cells too quickly and prevent translocation to the site of action in a plant.

**Timing**

**Timing of application** refers to the growth stage of a weed when control can be successfully undertaken.

Herbicides are applied at different stages of weed growth. You should direct your customers to read the product label for the most effective and safest time to apply any herbicide.

**Pre-plant herbicides** are applied to the soil before seeding or transplanting. Some pre-plant herbicides are volatile and need to be incorporated directly into the soil. These are called **pre-plant soil-incorporated treatments**.

**Pre-emergence herbicides** are applied to the soil after planting, but before the emergence of the planted seed or the weeds. Pre-emergence may refer to the germination of either the weed or the crop.
Pre-emergence herbicides control weeds before, or soon after, they begin to grow.

**Post-emergence herbicides** are applied after the planted seed and weeds have begun to grow. These pesticides will control established weeds. The application can be soon after emergence or up to a specific plant height or leaf number. Atrazine, a herbicide used to control weeds in corn crops, is an example of a post-emergent herbicide.

**Residual Effectiveness**

**Residual effectiveness** refers to the length of time over which a pesticide can remain effective.

**Non-residual herbicides** quickly break down in the soil after application and do not affect future crops. They will control only those weeds that are present. Weeds that germinate after the application of a non-residual herbicide will not be controlled.

**Residual herbicides** do not break down quickly and can control weeds for several weeks to several years after application. They can also limit the crop type that can be grown the following year.

**Soil sterilants** are non-selective residual herbicides that are applied to soil to prevent the growth of plants for a long period of time (i.e., a few months to many years). Vendors should be familiar with these products and be prepared to advise customers before they purchase them.

## Plant Growth Regulators

Plant growth regulators are used to change (speed up, slow down, or stop) the vegetative or reproductive growth of plants. These pesticides are most commonly used by greenhouse operators to control plant size or encourage flowering.

## Insects and Mites

There are many different insects and mites. Most insects are beneficial. However, a few are considered to be pests when

they become a nuisance to people or pets, damage property or garden plants, or carry disease.

## Differences

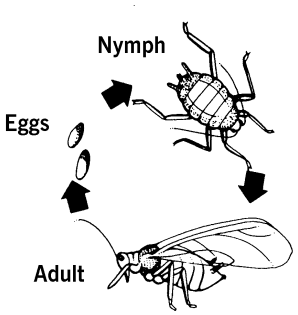
| | Insects | Mites |
|---|---|---|
| **Pair of antennae** | 1 | None |
| **Sets of legs** | 3 | 4 |
| **Skeleton** | exoskeleton | exoskeleton |
| **Body segments** | 3 | 2 |

## Life Cycles

Insects and mites, which change as they grow and mature, go through different life stages. The stages are either:

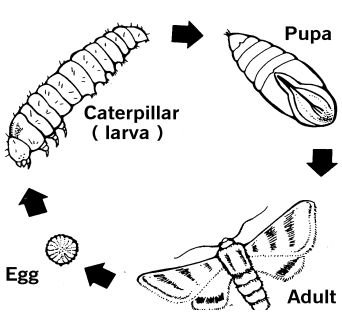
- egg, larva, pupa, and adult, or
- egg, nymph, and adult.

**Three Life Stages**




**Aphid Lifecycle**

**Four Life Stages**




**Moth Lifecycle**

Pest control is specific to the stage of growth. **The best control is usually achieved during the early stages (young,**

**nymph, or larva).** Eggs and pupa are not affected by most insecticides and miticides. For more information on life cycles, you should advise your customers to contact appropriate insect specialists.

## Management

Various methods are used to control insects and mites. These include:

- exclusion;
- cultural;
- mechanical/physical;
- biological;
- insect pheromone methods;
- genetic; and
- chemical (pesticide).

Your customers should understand that it is important to know the best management methods for each pest if they are to plan a good control program. For example, the parasites and predators of a pest must be known if they are to be used to control a pest.

## Insecticides and Miticides

Insecticides and miticides are often classified according to their selectivity, mode of action, and residual effectiveness.

### Selectivity

**Selective insecticides** control only certain insects or mites, and generally do not harm non-target organisms.

**Non-selective insecticides** control all insects, mites, or both in a treatment area.

### Mode of Action

**Contact insecticides** must come in contact with the pest to be effective. They can be applied to the pest or to the surfaces that a pest would be expected to touch. Some contact insecticides have a residual effect and can control the pest for some time after application.

**Systemic insecticides** enter plants or animals and flow in the sap or blood. Pests that suck the sap or blood are

then killed by the insecticide it contains. Some insecticides are both systemic and contact.

**Stomach poisons** must be swallowed by the pests to be effective. They are usually applied to the pests' food and then eaten. Sometimes, stomach poisons are mixed with food to form a poisonous bait.

**Suffocating insecticides** (oils or soaps) typically clog a pest's breathing system, but they can also affect egg survival.

**Residual Effectiveness**

Some insecticides have a short (1 to 2 day) residual period of effectiveness; others have long residual periods of effectiveness (several weeks or more). Residual insecticides control undesired insects for a longer period of time.

**Insecticide types**

**Fumigants** are insecticides that work in a gaseous form. Fumigants are often used to kill pests in enclosed spaces or in soil, where they breathe in the poisonous fumes.

**Growth regulators** act like an insect's own growth hormones. They disrupt the normal development of the insect, and it dies before it becomes an adult or before it can reproduce.

**Silica dusts or gels** are inert powders that control crawling pests by abrading their bodies, thereby causing them to loose body fluids and die. Contact insecticides are sometimes mixed with these powders.

**Attractants** are insecticides that can attract female insects for egg laying, or attract male insects to artificial female traps.

**Repellents** are insecticides that repel insects, and thus keep them away from their hosts. Repellents are typically used against mosquitoes and other biting flies.

**Sticky pastes** are placed on traps that attract pests. Chemical attractants or colours are used to attract the insects to the trap. Once trapped, the pest cannot cause damage. Sticky pastes are also used as barriers to restrict the movement of crawling pests or to determine insect populations.

**Microbial insecticides** are selective insecticides that contain microbes (tiny organisms, e.g., Bacillus thuringiensis). Generally, they are sprayed on plants. After they are eaten, the microbe or a poison the microbe produces, kills the target insects. One positive characteristic of a microbial pesticide is that it is typically only poisonous to selected insects. Application early in the development stage of the insect is often most effective.

## Slugs and Snails

Slugs and snails are soft bodied animals that reproduce by laying eggs. They become pests when they damage plants, feed, or food, or when they carry diseases that affect people or animals.

### Management

**Molluscicides**

Slugs and snails are first attracted by the odour of the molluscicide, and then are killed after eating it. It is important to advise your customers that these pesticides are quite toxic and must be kept away from children, pets, birds, or wildlife.

## Diseases

A healthy plant can become diseased when subjected to dramatic changes in its environment or life functions. Disease symptoms are caused by environmental stress, herbicide damage, insect damage, and/or microorganism infections (e.g., fungi, bacteria, virus, nematodes, etc.). It is important that you advise your customers to correctly identify the cause of the symptoms so that an effective treatment can be chosen.

### Causes

Causes of disease can include the following:

**Environmental stress**. Unfavourable environmental conditions, which stress plants and cause abnormal growth or disease-like symptoms, include extremes of light, temperature, water, or nutrients, as well as toxic chemicals (e.g., air pollutants). Plants weakened by environmental stress are more likely to be infested by pests. Recognizing and relieving the stress will help prevent infectious diseases.

**Herbicide damage**. Such damage usually occurs over large areas (treated areas), injuring and/or killing wanted and unwanted vegetation.

**Insect damage**. This damage generally occurs in isolated areas when insects eat foliage or suck plant juices, thereby weakening the plant or causing undesirable changes.

**Pest infections**. Micro organisms, including fungi, bacteria, viruses, and nematodes, can cause various diseases. Micro organisms become a pest when they damage desirable plants. Identification is usually based on visual symptoms.

## Types

Types of diseases include:

**Fungi**, the largest group of organisms that cause plant diseases, feed on living or decaying tissue. This group includes moulds, mushrooms, and rusts. Most fungi reproduce by tiny spores, which are usually moved by wind or water to land on a host plant. Some fungi (e.g., rusts) need two different hosts to survive and reproduce.

Some symptoms that can be caused by fungi include cankers, dieback, galls, leaf spot, rots, rusts, and wilts. Customers should understand that the movement of infected plants, plant parts, and soil can spread the fungus.

**Bacteria**, or single-celled organisms that can only be seen with a microscope, cause some major plant diseases. Bacteria are spread by wind and rain, by ground or surface water, or by contact with contaminated animals or equipment. They usually enter a plant through natural openings or wounds. Under favourable conditions, bacteria reproduce very quickly, using the plant as a source of food.

**Viruses** cannot be seen with an ordinary microscope, yet they can cause diseases that reduce plant vigour and crop yields. They reproduce only when they enter living cells and can be spread by mechanical means (e.g., during pruning or harvesting); in propagation material (seeds, tubers, and other plant parts); or by vectors (insects, mites, nematodes, and fungi). Mosaics, ringspot, and leaf roll are examples of diseases caused by viruses.

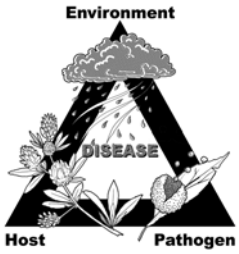
No pesticides are available to control viruses directly. However, some insecticides can be used to control virus vectors.

