Health Risks of Pesticide Use

Each time you handle a pesticide, you are at some risk. Just as household cleaners and medications can harm you if you don't handle them properly - so can pesticides. The amount of risk depends on two things – your **exposure** to the pesticide and the **toxicity** of that pesticide. Risk can be expressed as:

Risk = Toxicity x Exposure

Toxicity is a measure of how harmful or poisonous a pesticide is.

Exposure is a measure of the contact you have with the pesticide.

Take Control of Your Risk

Before you begin to handle any pesticide, consider the toxicity of the pesticide and how you can prevent your exposure.

Choose the least toxic pesticide when possible. If there is more than one product that will do the same job, choose the product that has the lowest toxicity.

Prevent your exposure to the pesticide. You are the one who controls your amount of exposure and the exposure of others. Use safe handling procedures and wear protective clothing and personal protective equipment (PPE) that fits you and is in good working condition.

Read the product label and the Material Safety Data Sheet (MSDS). Make sure that you have the information you need to make informed choices.

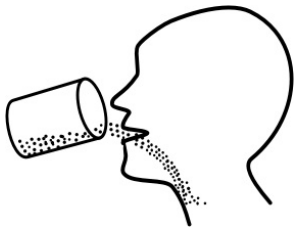
Routes of Exposure

You may be exposed to a pesticide in three ways:

- **oral exposure - ingestion**
  through your mouth or by swallowing a pesticide
- **dermal exposure/ ocular exposure**
  by contact with your skin and eyes
- **respiratory exposure - inhalation**
  by breathing in spray mist, dust or vapours.

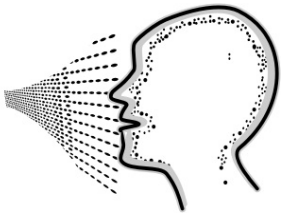
How do pesticides enter your body?

Once a pesticide enters through one of these routes of exposure, it can travel to other places in your body through your blood stream. This is how pesticides can harm tissues that are far away from the original point of entry. For example, pesticide spilled on your skin could end up in your liver.



Oral exposure occurs when a pesticide enters your **mouth** or you **swallow** a pesticide. Pesticide may splash into your mouth during mixing or clean up, or spray mist or dust may enter your mouth during application. Oral exposure also occurs if you eat food that has been contaminated by pesticides.

Oral exposure is often the result of carelessness – for example, blowing out a plugged sprayer nozzle or smoking or eating without washing your hands and face first. The most common reason why someone swallows a pesticide solution is that the pesticide has been removed from its original container and stored in liquor, soft drink or food containers.



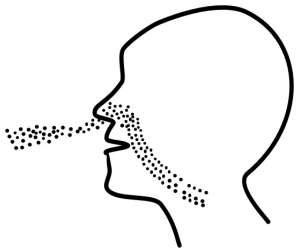
Dermal exposure occurs when a pesticide comes in **contact** with exposed **skin or eyes**. Dermal exposure can occur easily when you have direct contact with the pesticide concentrate or solution, or when you apply a dust or spray mist. Another common cause of dermal exposure is wearing clothing that has been contaminated with pesticide.

Dermal exposure is the most common kind of exposure that pesticide users experience. The amount of pesticide taken into the body depends on several things including:

- **skin condition**. Rashes, broken skin or abrasions, and moist skin may increase the rate of intake.
- **the part of the body that is exposed**. Your eyes, genital area, scalp and ear canals absorb pesticides at a higher rate than your hands or arms.

- **formulation of the pesticide**. Your skin absorbs liquids more easily than powders. In some cases, formulations such as emulsifiable concentrates may be more easily absorbed than water solutions.
- **adjuvants added to the spray solution**. Some adjuvants may increase the amount of pesticide that spreads onto or sticks to your skin, and the amount that is absorbed through your skin.

