Pesticide Applicator Report

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For Vermont's Pesticide Applicators

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News from the Agency

EPA Releases Pesticide Container and Containment Rule

by Cary Giguere, Agrichemical Section Chief

EPA has released the final rule on standards for pesticide containers and containment. The rule was first proposed in 1994. The rule will affect pesticide registrants, distributors and retailers. The only requirement for private applicators (farmers) and commercial/noncommercial applicators is to follow instructions on the pesticide label regarding refilling, cleaning and recycling containers. The rule has extensive language regarding the containers, both refillable and non-refillable and containers used for repackaging of pesticide products. Containment structures are required for agriculture retailers as well as agriculture commercial and custom applicators. These structures include secondary containment dikes around stationary tanks, containment pads for pesticide dispensing areas, recordkeeping and monthly inspections of tanks and structures. More information about the new regulation is available at:

http://www.epa.gov/pesticides/regulating/containers.htm
(Sources: EPA Office of Pesticide Programs Update 8/16/06, ASABE News Release, 9/21/06)

Vermont has petitioned US EPA for an allowance to continue implementing our own regulations in lieu of the federal containment regulations. US EPA will be making that determination this December. If the Vermont Regulations for the Control of Pesticides is found to provide equal or greater protection to the environment, you will notice no change in regulation; we will provide you with EPA's determination if it will affect your operations.

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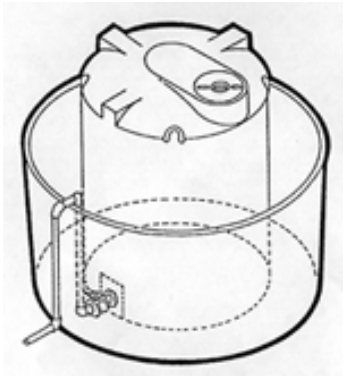
Questions or comments regarding this newsletter? Please contact Matthew Wood at 802-828-3482 or matthew.wood@state.vt.us

We plan on inspecting secondary containment facilities during the 2008 season for adequate sizing and recordkeeping requirements.



Example of "tank in a tank" secondary containment.

The Vermont Regulations can be found at; http://www.vermontagriculture.com/ARMES/VTregs91.htm or you can request a copy at (802) 828-2431.

The Pesticide Container and Containment rule also includes residue removal provisions for refillable and non-refillable pesticide containers, which USEPA has identified as the procedures and standards for which states must have an adequate program. USEPA has stated that the residue removal requirements are intended to minimize human exposure to pesticides during container handling and to facilitate proper container disposal and recycling. The residue removal provisions include;

Non-refillable Pesticide Container Requirements (40 CFR Part 165 Subpart B)
The non-refillable container residue removal standard and the associated record keeping:

- The non-refillable container residue removal standard applies to dilutable pesticides (liquid & dry) in containers that are rigid and have capacities less than or equal to 5 gallons (liquids) or 50 pounds (solids).
- Each container/formulation combination meeting these criteria must be capable of attaining at least 99.99% removal using the prescribed testing procedure.
- Testing is only required for flowable concentrate formulations or if USEPA requests it on a case-by-case basis.
- If product is a flowable concentrate or if USEPA specifically requests testing on a case-by-case basis, registrants must keep records to show compliance with standard.

Repackaging Requirements (40 CFR Part 165 Subpart D)
Registrants must develop a residue removal procedure for cleaning refillable containers, provide it to refillers, and keep records of the procedure.

- Registrants must develop a written residue removal procedure.
- Registrants must keep records of the residue removal procedure.
- Registrants must provide the written residue removal procedure to a refiller before or at the time of distribution or sale.

Refillers must obtain the residue removal procedure for cleaning refillable containers and must keep records of it:

- The refiller must have the residue removal procedure before repackaging a pesticide.
- The refiller must keep records of the residue removal procedure for the current operating year & for 3 years after that.

Refillers must clean refillable containers before repackaging pesticide into them, if cleaning is necessary.

- The refiller must clean a refillable container according to the residue removal procedure unless each tamper-evident device and one-way valve (if

required) is intact and either of these conditions is met: (i) it is being refilled with the same pesticide product or (ii) the container previously held a pesticide with a single active ingredient, it is being repackaged with a pesticide with the same single active ingredient and there is no change that causes the repackaged pesticide to not meet the product integrity standard.
- If a tamper-evident device or one-way valve is not intact, the refiller must clean the container using the residue removal procedure. Other procedures may also be necessary to ensure product integrity.

Pesticide Container Labeling (40 CFR 156 Subpart H)
Registrants must ensure that the labels of non-refillable and refillable containers have the required container cleaning instructions.

Cleaning instructions for non-refillable containers must:

- Be placed under the heading "Storage and Disposal."
- Have a statement about rinsing the container promptly.
- Include triple rinsing instructions (sample language given) and may include pressure rinsing instructions (sample language given).
- Require that a registrant submit a request to USEPA if registrant wants to include instructions to rinse a container with a diluent other than water.