**Nematodes** are small worm-like organisms that feed on plant roots, stems, and leaves. They can effect the movement of water and nutrients in a plant, and they can create wounds that allow fungi or bacteria to enter. Some symptoms that can be caused by nematodes are wilting, stunting, lack of vigour, and growth deformities.

## Management

Three conditions must he present for a pathogenic disease to develop. These are:

- a disease-causing organism (pathogen);
- a host susceptible to the disease; and
- an environment favourable to the disease organism and/or unfavourable to the host.




**Three conditions for a disease**

Taking away or changing any one of these three conditions will control the disease. For example, a disease problem can be prevented by:

- keeping the organism out of an area;
- using strains of plants that are resistant to, or are not affected by, the discase;
- reducing the population of disease causing organisms; or
- manipulating the environment to favour the host but not the pathogen.

Chemical control of disease-causing organisms can involve the use of fungicides, bactericides, and nematicides. For more information, customers should be referred to disease control specialists.

## Fungicides

**Fungicides** are often described according to how they work (mode of action).

### Protectants

**Protectant fungicides** provide a protective film of fungicide on, or around, the host to prevent fungus spores from germinating.

Fungi are most vulnerable to fungicides between germination and infection. After the plant is infected the fungicide normally will not kill the fungi inside the

plant, but it may protect the plant from more infection. Repeated pesticide applications are required since any new plant growth is not protected.

**Eradicants**

**Eradicant fungicides** kill fungus organisms that have already infected the plant, but have not become well established within the plant. Eradicant fungicides have limited value when fungi are well established within plants.

**Systemics**

**Systemic fungicides** are absorbed by plants and move within them. They can act as protectants, eradicants, or both. Once inside the plant, systemic fungicides move to new areas of plant growth.

## Bactericides

**Bactericides** are chemicals that are toxic to bacteria. They kill bacteria on contact and must be used before the bacteria infect a plant.

## Nematicides

**Nematicides** move through the soil as a gas, or via soil water, and depend on the presence of spaces between the soil particles for their movement.

## Fumigants

**Fumigants** are chemicals, in the gaseous state, that move through the air spaces between soil particles in sufficient quantities to be lethal to a pest organism.

## Vertebrate Pests

Vertebrate pests typically include birds, rodents, rabbits, and regional pests such as bats, coyotes, raccoons, skunks, etc. These animals become pests when they damage property or when they carry disease.

You should be aware of, and be prepared to advise your customers on, the importance of knowing vertebrate pest behaviour and biology because it is important in determining:

- the most effective control methods;
- the best time to implement the control; and
- the best location for control (e.g., traps, repellents, or poisoned baits).

For more information, you should refer your customers to appropriate specialists.

Provincial and/or federal legislation for the protection of wildlife can prevent the destruction of some pests. As a minimum, a permit may be required for their control. You should advise your customers to contact an animal control specialist in the case of a pest problem.

## Management

Vertebrate pests can be managed or controlled by:

- excluding them from a feeding or breeding location;
- destroying or changing their habitat;
- encouraging natural predators;
- repelling or frightening them away;
- shooting or trapping;
- poisoning them with pesticides (e.g., avicides, rodenticides); or
- preventing pest reproduction with chemosterilants.

## Legal Status

Customers should check with provincial authorities about laws that could affect vertebrate control programs. Provincial and/or federal legislation for the protection of wildlife may prevent the destruction of some pests or special permits may be required for their control. Shooting, trapping, or the use of pesticides may be limited to specified times of the year or specified locations.

## Pesticide Control

Pesticides used for vertebrate control include the following:

### Birds

**Chemosterilant avicides** reduce bird populations by inhibiting reproduction.

**Bird repellents** may be non-poisonous or poisonous to birds.

- **Non-poisonous repellents** are sticky and irritate the bird. They are usually placed on exterior ledges, windowsills, beams, and places where birds are not wanted. Noise making devices, visual devices, and glue-paste materials also act as repellents.

- **Poisonous repellents**, when eaten by birds, make the birds act strangely. The birds' strange behaviour then repels other birds.

### Rodents

**Rodenticides** commonly used include:

**Acute rodenticides**, which kill rodents after one feeding.

**Anticoagulant rodenticides**, which cause internal or external bleeding and death after they are eaten. These are available as single-dose rodenticides, which involve only a single feeding or multiple-dose products, which need several feedings over several days.

**Animal repellants**, which are used to keep animal pests away from plants or buildings.

**Vendors must advise their customers to carefully read the label before using any rodenticide, as cats and dogs are highly susceptible to these pest control products.**

### Fish

**Piscicides** are used to kill fish in bodies of water. Vendors must advise their customers to consult with provincial pesticide regulatory authorities before they purchase or use these products.

**Fumigants** are poisonous gases used to kill burrowing rodents, gophers, and ground squirrels.

Animals

**Animal repellants** are used to keep animal pests away from plants, buildings, or other treated areas.

## Pesticide Resistance

Pesticide resistance describes the situation that occurs when a portion of a pest species is able to survive a pesticide dose that had previously been successful in controlling the species.

Because of a genetic difference, a resistant pest population can develop that is not affected by or is resistant to the particular pesticide. When these pests reproduce, they pass on their resistant trait(s). When one particular pesticide is used repeatedly on such a population, the susceptible individuals are eliminated while the resistant ones continue to reproduce and become dominant.

After a pest population develops resistance to a pesticide, the effectiveness of other closely related pesticides may also be reduced. Some applicators may attempt to achieve control of the pest by **increasing the pesticide application rate**, but this will result in increased selection pressure and hence **will speed up the development of resistance**. There is also evidence to suggest that **the repeated use of pesticides with the same mode of action will, sooner or later, result in the appearance of a resistant organism.**

**Failure to follow label rate recommendations is illegal and may speed-up the development of pest resistance.**

# Pesticide Application 9

## Introduction

Once a customer has identified a pest, their attention commonly focuses on how to deal with its control. As noted earlier there are various control options, including the use of a pesticide.

To be effective, a pesticide must be applied properly, which means following label directions and using the right equipment. Your customer will also need to know how much pesticide to purchase. This chapter presents information that will help you to assist them in the proper application of a pesticide.

## Learning Objectives

Completion of this chapter will help you to:

- Assist a customer in choosing the correct application equipment
- Assist a customer with the calibration of basic application equipment
- Identify environmental factors that can affect a pesticide application
- Understand and explain the importance of maintaining application equipment
- Help a customer determine the size of an application area
- Apply information from the label to assist a customer to determine the amount of pesticide to purchase
- Apply information from the label to assist a customer with preparing a proper tank pesticide mix

## Application Equipment

Some pesticides are ready-to-use directly from the container in which they are sold. These pesticides are already mixed, require no further dilution, and are ideal for a customer with a minor pest problem. They also eliminate the need to understand mixing instructions, and storage of leftover concentrated pesticide. Ready-to-use products include:

- ant traps;
- bait boxes;
- aerosol cans;
- trigger sprayers; and
- dust cans.

For other products, your customer must select appropriate application equipment.

Application equipment should apply the pesticide uniformly and at the correct rate for the desired target pest. Also, it should not contaminate non-target areas. The equipment must therefore:

- be selected carefully;
- have the proper components;
- be operated correctly;
- be calibrated accurately; and
- be properly maintained.

## Equipment Selection

A variety of equipment is available for the application of pesticides (back pack sprayers, tractor driven boom sprayers, in-furrow injection applicators, etc.). Customers should choose equipment that best suits:

- the size of area to be treated;
- the pest to be controlled;
- the pesticide formulation selected for use; and/or
- the label recommended method of application.

## Equipment Operation

You should be able to assist your customers with the interpretation of label instructions for application rates. You should also be able to advise them regarding the operation of

application equipment in a manner consistent with the instructions on a pesticide label.

## Amount of Pesticide to Purchase

As a vendor, you should be able to assist your customers in calculating how much pesticide they will need to purchase to complete an application.

### Label Directions

The "Directions for Use" section of any pesticide label indicates how much pesticide should be applied. For ready-to-use formulations, the label will recommend the amount of formulated pesticide that is to be applied per area or volume (recommended pesticide rate).

**Calculations using "amount per unit area"**

Some pesticide labels state the amount of product that should be applied per unit area. For example, apply 25 L per hectare for a liquid spray or 25 kg per hectare for a granular pesticide. If a customer knows the size of the area to be treated (in hectares), calculating the amount of pesticide to buy can be done by using the simple ratio calculation below. Always check the label to make sure the customer is using the correct application rate. Application rates can vary from crop to crop and from pest to pest.

**Example: liquid pesticide**

The treatment area is 10 hectares. The label states that the application rate is 2.5 L of pesticide per hectare to be treated.

**What is the total amount of pesticide required to treat 10 hectares?**

Example of calculations:

To treat 1 hectare will require 2.5 L

Therefore, to treat 4 hectares will require

2.5 L X 4 = 10 L

A customer would need to purchase one, 10-litre container of pesticide.

**Calculations using "dilution ratios"**

When a pesticide concentrate is used, the customer must be able to calculate the correct amount of concentrate to mix with the water in the application equipment. Many pesticide labels give the application rate in the form of a "dilution ratio", such as apply 1.5 L of formulated product per 100 L of water.