Dermal exposure through the eyes is also called **ocular exposure**. Ocular exposure can occur very easily if you don't protect your eyes from splashes, spray mists or powders with safety glasses or a face shield. You can also can injure your eyes if you rub them with a glove or clothing that is contaminated with pesticide.



Respiratory exposure occurs when you **inhale** (breathe in) small spray particles, dust, gases or vapours. There is a greater chance of inhaling pesticides when you work in a confined space or poorly ventilated area, and when you work with fumigant and aerosol pesticides.

Since the surface of the lung is a very thin membrane, it allows chemicals to enter the bloodstream quickly. The nose, throat and lungs may also be damaged by inhaling some chemicals.

➠ The **Pesticide Poisonings** and **Protective Clothing and Personal Protective Equipment** sections of this manual give detailed information about how you can protect yourself from oral, dermal, ocular and respiratory exposure.

Toxicity

Toxicity is the measure of how harmful or poisonous a pesticide is – how it may cause human injury, sickness or other unwanted effects. Pesticides vary from being slightly toxic to extremely toxic. Before a pesticide product is approved by the Pest Management Regulatory Agency (PMRA) of Health Canada, it must be tested to determine how dangerous it is for:

- a single dose or exposure, and
- repeated exposures to small doses.

Acute toxicity is the toxic response that results from a **single** dose or exposure to a pesticide.

Chronic toxicity is the toxic response that results from **repeated** exposures to small doses of a pesticide over a longer period of time.

Acute Toxicity

Scientists measure the acute toxicity of a pesticide by determining its lethal dose 50% or LD_{50}.

Lethal Dose 50% (LD_{50})

The LD_{50} value is the statistical estimate of a pesticide which will kill 50% of the test animals within a stated period of time (24 hours to seven days). The test animal is usually a rat, mouse or rabbit.

Since pesticides can enter the body by three different routes of exposure, the lethal dose or concentration for each route must be measured.

Oral LD_{50} is the amount of a pesticide (mg/kg of body weight) which will kill 50% of the test animals when it is ingested orally (swallowed).

Dermal LD_{50} is the amount of a pesticide (mg/kg of body weight) which will kill 50% of the test animals when it is applied to the skin.

Pesticides with low LD_{50} values (0-10) are extremely toxic. It takes only a very small amount of these pesticides to cause harm. The smaller the LD_{50} value, the more toxic the pesticide.

The symbols and signal words on the primary display panel of the pesticide label give you some information about the acute toxicity of the product.  See **The Pesticide Label** section in this manual.

Lethal Concentration 50% (LC_{50})

Inhalation Toxicity LC_{50} is the concentration (expressed in parts per million) of a pesticide vapour in air which will kill 50% of the test animals when it is inhaled (breathed in) over a set period of time.

Pesticide	Oral LD_{50} (mg/kg)	Symbol Information		
				mg/kg
VYDATE L (insecticide)	9 - 10	high		<500
MATADOR 120 EC (insecticide)	64 - 110	high		<500
MCPA AMINE 500 (herbicide)	700 - 1200	medium		500 - 1000
SENCOR 480 F (herbicide)	1078 - 1865	low		1000 - 2000
ROUNDUP TRANSORB (herbicide)	>5,000	very low	no symbol	>2000
CLASSIC (herbicide)	> 5,000	very low	no symbol	>2000

More information about the acute toxicity of a pesticide, including the values of the acute oral LD_{50}, acute dermal LD_{50} and the inhalation LC_{50}, are usually available on the Material Safety Data Sheets (MSDS) for that product. Ask your pesticide dealer or the product manufacturer for a copy of the MSDS.

Chronic Toxicity

Acute toxicity does not give you complete information about the dangers of a pesticide. You also need information about chronic toxicity.

Chronic toxicity of a pesticide is measured in different ways than acute toxicity. Laboratory animals are exposed to low levels of pesticides for periods ranging from about 90 days to several years. The tests may use oral, dermal or respiratory exposure. The animals are examined after the testing to determine whether the exposure has caused any toxic effects.