The label may specify adding a certain amount of pesticide concentrate to make a given quantity of spray mix. The customer must calculate how much concentrate should be used to make up the total quantity of mix needed.

The following example shows how to calculate the amount of concentrate needed to make 400 litres of spray.

**Example**: **liquid pesticide**
A pesticide label says mix 1.5 L of product in 100 L of water. The spray tank is 400 L in size. How much concentrate should be added to make 400 L of spray in the tank?

100 L of water requires 1.5L of the pesticide.

Therefore: 1 L of water requires 1.5L/100= 0.015L

400 L of water will require 400 X 0.015 L = 6L of the pesticide.

Advise your customers that the proper mixing procedure is to:

- partially fill the sprayer with water;
- add 6 L of pesticide;
- continue to fill the sprayer with water to the 400L mark; and
- agitate for a uniform mix.

You should ensure that your customers understand that, prior to use, application equipment may need to be calibrated if it is to deliver the correct amount of pesticide mix. The output of a sprayer is referred to as the calibrated sprayer output.

## Calibration

Calibration procedures for specific application equipment may be outlined in the operator manual or recommended by industry or government specialists. To calculate how much total pesticide the customer will need to purchase, one can multiply the amount of formulated product by the size of the area to be treated.

Example

When applying a particular pesticide, the label directions indicate an application rate of 2.2 L of liquid concentrate per hectare. The customer has calculated the size of the area to be treated to be 6.3 hectares.

**The customer would need to purchase:**
**( 2.2 L/ha X 6.3 ha) = 13.9 L to do the treatment.**

For formulations that are diluted, the label will recommend:

- the amount of formulated pesticide that is to be applied per area or volume (recommended pesticide rate), or
- the amount of diluent or carrier that is to be applied per area or volume (recommended sprayer output).

NOTE: The terminology used to describe these rates varies widely on labels.

Vendors should ensure that their customers understand that prior to use, application equipment must be calibrated so that it will deliver the correct amount of sprayer mixtures. The output of a sprayer is referred to as the calibrated sprayer output.

## Equipment Calibration

Calibration can be defined as checking and adjusting the delivery rate of application equipment. Calibration procedures for specific application equipment may be outlined in the operator manual or recommended by industry or government specialists. Properly calibrated and operated equipment will deliver the correct amount of pesticide, and in a uniform distribution, to the treatment area. There are many different calibration procedures. Always advise your customers to use an accurate calibration method suited to the type of application equipment being used.

**Equipment that is not properly calibrated will apply the pesticide at an incorrect rate or in a non-uniform distribution, thereby resulting in areas of over, or under, application.**

As a minimum, pesticide application equipment should be calibrated:

- before being used for the first time;
- when parts have been replaced (e.g., nozzles, pump, hoses);
- at the start of each new season;
- periodically throughout the season; and
- when the equipment's output has changed (e.g., change in pressure, nozzles, etc.).

**Over-application** of a pesticide can result in:

- increased application costs;
- damage to the application site;
- damage to the environment;
- increased applicator or bystander exposure; and
- excessive pesticide residues.

**Under-application** of a pesticide can result in:

- poor control of the pest;
- a need to re-treat the area (increased application time and costs); and
- the development of resistant strains of a pest.

**Application of a pesticide in excess of label rates is ILLEGAL**.

**Calibration Method**

A simple method whereby a customer can calibrate sprayer output is to:

- mark out 1 hectare (an area 100 m x 100 m = 10,000 sq m = 1 ha);
- fill the spray tank with water to a set mark;
- spray the measured hectare at the same speed, pump pressure, etc., as for the intended application;
- measure the amount of water needed to refill the sprayer to the original mark on the tank (e.g., 40 litres).
- Since a hectare was sprayed, this volume (in this case, 40 litres) is the calibrated sprayer output or delivery rate per hectare of the equipment.

**Note**

If the label indicates that the pesticide should be applied at a rate of 2.2 L of liquid concentrate in 30 L to 60 L of water per hectare, and it took 40 L of water to refill the tank to the mark, (the calculated sprayer output is 40 L/ha), then there is no further adjustment required to the equipment (speed of travel, pump pressure, etc.). This is because the 40 L/ha is between the label recommended rate of 30 L and 60 L of water per hectare.

This method cannot tell anything about the condition or delivery rate of individual nozzles, or the uniformity of delivery across the spray swath.

For more detailed information on calibration, sprayer pressures, nozzle selection, equipment output, etc., vendors should direct their customers to contact their local equipment dealer, or private or government sprayer calibration services.

## Application Rate Terminology

An application rate for a pesticide is sometimes presented as a word description on the label. You should be familiar with this terminology and prepared to assist your customers in the interpretation. Some examples are listed below.

**Spray to wet surface**: When a label says to "spray to wet surfaces on plant leaves", this means that enough pesticide is applied to cause the surface to be damp or wet to the touch, but not to cause the pesticide to run, drip, or puddle.

**Spray to drip**: A label may indicate "spray to drip" or "spray to run off." This means that the pesticide is to be applied until spray droplets run together and start to drip off the plants. Spraying should be stopped just as the pesticide first begins to drip off the plants.

**Light dusting**: Dusts should be applied in a very fine layer. A "light dusting" means just enough to barely see a dusty effect. This does not mean the dust is thick enough to obscure the surface. Thick dust can repel insects and when applied to plants, may also stop sunlight from reaching the leaves.

**Broadcast treatment**: When a pesticide is applied evenly over an entire area it is termed a "broadcast treatment." An example is treating an entire lawn for a broad-leaved weed infestation using a selective herbicide.

**Spot treatment**: A "spot treatment" is just what the name implies. A pesticide is applied to small, specific areas. This can be to an individual plant or an area less than 20 $cm^2$ in

size. For example, a lawn with a light infestation of dandelions could be spot-treated with a herbicide. The herbicide is applied only to the individual weeds, rather than treating the whole lawn. This saves pesticide and helps protect the environment.

For more detailed information on calibration, sprayer pressures, nozzle selection, equipment output, etc., direct your customers to contact their local equipment vendor.

## Equipment Maintenance

For equipment to operate correctly, it must be properly maintained. If a customer undertakes regular maintenance they will:

- increase the life of the equipment;
- reduce the chance of leaks and spills;
- reduce the chance of equipment failure; and
- prevent cross contamination of pesticides.

Advise your customers to do the following before they add a pesticide to application equipment:

- rinse clean water through the tank, pump, hose, and nozzle(s);
- dispose of this wash water where it will not contaminate the environment;
- check and clean screens, strainers, and nozzles;
- check the hose, seals, and clamps for wear; and
- replace any worn or damaged parts.

Remind your customers to wear chemical resistant gloves any time they are working around application equipment.

## Environmental Conditions

Environmental factors, such as air movement, precipitation, relative humidity, and temperature, can affect pesticide applications and/or pesticide effectiveness. Customers should consider environmental conditions before applying a pesticide.

Limitations on temperature and wind speed at the time of application may be indicated on the pesticide label. Limitations are also defined under provincial legislation. You should refer your customers to the pesticide label or the provincial pesticide regulatory authority for details (*see* Chapter 2*:* Legislation).

# Emergency Response 10

## Introduction

There is a potential for risk associated with distributing, transporting, or storing pesticides. As a vendor, you must be prepared for emergencies such as poisonings, minor or major accidents, spills, or fire. Steps to ensure that a pesticide vendor facility is as safe as possible for employees, the community, and the environment include:

- identification of all possible areas of risk;
- implementation of measures designed to reduce these risks; and
- development and installation of a plan of action that should minimize risk, if an accident does occur.

## Learning Objectives

Completion of this chapter will help you to:

- Prepare for and respond to a spill, a fire, or a theft involving pesticides
- Identify who to contact in case of a spill or fire involving a pesticide
- Take the required first aid steps to respond to different types of pesticide poisoning

## Risk and Hazard

Risk can be described as the possibility or likelihood of danger or injury as a result of an activity. For example, the operation of a forklift when transporting pesticides off or onto a delivery truck involves an element of risk. The potential is there for an accident, so there is risk associated with this activity. Hazard, another factor to consider, focuses on the potential negative consequences of an accident while doing the activity. In the example above, the hazard might be moderate, since product falling from the forklift could injure staff or contaminate the facility or the

environment. If the driver of the forklift is not adequately trained, the forklift not properly maintained, or the ramp is too steep, then the risk (likelihood) of an accident occurring is higher. Your primary objective should be to take whatever steps are necessary to reduce risk to as low a level as possible within your vendor facility.

## Risk Assessment

Reducing the risk associated with any pesticide vendor facility starts with doing a risk assessment or risk evaluation of the entire business. You should start by examining all problem areas or activities that could potentially create an accident or emergency. Then, consider the consequences of these problems. A risk assessment should help you answer the question: "What are the unwanted events that could occur which could harm the employees, the business, the environment, or the community?"

You should not limit the assessment merely to pesticide storage, display, receiving, or handling activities. A risk assessment should be conducted for the entire operation, including any activity that could lead to a fire, a spill, or a minor or major injury. Ultimately, the practice of risk assessment should provide you with ideas on how to minimize or even prevent the occurrence of possible problems.

You should examine the entire facility and prepare a list of possible emergency events and control mechanisms (*see* Table 10.1).

| Event | Cause | Control Mechanism |
|---|---|---|
| **Minor injury** | Customer slipped on floor near display area. | Policy to immediately clean up a spill and maintain clean floor |
| **Spill** | Forklift tipped over | Repair edge of the ramp |
| **Fire** | Worn extension cord used to light the display area | Establish a monthly check list for all electrical items. |
| **Vandalism** | After hours break-in | Install adequate outdoor lighting, alarm systems, etc. |
| **Major injury** | Employee overcome with fumes while cleaning up a broken container in storage area | Provide adequate ventilation, clean up all spills, and provide and maintain personal protective equipment. |

**Table 10.1 Risk assessment examples**

## Risk Reduction

Once high risk areas have been identified, changes necessary to minimize the likelihood of an accident should be undertaken. This can involve:

- physical modifications to the storage facility. For example:
  - increase the fire rating of walls and doors;
  - re-design loading ramps; or
  - install fire extinguishers.
- change the way the facility is operated. For example:
  - control access to storage areas;
  - establish monthly check lists;
  - train staff in first aid; or
  - improve operating procedures for handling pesticides.

At the end of this exercise both the facility and its operation should be as safe as possible.

## Emergency Response Planning

**Accidents will always happen, so you must be prepared to respond to these events.** An Emergency Response Plan (ERP) will help you and other employees to act quickly and effectively when there is an emergency involving pesticides. The ERP should provide specific instructions for responding to, and dealing with, the emergency events identified for your facility. It should be designed to reduce the impact on the facility, the employees, the community, the public, and the environment.

The ERP can also be designed to reduce the possibility (or risk) of an emergency occurring. The process of preparing an ERP often results in the prevention of emergencies because workers learn to spot and control hazardous conditions before they cause serious problems. Planning also ensures that the facility and emergency response services are properly equipped to handle the type of emergencies associated with the storage, handling, and transport of pesticides.

It is important that a pesticide storage facility develop an Emergency Response Plan (ERP) for:

- accidents causing minor or serious injury;
- gas and odour release;
- pesticide spills;
- fires or explosions;
- natural disasters (floods, ice storms); and
- transport accidents.

## Preparing an Emergency Response Plan

Vendor facilities typically involve stationary sites, such as sales outlets and storage depots. The development of an ERP will depend on the type of emergency anticipated, the size of the operation, the availability of emergency response services, the site location, etc. The steps necessary to prepare an emergency response plan for a facility include:

1. **Assign emergency co-ordinators.** One person must be given overall responsibility. Then, co-ordinators should be assigned for specific duties. Someone is needed to co-ordinate:
   - communications;
   - site security and transportation;
   - first aid;
   - fire fighting;
   - environmental control; and
   - plant operations.

   Emergency response teams should have the authority to direct and manage employees and be available 24 hours a day. Alternate employees should be ready to take over if any team member is not available. In a small business, one person may be responsible for many or all duties.

2. **Make an emergency calling list**. Make a list of the local authorities in the order in which they should be called when an emergency occurs. On the calling list, note the information that is needed to provide to the authorities. This includes:

   - name;
   - location of the accident;
   - description of the emergency;
   - products and quantities involved;
   - injuries; and
   - potential dangers.

   Groups to inform include:

   - employees on site;
   - managers and/or supervisors off site;
   - local fire and police departments;
   - provincial pesticide authorities;
   - neighbouring businesses;
   - legal representatives (lawyers);
   - insurance agencies; and
   - the media.

   Keep a record of the time at which calls were placed and the name of the person reached. This information may be needed later (e.g., in court).

3. **Make a list of emergency helpers from the community**. Contact neighbouring businesses to see if they can help you in an emergency. Get a contact name and phone number, list the clean-up equipment they have available, and note the time needed for them to respond. For example: gravel for the construction of dikes, or a back hoe from a nearby construction company, might be needed.

4. **Map the storage facility and the surrounding area**. The map should include:
   - all buildings, tanks, loading docks, containment areas;
   - waterways, sewers, and drains;
   - outside perimeter fencing;
   - access routes;
   - main shutoff for electricity, water, and gas;
   - areas of hazardous materials;
   - location of emergency equipment;
   - directions (north/south);
   - instructions for building dikes and dams to block runoff;
   - evacuation routes and shelters that could be used; and
   - neighbouring residents.

5. **Keep accurate inventory records at the business site, but away from the warehouse.** Pesticide product names, PCP Act registration numbers, volumes stored, and locations should be noted. Keep copies of product labels and MSDSs for information. If any product requires special emergency treatment, make a note of it.

6. **Have necessary emergency equipment available and in working condition**. This includes fire extinguishers, personal protective equipment, and containment equipment. Check with your local fire department to determine or confirm exactly what is needed.

7. **Outline the emergency procedures in the exact order in which they need to be done**. When writing the step-by-step procedures consider the following:

   - emergencies expected to be handled;

- emergencies needing outside help;
- procedures for each kind of emergency;
- evacuation procedures;
- every task that must be done;
- the person responsible for each task (put a name beside every task); and
- training for employees.

Talk to the provincial pesticide regulatory authority, your lawyer, and your insurance agent to make sure that everything needed is included.

Invite outside helpers to tour the facility and discuss ways in which to work together in an emergency. Be sure that everyone understands their responsibilities.

**Regularly practice** each emergency procedure so that everyone knows what to do. Review the procedures with each new employee.

8. **File the plan with responsible employees and local authorities**. Plans should be updated annually, or any time that changes in the facilities or the products carried are made. Be sure to keep all employees informed of any changes.

**An Emergency Response Plan can be a vendor's most important business document. It can prevent a minor occurrence from becoming a major disaster. This information should be compiled in a single manual and copies made available to all staff.**

## Safety Training

Pesticide vendors should ensure that training is provided regularly for all appropriate personnel. This training should include the various emergency procedures developed for their work areas, including:

- first aid and CPR;
- firefighting techniques and use of a fire extinguisher;
- safe operation of a forklift;
- use, cleaning, and maintenance of personal protective equipment;
- use of an eye wash; and
- use of information contained on MSDSs and product labels.

# Emergency Services, Supplies, and Equipment

Emergency services, supplies, and equipment, as described below, should be available for every storage site.

## First Aid Centre

**First aid centre**

Large vendor operations may chose to designate a room or a portion of a room to serve as a first aid centre. Provincial Occupational Health and Safety regulations will assist in defining the contents of a first aid centre and which businesses must have them.

In addition, the following materials should be available at facilities and to work crews that handle pesticides:

- clean water, soap, and towels for washing;
- one-way mask for giving artificial respiration;
- clean water for drinking;
- list of emergency phone numbers;
- syrup of ipecac (available from drug stores) to induce vomiting;
- unlined gloves impervious to chemicals for the person who administers first aid; and
- MSDSs for all products likely to be handled at the site.

## First Aid Kits

**First aid kits**

Requirements for emergency first aid supplies and equipment are based on the number of workers per shift on a specific site, the type of work being done, and the location of the work. You should check provincial first aid regulations for a description of the necessary contents of the first aid kits. The items listed in Table 10.2 should be available for emergency response near any pesticide storage area.

| ITEM | PURPOSE |
|---|---|
| clean water | for drinking, or washing skin or eyes |
| soap | to wash pesticide off skin |
| chemical impermeable gloves | to protect the person administering first aid |
| cup | for drinking |
| face mask with one way valve | to protect the person giving mouth to mouth resuscitation |
| bandages | to prevent pesticides from entering wounds |
| blanket | to cover a victim |
| phone numbers | to call for assistance |
| paper towel | to clean up |
| plastic bag | to collect vomit |

**Table 10.2 Items for a First Aid Kit**

## Emergency Conveyance

**Emergency conveyance**
Workers must have access to emergency conveyance, either through a local ambulance service (911) or by an emergency conveyance on the work site. Emergency conveyance vehicles must be large enough to accommodate a stretcher and passenger.

## Eyewash/Shower Facilities

**Eyewash and shower facilities**
Wash facilities and an eye wash kit should be immediately available wherever there is a possibility that a worker or customer will be splashed with pesticides or other harmful substances. As a minimum, a container of clean water and an eyewash kit should be located near the display and storage area.

## Respiratory Protective Equipment

**Respiratory protective equipment**
Respirators equipped with pesticide cartridges should be available and worn wherever workers may be exposed to airborne contaminants.

## Fire Fighting Equipment

**Firefighting equipment**
Firefighting equipment should be available outside of all storage sites and on each fork lift used to transport pesticides. Storage areas are rated as ordinary hazards, and require a minimum of a 2-A:10-B:C fire extinguisher within 9 metres or a minimum 2-A:20-B:C fire extinguisher within 15 metres travel distance to the extinguisher. Fire extinguishers on forklifts should have as a minimum a 5-B:C rating.


**An individual should not fight a fire involving pesticides unless they use proper personal protection equipment and are fully trained in fire control.**

Fire fighting equipment should be inspected regularly to ensure:

- full charge;
- the hose and nozzle are unobstructed;
- the pull pin and seal are intact; and
- extinguishers are clean and free from corrosion.

A log of inspections and repairs should be kept. If low pressure or damaged seals are found, the extinguisher should be repaired or replaced immediately. If regular equipment is removed for longer than a few hours, replacement equipment should be substituted.