Chronic effects of pesticide exposure may include skin irritation, reduced body weight, organ damage, nerve damage, tumours, cancer and birth defects. Reproductive effects such as reduced sperm count and/or quality, sterility and miscarriage are also possible.

Know All The Risks

Pregnant Women and Nursing Mothers

In general, women who are pregnant or breast-feeding should avoid contact with pesticides. Some pesticides may be harmful to the fetus or to breast-fed infants. The Motherisk program at Toronto's Hospital for Sick Children provides information about the risks to the fetus or infant when the mother is exposed to drugs, chemicals, environmental agents and diseases. If you have questions about pesticide exposure while pregnant or nursing, contact the Motherisk call centre at **416-813-6780**. The Motherisk web site is located at **www.motherisk.org**.

Allergic Sensitization

Allergic sensitization is the term used to describe the development over time of an allergic reaction to pesticides or chemicals used in the formulation of pesticides. There are two types of sensitization: skin and respiratory. Symptoms of skin sensitization may include swelling, redness, itching, pain, and blistering. Respiratory sensitization symptoms may include wheezing, difficulty in breathing, chest tightness, coughing and shortness of breath. In some cases, respiratory sensitization can produce symptoms of a severe asthma attack.

As the allergy to the pesticide develops, the reaction can become worse with each exposure. Eventually, even a short exposure to a low concentration of the pesticide can cause a very severe reaction. Although it is rare, you need to be aware that pesticides may have the ability to cause life threatening allergic reactions in some people.

Cancer Risks

PMRA states that the majority of pesticides registered in Canada do not cause cancer in laboratory animals. However, the Canadian Cancer Society reports that exposure to many different risk factors may increase a person's risk of developing cancer. This combined risk may be higher than the risk linked with each individual chemical. It can take many years for cancer to develop after exposure to a risk factor, and people may be exposed to many risk factors as part of their daily lives.

Some studies have found that people who work with certain pesticides are at higher risk of developing some types of cancer than members of the general population. These cancers include non-Hodgkin's lymphoma, leukemia and multiple myeloma. Studies have also linked working with certain pesticides to ovarian cancer, prostate cancer, lung cancer and non-melanoma skin cancer.

People who work with pesticides on a regular basis may be at higher risk than the general population because the general population is usually exposed to smaller amounts of pesticides for less time. When you work with pesticides, lower your risk by keeping your exposure as low as possible.

You can find more information about pesticides and cancer risks on these web sites:
Canadian Cancer Society located at **www.cancer.ca**
U. S. National Cancer Institute located at **www.cancer.gov**
PMRA located at **www.pmra-arla.gc.ca**

U. S. Agricultural Health Study

In 1994, scientists from the National Cancer Institute, the National Institute of Environmental Health Sciences, and the U. S. Environmental Protection Agency began a study known as the Agricultural Health Study (AHS). The study has nearly 90,000 participants from Iowa and North Carolina who are farmers or farm family members. This ongoing study is looking at how the health of these farm families may be affected by things they are exposed to in their environments, including pesticides.

Some results from the Agricultural Health Study have been published. The researchers have found:

- exposure to some fungicides and insecticides may increase the risk of retinal degeneration (a cause of blindness).
- pesticides may contribute to respiratory symptoms among farmers.
- pesticide applicators may have a significantly increased risk of prostate cancer.

You can find up to date information about this study on the Agricultural Health Study web site located at **www.aghealth.org**.

Protect Others From Pesticide Exposure

The dangers of pesticide exposure are not limited to the person who handles or applies the pesticide. If you don't handle pesticides safely, you can expose others - your family or co-workers, livestock, pets and consumers of your products.

- Be sure that there are no people, livestock, pets and wildlife nearby when you handle and apply pesticides.
- Follow the re-entry times given on the label. Do not allow anyone to enter a treated area until the re-entry time has passed.
- Follow the pre-harvest intervals and pre-grazing intervals given on the pesticide label.
- Prevent pesticide from drifting away from the area you want to treat.
- Protect water sources from pesticide contamination.