## Specific Emergency Response Procedures

Pesticides can be dangerous. They must be handled carefully to prevent injury to the user or to other people. Trained staff should know how to handle them safely to prevent accidents, and always be prepared for an emergency. Here are some things you can do before an accident happens:

- be familiar with the label of products being handled, paying special attention to the *PCP Act* number, the guarantee, and any precautionary or first aid statements;
- be familiar with the symptoms of pesticide poisoning;
- know the emergency telephone numbers;
- have access to plenty of clean water where pesticides are being displayed, handled, stored, or transported; and
- ensure a number of the staff have taken a First Aid Course. In most communities, St. John Ambulance offers courses to help prepare for various types of emergencies. Doctors or local hospital staff can sometimes be a source of information.

## Injuries

The vendor business should develop a response plan for dealing with both minor and major accidents. The plan should include information on:

- emergency phone numbers;
- ambulance services;
- location of First Aid kits, blankets, respirators, etc.;
- list of staff trained in CPR or First Aid; and
- contents of a general First Aid kit.

Anyone working with pesticides should learn the signs of chemical poisoning and be familiar with appropriate first aid treatment in case of an accident. Accident victims are often not capable of helping themselves. If an accident occurs, you need to assess the hazard, stay calm, and act quickly. Prompt action can save a life.

If a rescue of a fallen or trapped employee is required, you must carefully assess the situation. If the rescue cannot be made safely by Emergency Response Team members, keep the employee warm and provide encouragement until the ambulance/fire crews arrive.

## Poisoning

Rapid and organized response in poisoning emergencies is important, as it minimizes the negative effects to a poison victim.

General procedures for any pesticide poisoning include:

- Have someone call 911 for help.
- Assess the hazard before approaching the victim. **Protect yourself first.** This might require that you put on personal protective equipment (respirator, waterproof gloves, coveralls), as required, prior to the rescue.

- Move the victim away from any spilled pesticide or smoke. If the victim is exposed to fumes or smoke, first protect yourself with a self-contained breathing apparatus. **(Note: Unless there is an immediate threat to life, do not move the person if spinal cord injury is suspected.)**
- Check to see if the person is conscious. If the person is unconscious, check for breathing and, if necessary, give artificial respiration. Use a one-way face mask to prevent pesticide exposure from the person's mouth. Cardiopulmonary resuscitation (CPR) may be necessary if the pulse disappears. **CPR should only be done by properly trained people.**
- If the victim is unconscious but breathing, you can remove contaminated clothing and wash contaminated skin. Place the victim in a semi-prone position, turned slightly to one side so as to protect the victim from choking should he or she vomit. **Do not administer anything by mouth.**
- Call a Doctor or Poison Control Centre. Give them information on the product from the MSDS and label. If the victim is critically ill, have someone make all emergency calls. Do not leave a seriously ill person alone. Be prepared to provide information on:
  - the telephone number from where the call is made;
  - condition of the victim (e.g., breathing, in shock, symptoms, length of exposure, etc.);
  - the exact name of the product as it appears on its label;
  - the PCP Act registration number from the label;
  - the circumstances of the poisoning (fumes, splash from a spill, etc.);
  - any first aid actions taken prior to the call; and
  - name, age, and weight of the victim.

**Stay on the line to receive information on first aid treatment, to provide additional information, or to direct emergency response services to the victim's location**.

- Keep the person quiet, warm, comfortable, and reassured. Position the person by placing them on their side with their head lower than the rest of their body and turned to one side. If the person is not conscious, keep their chin pulled forward and their head tilted backward slightly to allow breathing to take place. (An unconscious person should never be transported flat on their back.); and

- Arrange emergency transportation and alert the nearest hospital as to the victim's impending arrival.

## First Aid

First aid provides immediate assistance (helps to stabilize a person and sustain life) until medical help can be reached. If a person feels ill during or after handling pesticides, seek medical attention immediately.

Staff working with pesticides or closely associated with these workers should be familiar with:

- all relevant emergency phone numbers;
- signs and symptoms of pesticide poisonings; and
- first aid for pesticide poisoning for the products being used.

### First Aid Procedures

The victim may be suffering from both physical injury and a pesticide accident at the same time. Internal injuries usually take precedence over the contamination. The proper sequence for first aid treatment of pesticide accident victims is as follows:

1. Put on protective gloves.

2. Address respiratory concerns. If the victim is not breathing, use a one-way airway device to prevent cross contamination.

3. Address circulation issues (heart beating).
4. Have someone call for medical help (911).

## Ocular Exposure

**Procedures for ocular exposure (in the eye):**

Follow steps 1–4 listed above, plus:

5. Hold the eyelid open and wash the eye immediately with clean running water for 15 minutes or more (refer to the first aid information on the label for the specific duration time).
6. Await medical help.

## Dermal Exposure

**Procedures for dermal exposure to non-corrosive pesticides:**

Follow steps 1–4 listed above, plus:

5. Remove the victim's contaminated clothing, including footwear.
6. Immediately drench the skin with cold water. Cold water is preferred, as hot water opens pores and increases absorption.
7. Wash the victim's skin and hair with soap and water.
8. Dry the victim and wrap them in a blanket (treatment for shock).
9. Wait for medical help.

## Burns on the Skin

**Procedures for chemical burns on the skin:**

Follow steps 1–4 listed above, plus:

5. Remove the chemical to stop the burning. Do not wait for clothing to be removed. Brush dry chemical off the skin and clothing, then rinse with water. If the chemical is a liquid, rinse with lots of running water.

6. If a shower is available, place the victim in the shower first and then remove all contaminated clothing.

7. If no shower is available, remove contaminated clothing.
8. Immense the burned area in ice water.
9. **DO NOT apply anything to the burn.**
10. Wait for medical help.
11. Do not touch, remove any clothing stuck to the skin, break any blisters, or use ointments on the burned area.

## Oral Exposure

**Procedures if a pesticide is swallowed (oral exposure)**:
Follow steps 1–4 listed above, plus:

5. Read the product label or MSDSs for instructions.
6. Do not induce vomiting unless upon instruction of a poison control centre or doctor, or if specifically indicated on the label and only if the patient is alert.
7. Do not induce vomiting if the person is unconscious or having convulsions.
8. Do not induce vomiting if a corrosive material or petroleum-based product was swallowed. Instructions should be on the label.
9. Never give anything by mouth to an unconscious or drowsy person.

## Procedures to Induce Vomiting

**Under the direction of a doctor or Poison Information Centre:**

Give syrup of ipecac (15 ml [1 tablespoon] to children, 30 ml [2 tablespoons] to adults). One-dose bottles of this product are available at most drugstores. Follow with one to two glasses of water or fruit juice. Repeat in 15 minutes if vomiting has not occurred.

**Without direction from a doctor:**

Give a conscious, non-convulsive patient several glasses of warm water to drink. If this does not work, tell the patient to tickle the back of their throat with their own finger. Vomiting caused by tickling is usually not complete and the patient must be seen by a doctor as soon as possible.

The patient should be kept lying down with their head below the level of their feet. This position allows any vomit to drain away from air passages. If the poison cannot be identified, collect some of the vomit for analysis by medical authorities.

## Inhaled Pesticides

**Procedures if pesticides inhaled (dust, vapours, gases):**

NOTE: If the victim is in an enclosed space, emergency responders should first put on all necessary personal protective equipment.

Then follow steps 1–4 listed above, plus:

5. Move the victim to fresh air.
6. Loosen tight clothing.
7. Prevent chilling or overheating.
8. Keep the person quiet.
9. Get medical help.

If full recovery takes place after first aid measures are undertaken, all victims should seek assessment by medical personnel before they return to work. Appropriate staff should then review and study what went wrong so as to avoid an accident recurrence, and, if needed, revise your emergency response plan.

## Pesticide Spills

Pesticide spills are hazardous because the pesticide or its vapours can poison people, animals, or plants. Spilled pesticides, when not properly addressed, can also contaminate soil, sewer systems, streams, food or feed, surfaces (e.g., wood or concrete), lakes, wells, and other water sources.

### Prevention and Preparation

Risk from leaking containers or pesticide spills can be reduced by following good storage practices (stacking height restrictions, adequate lighting), ensuring proper handling by forklift operators, securing product while in transit, and conducting regular inventory inspections.

Maintaining a storage facility floor and containment walls that are impervious to chemicals should minimize broad-scale environmental damage in the case of an accidental spill. It should also make necessary cleanup easier and less costly. The design of the containment system should depend on the types and quantities of pesticide being stored.

All employees should know what to do when a pesticide spill occurs. They should also be aware of the hazards involved in a pesticide accident. The operation should ensure that all appropriate employees are trained to properly use personal protective equipment. If everyone is well prepared, health hazards can be reduced and environmental damage kept to a minimum.

### Decontamination Kit

The vendor facility should have a decontamination kit for use at all sites where pesticides are stored, displayed, loaded, or handled. The kit should be fully equipped and easy to access in an emergency.

## Contents

A well-equipped spill decontamination kit should contain:

- 1 - 12 litre package of heavy duty detergent;
- 4 - 25 kilogram bags of absorbent material;
- 2 - 4 litre containers of sodium hypochlorite (laundry bleach);
- 4 - 25 kg bags of hydrated lime (do not mix bleach and lime);
- 2 square mouthed shovels or spades;
- 2 yard brooms;
- 1 hand pump with hose;
- 2 - 205 litre open-head drums with lids;
- 2 - 205 litre sealable drums;
- 2 - 20 litre open-head drums with lids;
- labels to identify contents of drums;
- 2 heavy plastic bags;
- 2 cartridge type respirators;
- 2 pair of safety goggles;
- 4 pair of industrial chemical resistant gloves;
- 2 pair of chemical resistant boots; and
- 2 pair of overalls.