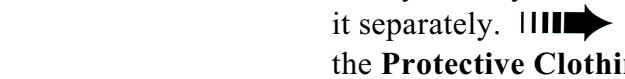
Prevent "Take-Home" exposure

Research studies have shown that family members can easily be exposed to pesticides without realizing it. This can happen when a pesticide user accidentally contaminates the family home, yard or vehicle.

You can prevent "take-home" exposure.

- Clean items like door handles, steering wheels, water taps and telephones. If you touch them with gloves that have pesticides on them, you could accidentally expose someone else to the pesticide.

- Remove your protective clothing before you get into your truck or car. If you don't, you could leave traces of pesticide inside.

- Keep clothing contaminated with pesticides away from the family laundry. Store it safely until it can be washed. Wash it separately.  Follow the washing instructions given in the **Protective Clothing and Personal Protective Equipment** section of this manual.

Read the Label and MSDS

Before you use any pesticide, read the label and the Material Safety Data Sheet. Remember:

- Look at the symbols and warning words on the product's label for information about the pesticide's acute toxicity.
- Read the fine print on the label for written warnings about the product's ability to cause chronic effects.
- Read the Material Safety Data Sheet (MSDS) for detailed information about the toxicity and possible health effects.

You can find health related information under the headings of Hazards Identification or Toxicological Information of the MSDS. The MSDS information may use some of the following words:

Allergic sensitization - the ability to cause allergic reactions.
Carcinogenicity - the ability to cause cancer.
Mutagenicity - the ability to cause genetic changes.
Oncogenicity - the ability to cause tumour growth (not necessarily cancers).
Teratogenicity - the ability to cause birth defects.

In addition to the MSDS, you can also find information about the health effects of pesticides on the EXTOXNET web site located at **http://ace.orst.edu/info/extoxnet/**.

Take Control of Your Risk

Every time you decide to use a pesticide, you have choices to make that give you some control over your risk and the risk of others. Make sure that you have the information you need to make informed choices.

Choose the least toxic pesticide when possible.

Prevent your exposure to the pesticide.

Read the product label and the Material Safety Data Sheet (MSDS).

Review Questions

1. Chronic toxicity of a pesticide refers to the immediate toxic response resulting from a single dose or exposure to a pesticide.

   TRUE FALSE

2. An LD_{50} value is defined as the:

   a) lowest dose required to kill 50 rats in a test population.
   b) dose required to kill a population of test animals under experimental conditions.
   c) legal dose acceptable for use by the scientific community.
   d) dose which will kill 50% of the test animals within a stated period of time.

3. Based on the given Acute Oral LD_{50} values, which of the following pesticides is the **least** toxic?

   a) 1,870 mg/kg
   b) 294 mg/kg
   c) 195 mg/kg
   d) 53 mg/kg

4. When you handle pesticides, you can lower your personal health risk if you:

   a) choose to use a pesticide with the lowest LD_{50} number.
   b) wear the same disposable coveralls through the spray season.
   c) tank mix the two Group 2 pesticides together.
   d) use personal protective equipment that fits you well.

5. What are the three ways a pesticide may enter your body (routes of exposure)?

   1.

   2.

   3.

6. What type of toxicity occurs from a single exposure to a chemical?

   a) Systemic
   b) Acute
   c) Selective
   d) Chronic

7. List three (3) ways that you can prevent the accidental oral exposure of pesticides on your farm.

   1.

   2.

   3.

8. Dermal exposure is the most common reason for pesticide poisoning. List three (3) ways you can protect yourself from dermal (skin) exposure to pesticides.

   1.

   2.

   3.

9. State three (3) ways you can protect yourself from respiratory (lung) exposure to pesticides.

   1.

   2.

   3.