## Vehicle kit

The following cleanup equipment should be available on vehicles used to transport pesticide products:

- personal protective equipment;
- emergency phone numbers;
- absorbent material;
- a shovel;
- an empty container with a lid for transferring ruptured containers or contaminated materials; and
- blank labels for identifying the contents of waste containers.

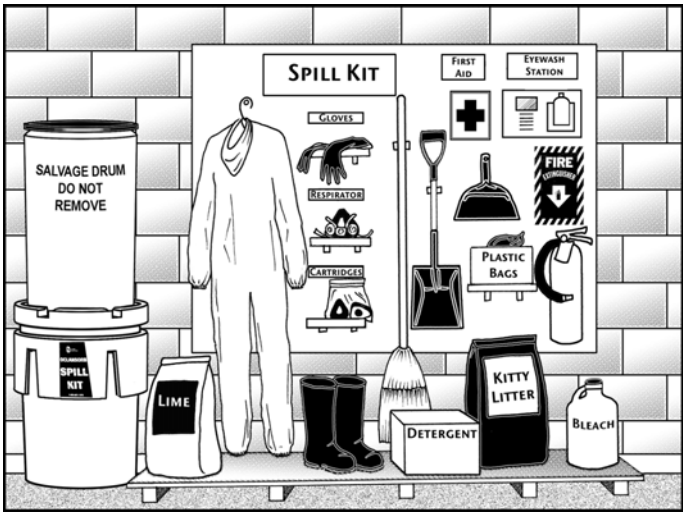
## Protection

You should always put on appropriate personal protective equipment before entering a contaminated area or handling a victim. Employees who will be involved in spill cleanup must wear proper personal protective equipment. If the spill is in a storage area, someone wearing respiratory protective

equipment should first enter the storage area to open all windows and doors for ventilation. Electric ventilation systems should be used only if they are explosion proof as explosive levels of flammable materials could be present in the air.

Before beginning cleanup, the area should be roped off and unauthorized people and vehicles kept away. Flares or smoke should never be used near a chemical spill. If the spill occurs on a roadway or parking area, vehicles should be prevented from traveling over spilled material.

If any person has come into contact with a pesticide, quick action must be taken to stop continued exposure. Move the victim from the contaminated area and remove all contaminated clothing. Wash the affected skin with soap and water to prevent further exposure. Other first aid procedures can be necessary so get medical attention as soon as possible.




**Items for a spill response**

## Small Spill Containment

For a small spill of liquid pesticide within a storage confinement or display area the following steps should be taken:

- Keep unauthorized people away from the spill;
- Put on personal protective equipment as required.
- Absorb liquid material using activated charcoal, coarse clay, or cat litter. Commercial absorbents are also available.
- Sweep or shovel the contaminated absorbent material into a drum or container lined with a heavy duty plastic bag. Secure the lid on the container.
- Label the drum (name of pesticide and date).
- Neutralize any remaining residues. Consult the MSDS and other information sources to determine specific neutralization techniques.
- Contact a licenced hazardous waste handling company.

## Decontamination

You can decontaminate hard surfaces by:

- Using as small an amount of wash water as possible (only enough to extract the pesticide, not dilute it);
- Contain the wash water to the contaminated area;
- Work the cleaning material into the spill area with a coarse broom;
- Absorb the excess liquid with absorbent material;
- Sweep this into the waste container;
- Seal the container and label (pesticide and date);
- Contact the provincial pesticide authority (and IF REQUIRED a licenced hazardous waste disposal company); and
- Store the waste until it can be disposed of properly.

## Dry Product Spills

For spills involving dry pesticide products, the following steps should be taken:

- Dampen the area very slightly with small amounts of water.

- Sweep or shovel the material into drums with tight-fitting lids.
- Label the drums (pesticide name and date).
- If necessary, contact a licenced hazardous waste disposal company.
- Neutralize any remaining residues. Consult the MSDS and other information sources to determine specific neutralization techniques.

Never use water to wash down a spill. The chemical might leach into the soil, or it might enter the groundwater system, sewage systems, streams, or lakes.

The manager of the vendor facility should be notified of any pesticide spill that occurs in a display or storage area.

## Management of a Major Spill

For a major spill in the storage facility, or the display area, notify:

- the manager; and
- the product manufacturer or appropriate provincial regulatory authority for emergency response measures and cleanup procedures.

## Follow-up

Following a cleanup you should:

- Ensure that all equipment (coveralls, gloves, boots, shovels, etc.) used is accounted for, and then quarantine it for decontamination or disposal.
- Ensure any emergency responders involved in the cleanup are advised that their clothing might be contaminated and direct them to wash thoroughly before smoking or eating.
- Watch for poisoning symptoms in employees or emergency responders.

### Disposal

Consult the appropriate provincial authority for advice on proper disposal of clean-up material. The drums or containers holding the clean-up material should be covered and labelled with "spilled pesticide - DANGER" and the name of the pesticide. Do not take them to a garbage dump unless environment officials have authorized this. Contact a licensed hazardous waste disposal company for disposal of the containers.

### Personal Hygiene

After a small spill has been cleaned up, all workers involved should wash their hands throughly with soap and water as soon as possible. If clothing becomes contaminated, shower and change clothes.

If any person involved in the accident or cleanup begins to feel sick (nausea, headache, etc.), immediately take them to the nearest hospital. Take along the *PCP Act* registration number and any additional medical treatment information from the pesticide label or MSDS. The doctor or Poison Control Centre staff can find the necessary medical information for treatment of the patient from the *PCP Act* registration number.

### Reporting Spills

Vendors should contact their local and/or provincial environmental emergencies office as well as their provincial pesticide regulatory authority to report a pesticide spill. The owner of the material, or the person who had control of it immediately before the spill, should assess the situation and take responsibility for the spill even if they are not at fault. The owner/controller may later seek compensation from those responsible.

## Pesticide Theft

### Prevention

The likelihood of a pesticide theft occurring can be minimized when you:

- keep doors and windows secured;

- keep the pesticide storage area securely locked when unattended; and
- have adequate external lighting on all sides.

The vendor facility can be liable in the event of an accident involving stolen pesticides.

### Response

If a theft occurs, you should notify the police and the appropriate government authorities. Advise them of the *PCP Act* registration number, the quantity of the product stolen, and any human health or environmental hazards noted from the pesticide label or MSDSs.

## Pesticide Fires

An uncontrolled fire in a pesticide storage area can be extremely dangerous because the pesticides involved can be flammable, explosive, react with water, or generate toxic fumes when burning. For these reasons, special fire control tactics are required. If not properly addressed, the initial hazard from the fire can be further compounded by contamination of the air, surface water, groundwater, or soil.

## Preparation and Prevention

A facility that stores pesticides can reduce the risk to life and property through the development and implementation of a comprehensive emergency response plan. The following is a list of some things that can be done.

- Prepare for the possibility of fire by developing the plan before a fire occurs.
- Provide the local fire department, as well as other nearby fire departments that might be called to provide mutual aid, with the names and quantity of products being stored.
- Keep up-to-date copies of the Material Safety Data Sheets both at the facility and at a secure, off-site location.

- Take the time to carefully map a floor plan of the pesticide storage facility and an overview sketch of the facility.

## Floor Plan

The floor plan of the storage area should indicate:

- the location of the fire extinguishers and personal protective equipment;
- the position of all windows, fire doors, and access or emergency exit doors;
- location of ventilation inlets and outlets;
- the exact location of any flammable or explosive pesticides; and
- location of access aisles for fire fighting equipment.

The overview sketch of the facility should include:

- any water sources and the volume of water available for fire fighting;
- location of any manholes, waterways, or ditches;
- the direction runoff water would flow, to help determine how to control such runoff;
- location and function of other on-site buildings;
- the fence line, gates, and points of access;
- fire routes; and
- location and function of off-site buildings (hospitals, residential areas, schools, recreational facilities, industrial sites, etc.) surrounding the property boundary.

**These detailed plans should be provided to the local fire department, and an invitation extended to them to visit the site so as to make them familiar with the quantity and location of stored products**.

Employees should be familiar with what to do in an emergency and trained in the proper use of safety equipment.

Vendors should prepare procedures for evacuating and notifying the fire department.

**No one should take unnecessary risks in fire fighting. It is wiser to wait for the fire department than to be burned, poisoned, or injured.**

## Fire Plan

The vendor facility should have a detailed, step-by-step plan of what to do if a fire occurs. Identify in advance a person to co-ordinate activities with emergency personnel and to respond to news media questions. A fire emergency plan should include the following:

- Immediately evacuate and isolate the area where the fire is detected. Have a predetermined location for all staff to meet. Account for all staff so fire fighters know when they first arrive whether they need to do a search and rescue or merely attempt to control the fire.
- Call the local fire department (911) immediately when smoke or fire is detected anywhere at the facility. The pesticide storage area and the building in which it is housed should have a fire detection system connected to a 24-hour automatic monitoring service.
- Determine the location and extent of the fire if this can be done safely.
- Remind fire fighters and emergency responders that anyone in the vicinity of the fire can be exposed to toxic fumes, poisonous run-off, and/or concentrated pesticides from leaking or exploding storage containers, and of the additional danger posed by burning pesticides and thus the importance of wearing self contained breathing apparatus.

- Call the police so that they can assist the fire fighters with traffic control or initiate an evacuation of the surrounding area.
- Call the local medical authorities and/or the local Poison Control Centre and advise them of the chemicals involved.

- Cordon off the area and set up an emergency command centre for police, municipal disaster services, government officials, company staff, or other emergency personnel.

Inform emergency response personnel:

- as to whether all staff are accounted for;
- as to the location of the pesticide display and storage areas within the facility;
- as to what pesticides are in the affected area (provide Material Safety Data Sheets if available);
- to avoid contaminating the surrounding area by using a minimum amount of water;
- that runoff water should be controlled; and
- that their clothing should be decontaminated before leaving the scene.

## Summary

As a vendor, you need to be familiar with the Emergency Response Plan (ERP) procedures if you are to minimize the risks associated with handling pesticides. A pesticide vendor facility can be a safe working environment. To minimize risk, managers need to prepare Emergency Response Plans to address pesticide poisonings, spills, or fires, as well as minor and major accidents. Everyone should participate in drills that involve the use of the ERP and be able to properly respond to their assigned duties. Being prepared with a well documented and practiced Emergency Response Plan will make your pesticide vendor facility a safer place for employees, the community, and the environment.

## *Reference material only*

### *Fire prevention*

*A pesticide storage facility can be made a safer place by:*

- *keeping an inventory of stored pesticides in an easily accessible location away from the storage area;*
- *informing the fire department as to where all pesticides are stored;*
- *posting a warning sign on all entrances to the storage facility;*
- *keeping emergency phone numbers handy;*
- *keeping a fire-extinguisher approved for chemical fires near the storage area;*
- *getting advice from the local fire department about adequate fire equipment for the facility, i.e., a sprinkler system;*
- *developing a plan of action to address a fire;*
- *installing a smoke alarm / detection system;*
- *training employees to respond properly in an emergency;*
- *not using open flames for welding, burning, or cutting in the pesticide storage area;*
- *using stretch wrapping rather than shrink wrapping, because stretch wrap does not require heating;*
- *ensuring that the pesticide storage area meets all required codes (i.e., National Fire Code, National Building Code, National Electrical Code);*
- *not having spare flammable, compressed, liquified storage cylinders inside the storage facility;*
- *not allowing flammable or combustible products to be stored inside the storage facility;*
- *not allowing staff or customers to smoke in the storage area;*
- *ensuring that the heating system is designed to prevent contact with explosive vapour; and*
- *securing doors and windows to prevent unauthorized entry to the property.*

***After a fire has occurred:***

- *secure the area to prevent entry;*
- *ensure that emergency responders are aware of the importance of decontaminating all equipment used in the emergency;*

- *ensure that emergency responders are aware of the importance of minimizing the use of water to control the fire;*
- *report adverse health effects noted by anyone involved in the fire;*
- *contact the proper provincial authorities for advice on disposal of debris;*

- *advise provincial or municipal authorities of any runoff; and*
- *have staff cooperate with local fire department personnel to assist in determining the cause of the fire.*

## *Environmental concerns*

***Groundwater and surface water contamination***

*Historical evidence has shown that environmental damage resulting from fires involving pesticides increases in proportion to the volume of water used to control and extinguish the fire. This run-off water is often heavily contaminated with toxic compounds and is extremely difficult to contain without diking. Similarly, products of incomplete combustion, due to low temperature burns, tend to be substantially more toxic and less stable than are the original compounds.*

***Air quality contamination***

*Air quality, at or near ground level, during a pesticide fire will deteriorate dramatically as the combustion temperature is reduced. A combustion temperature of 982 degrees Celsius, for example, provides for the complete thermal decomposition of pesticides. The resulting emissions are primarily carbon and water. At this temperature all contaminants are carried into the high atmosphere where dispersion ensures that toxic levels do not occur at or near ground level.*

*As the combustion temperature is reduced, various noxious and toxic gases can be created. In addition, steam generated from the addition of water to the fire carries contaminated particles into lower levels of the atmosphere where they return quickly to the ground. As an example, air dispersion models*

*run on pesticides indicate that where exit temperatures drop from 650 degrees Celsius to 400 degrees Celsius, ground level contaminants rise by a factor of three.*

## *Life safety concerns*

***First responders and the public***

*Protection of first responders and the public is a major concern with fires involving pesticides. Historically, pesticides have not caused serious casualties among the public or first responders who have been adequately trained.*

*As demonstrated in the previous discussion on air quality, the management of respirable contaminants at ground level hinges on the temperature of combustion, and the exit temperatures from a structure. When fires have been allowed to burn at high temperatures, the risk has been lowered significantly.*

*First responders at an incident involving pesticides must be protected with a minimum of self-contained breathing apparatus and standard turn-out gear. If a facility is fully involved or free burning, life safety is greatly enhanced by remaining outside the structure and upwind of smoke and exhaust gasses.*

# Professionalism 11

## Introduction

The storage and sale of pesticides is not only a business, but also a profession. A profession that carries with it a great number of responsibilities because of the potential impact of pesticides on customers, the public, and the environment. These responsibilities require that the management and employees of all pesticide vendor facilities conduct themselves and their business in a professional manner. Equally important, they must be perceived by the community to be doing so.

## Learning Objectives

Completion of this chapter will help you to:

- Deal professionally with the public
- Conduct your business in a professional manner

## Legal Requirements

A pesticide vendor facility is a component of the community and so it is required that business be conducted in a legal manner at all times.

Some of the items that a domestic pesticide vendor must consider include the following:

- They must be familiar with and comply with all federal and provincial regulations, as well as municipal by-laws. This means that they must:
  - sell only federally registered pesticides;
  - restrict access to the display and storage of controlled purchase domestic pesticides; and
  - display, transport and dispose all pesticides in compliance with provincial regulations.

- They must make sure the business is licenced and that associated employees are certified as required by provincial regulations.
- They must keep and supply annual sales records (e.g., a description of the pesticide [name, PCP number, quantity, package size, etc.]), as required by provincial regulations.

## Vendor Responsibilities

A number of ways exist whereby a pesticide vendor can display professionalism.

### Customer

Customers will often look to you as a source of information. As a professional, you should be in a position to provide general advice to your customers, or to direct them to local sources of information on:

- selection of personal protective equipment;
- disposal of empty pesticide containers and unwanted product;
- Integrated Pest Management programs;
- Material Safety Data Sheets; or
- proper transportation, handling, use, storage, and disposal of a pesticide.

### Community

The business of storing and selling pesticides carries with it a potential for risk to the surrounding community. It is your responsibility to make the operation of storing and selling pesticides as safe as possible for your employees, for those living in the surrounding community, and for the environment.

### Environment

As a vendor, you have a responsibility to show both customers and the public that you care for the environment. The best way to do this is by example. Selected ways to show professionalism and help protect the environment include the following:

- Promote the proper handling, use, and disposal of any pesticide.

- Immediately clean up any spilled pesticide and stress the importance of doing this to your customers.
- Advise the fire department of the importance of minimizing the amount of water used to fight a fire in a pesticide storage facility.
- Have a plan for the on-site containment of any run-off water.

## Public Relations

Public relations refers to positive interactions between the staff or management of the pesticide vendor facility and customers, property owners bordering the facility, emergency responders, concerned citizen groups, and government personnel.

Good public relations will:

- enhance credibility;
- improve public and customer confidence; and
- help to deal with complaints or difficulties arising from activities related to the operation of the facility.

You can build strong positive public relations by:

- being knowledgeable and trained about the profession;
- having a good attitude;
- carrying out work activities in a professional manner; and
- communicating with the public.

## Knowledge and Training

Management and staff should continue to upgrade their knowledge of the pesticide sales business by attending seminars, trade shows, and courses or by reading journals, papers, and other literature. They must also be knowledgeable regarding:

- provincial regulations and municipal by-laws for pesticide vendors and applicators;
- information on individual product labels; and
- resources (people, publications, organizations, etc.) that can provide specific types of information.

## Attitude

It is important that vendor management and staff project a positive attitude. A positive attitude is shown when you:

- respond quickly and effectively to requests for information and to complaints, concerns, or emergencies;
- are credible (e.g., honest, courteous, polite, and respectful of others) at all times;
- only sell pesticides for registered uses;
- refuse to work under unsafe conditions;
- comply with government and industry standards;
- consider the concerns of bystanders and neighbours regarding outlet operation; and
- are conscientious of varying public opinions.

## Work Habits

You conduct work activities professionally when you:

- are environmentally safety conscious and human safety conscious and follow safety practices;
- advise others to handle and apply pesticides responsibly, according to the label and other application guidelines;
- maintain clean and safe display and storage areas;
- avoid unethical sales gimmicks; and
- set a good example for your customers.

## Communication

Communication, which involves listening as well as speaking, can be improved when you :

- understand the issues that concern your customers and others in the community;
- listen to public concerns and try to understand and appreciate varying viewpoints;
- understand that a problem can often be avoided by becoming a good listener, and by being honest, frank, open, and cooperative;
- keep the community informed about business practices, especially when these affect their health or safety; and
- involve local and neighbouring fire departments, emergency response services, municipal council, community groups, neighbours, and the media in mock

disasters at the facility. Make sure emergency responders are aware of your Emergency Response Plans for spills, injury, vehicle accidents, and fires.

# Appendix A Glossary of Pesticide Terms

**Absorption** is the movement of pesticides into organisms (plants, animals) or structures (soil, wood, etc.).

**Action threshold** is the point at which treatment should take place in order to prevent the pest population from reaching the injury threshold.

**Active ingredient** (a.i.) is the part of a pesticide formulation that produces the desired effects.

**Acute toxicity** is the adverse effects that occur within a few hours to a few days after exposure.

**Adjuvant** is a substance added to a pesticide mixture to enhance the pesticide's qualities.

**Adsorption** is the binding of chemicals to soil particles or other material.

**Baits** are mixtures of large particles, not recognized as a pellet or granular formulation, and an edible material.

**Calibration** is a procedure for checking and adjusting the delivery rate of application equipment.

**Certified applicator** means a person possessing a provincially approved pesticide applicator certificate bearing the name of that person.

**Chemical name** is the name of the chemical structure of the active ingredient.

**Chronic toxicity** refers to the adverse effects that occur and persist over time after exposure(s) to a poison.

**Commercial** pesticides are products registered for use in agriculture, forestry, industry, or other commercial operations.

**Common name** refers to the name of the active ingredient.

**Controlled Purchase Domestic Pesticide** is defined as any domestic pesticide not designated in Schedule 8 of the PEI *Pesticides Control Act* regulations as a self select domestic pesticide and any fertilizer within the meaning of the *Fertilizers Act* (Canada) that contains a pesticide. This includes all fertilizer–pesticide combination products.

**Degradation** is the breakdown of pesticides into other compounds.

**Deleterious substance** refers to any substance that, if added to water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat, or to the use by man of fish that frequent that water**.**

**Dermal absorption** is the intake of a substance through the skin.

**Desorption** occurs when bound pesticides are released from the soil or other material. Released pesticide residues are then more available for uptake and effect on the environment.

**Domestic** pesticides are registered for use in or around the home. Domestic pesticides are further classified in Prince Edward Island, as either self select or controlled purchase domestic pesticides.

**Dry flowables** are wettable powders which are formulated into small pellets or granules.

**Dusts** are finely ground dry materials consisting of a low active ingredient plus inert ingredients. They are ready to use.

**Emulsifiable concentrates** or emulsions are a clear solution with emulsifiers to be diluted in water. They form milky spray mixtures when combined with water.

**Eradication** refers to the total elimination of a pest population.

**Flowables or suspensions** are liquids that consist of solid particles of active ingredient suspended in a liquid.

**Formulants** refer to inert or other materials that are added to the active ingredient to make it suitable for storage, handling, or application.

**Formulation** is a mixture of active ingredients and formulants.

**Granulars** are a dry mixture of large, free-flowing particles with a low concentration of active ingredient.

**Groundwater** is found below the surface of the earth. Most groundwater occurs in zones of rock, sand, or gravel that are saturated with water. These zones are known as aquifers.

**Guarantee statement** states the active ingredients in the product and the amount of each ingredient.

**Half-life** is the time it takes for one-half of the initial amount of a pesticide to break down in the environment.

**Ingestion** or oral exposure refers to the intake of a substance by mouth.

**Inhalation** refers to the absorption of airborne particles of a substance.

**Injury threshold** is when a pest population reaches numbers such that it causes unacceptable injury or damage, sufficient to justify treatment.

**Integrated Pest Management (IPM)** is a decision making process that uses all necessary techniques to suppress pests effectively, economically, and in an environmentally sound manner.

**Label** is defined in the *PCP Act* to include: any legend, word, mark, symbol, or design applied or attached to, included in, belonging to, or accompanying any control product.

**$LC_{50}$** stands for lethal concentration 50, which is the concentration ( expressed in parts per million) of a pesticide in the air or water sufficient to kill one-half of the test animals exposed to the pesticide. The smaller the number, the more toxic the pesticide.

**$LD_{50}$** stands for lethal dose 50, which is the amount of a substance (mg/kg) that will kill one-half of the test animals exposed to the pesticide. The smaller the number, the more toxic the pesticide.

**Leaching** is the movement of pesticides with water through the soil.

**Manufacturing** pesticides are used in manufacturing, formulating, or repackaging and are not for use by applicators.

**Maximum Residue Limit or MRL** is the maximum amount of pesticide residue that may safely be contained in food products. MRLs are established by the Health Evaluation Division of Health Canada.

## *Appendix A Glossary of Pesticide Terms*

**Micro-encapsulated suspensions** are composed of small capsules of active ingredient suspended in a liquid. They slowly release the active ingredient.

**Net contents** may be listed as weight or volume measures. This information will help the applicator to decide how many packages of a pesticide product are needed.

**Non-point source** refers to when the pesticide is applied over a large area.

**Ocular exposure** is the intake of a substance through the eyes.

**Open body of water** means a river, stream, watercourse, bay, estuary, open municipal reservoir, farm pond, dugout, or other body of water, whether it contains water continuously or intermittently.

**Pest Management Regulatory Agency (PMRA)**, Health Canada, is responsible for administration of the *Pest Control Products Act* and Regulations.

**Pellets** are mixtures of active ingredients and formulants. They are typically formed into spheres, cylinders or other small solid pieces.

**Pest** is a harmful, noxious, or troublesome organism. Pests include weeds, insects, fungi, bacteria, viruses, rodents, or other plants or animals.

**Pesticide** is anything that is intended to prevent, destroy, repel, attract, or manage a pest. Pesticides also include plant growth regulators, plant defoliants, and plant desiccants.

**Pesticide resistance** is the term that describes the situation that occurs when a portion of a pest species is able to survive a pesticide dose that had previously controlled the species.

**Pesticide applicator certificate** means a document issued to a certified applicator.

**Photodegradation** refers to the breakdown of pesticides by sunlight.

**Phytotoxic chemical** is a chemical that is toxic to plants and can cause damage or injury to them.

**Point source contamination** refers to those instances where a large amount of pesticide is released into a small area (accidental spill, pesticide fire, or improper disposal).

**Pressurized products** are aerosols, sprays, foams, or dusts packed in a pressurized container. They may be liquids, solids, or gases.

**Product name** may describe the formulation, use, active ingredient, and distinctive brand or trademark of a pest control product.

**Registration number** is usually written as "REGISTRATION NO. 00000 PEST CONTROL PRODUCTS ACT". The higher the number, the more recently the product was registered.

**Restricted** pesticides are commercial type pesticides having certain limitations on the label.

**Risk** is the chance that someone or something will be harmed by a pesticide.

**Runoff** is the movement of water over a sloping surface. Pesticides may be mixed in the water or bound to soil particles that move with such water.

**Self Select Domestic Pesticide** is defined as any domestic class pesticide designated as a self select domestic pesticide in Schedule 8 of the PEI *Pesticides Control Act* regulations.

**Soluble granules** are solid materials (like granulars) that can be dissolved in a liquid.

**Soluble powders** are dry materials, similar to dusts, that are soluble in water.

**Solutions** are clear liquids composed of an active ingredient dissolved in a solvent.

**Spray drift** is the airborne movement of spray droplets away from a treatment site during application.

**Surface water** refers to water that is clearly visible on the earth's surface (ditches, streams, ponds, rivers, lakes, oceans, etc).

**Tablets** may be active ingredients alone, or active ingredients and formulants. They are formed into small blocks or spheres.

**Tank mixes** are mixtures of different pesticides blended in the same spray tank.

**Toxicity** is the harm a particular pesticide can cause to an organism.

**Toxicological information** provides information for medical personnel regarding the treatment of persons who have been poisoned, intoxicated, or injured by a pesticide.

**Vapour drift** is the movement of pesticide vapours in the air as a result of product evaporation from treated surfaces at any time during or after completion of a spray operation.

**Volatilization** is the process where solid or liquid substances evaporate into a vapour (gas).

**Wettable powders** consist of active ingredient plus a powder. They contain wetting and dispersing agents, and are mixed with water to form a suspension.

## *Appendix A Glossary of Pesticide Terms*

# Appendix B References

The following publications were used or reviewed in the preparation of this training manual.

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# Appendix C SCHEDULE 2

**EXCLUDED PESTICIDES**

An excluded pesticide is any pesticide that is used,
(a) as a bactericide in cutting oils or aviation and marine fuels;
(b) in household
    (i) cleansers,
    (ii) deodorizers,
    (iii) disinfectants, or
    (iv) soaps;
(c) as a dust control agent;
(d) as a fabric softener;
(e) as a bactericide or algaecide for use in swimming pools, domestic water supplies, industrial cooling systems, home aquaria, aquaculture facilities, or ornamental pools;
(f) as a surfactant, preservative or adjuvant;
(g) to control, destroy, mitigate, attract or repel any organism that is injurious to or noxious or troublesome for humans or domestic animals;
(h) as bait for flies, powder or liquid formulations for lice, or in a commercial barn spray;
(i) in pesticide analysis and research work in a laboratory or experimental research plot;
(j) in an industrial process incorporating a pesticide into a manufactured product on the premises where the product is manufactured; or
(k) by medical practitioners, veterinarians or health officers for the purpose of treatment, control, mitigation or prevention of pests in or on humans or animals.
(EC761/05)