Cleaning instructions for refillable containers must:

- Be placed under the heading "Storage and Disposal."
- Have a statement on the timing of the rinsing procedure (e.g., before final disposal).
- Include instructions for cleaning each container before disposal, appropriate to characteristics of pesticide & adequate to protect human health and the environment.

What Will Be the Compliance Date?

Under the federal rule, nationwide, the regulated community must comply with the residue removal requirements by 2009 or 2011, depending upon the provision. By August 16, 2009: registrants must ensure that the labels of refillable and non-refillable containers include the required cleaning instructions, pesticide users must empty and clean containers according to those label instructions, and registrants must ensure that certain non-refillable containers are capable of attaining the 99.99% residue removal standard. By August 16, 2011, registrants must develop the residue removal procedure, provide it to refillers and keep records; refillers must obtain the procedure and keep records; refillers must clean refillable containers before repackaging, if necessary under the requirements.

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2007 Cooperative Agricultural Pest Survey (CAPS) Update

By Emilie Inoue, State Survey Coordinator

The Cooperative Agricultural Pest Survey (CAPS) is a combined effort by Federal and State agricultural organizations to conduct surveillance, detection, and monitoring of agricultural crop pests and biological control agents. Survey targets include weeds, plant diseases, insects, nematodes, and other invertebrate organisms.

The Vermont CAPS program focused on surveying for 39 target pests in 2007. Surveys were conducted in nurseries/greenhouses, forests, vegetable farms, apple orchards, alfalfa fields and high-risk introductory sites.

Of the 39 target pests, 6 were detected in Vermont. Continued on next page →

For the past several years the ***viburnum leaf beetle*** and the ***lily leaf beetle*** have been detected throughout the state and have been causing significant damage on viburnum and Asiatic lilies. 2007 surveys in nurseries and greenhouses indicated that these two pests continue to be a problem and we consider both of these beetles to be established state wide.

Damage caused by viburnum leaf beetle
Photo: Paul Weston, Cornell University

Soybean aphid was detected on soybeans in the counties of Grand Isle, Franklin, Chittenden and Addison.

Swede midge, a pest that affects cruciferous crops, was detected for the first time. Swede midge has previously been identified in New York, Ontario, Canada, Massachusetts and Connecticut. Only one site in Chittenden County was found to have the pest.

Sirex noctilio is a pest of hard pines that was first detected in New York in 2005. The CAPS program has been surveying for this pest over the past two years and one positive specimen was identified in Lamoille County this year.

Sirex noctilio
Photo: Greg Hoover, PSU Entomology

Hemlock woolly adelgid was identified on a residential property located in Windham County during the month of June. The Vermont Agency of Agriculture in cooperation with the Vermont department of Forests, Parks and Recreation destroyed the infested trees on site. Hemlock woolly adelgid is not considered to be established in Vermont.

Two major pests of concern that the CAPS program continues to focus on include the **Asian Long-horned Beetle** and the **Emerald Ash Borer**. Neither of these two pests has been found in Vermont but both insects pose a serious threat to valuable Vermont forest resources, namely sugar maple and ash.

Emerald Ash Borer
Photo: H. Russel, Michigan State University

Asian Long-Horned Beetle
Photo: Pest and Diseases Image Library, Bugwood.org

The CAPS program will continue to survey for target pests in 2008. Further information regarding Vermont's CAPS program and specific target pests can be found at the Agency of Agriculture website: http://www.vermontagriculture.com

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Toxicity of Pesticides

Source: The Cornell University Extension Pesticide Management Education Program website; http://pmep.cce.cornell.edu/index.html

A pesticide is any substance used to control pests. Pests may be target insects, vegetation, fungi, etc. Most control the pests by poisoning them. Unfortunately, pesticides can be poisonous to humans as well. Some are very poisonous, or toxic, and may seriously injure or even kill humans. Others are relatively non-toxic. Pesticides can irritate the skin, eyes, nose, or mouth. The most important thing to remember is that you should always use caution whenever you work with any pesticide!

Goals of This Article

- Understand what toxicity is and how it affects humans.
- Learn the three routes of entry (how pesticides enter the body) and the importance of each.
- Be familiar with how toxicity is measured and what is meant by label warning statements.

Toxicity: What is it?

The toxicity of a substance is its capacity to cause injury to a living system. A living system can be many things: a human body, or parts of the body (such as the lungs or the respiratory system); a pond, a forest and those creatures that live there. Toxicity represents the kind and extent of damage that can be done by a chemical. In other words, if you know the toxicity of a pesticide, you know "how poisonous" it is.

Dose-Time Relationship - The effect of a pesticide, or any substance for that matter, is dependent on a number of factors. The most important factor is the dose-time relationship. Dose is the quantity of a substance that a surface, plant, or animal is exposed to. Time means how often the exposure occurs. Thus, the dose- time relationship is how much of the substance is involved and how often the exposure to the substance occurs. This relationship gives rise to two different types of toxicity that pesticide applicators must know and understand. They are acute and chronic toxicity.

Kinds of Toxicity - Acute vs. Chronic

***Acute* toxicity** refers to how poisonous a pesticide is to a human, animal, or plant after a single short-term exposure. Acute toxicity is used to describe effects which appear promptly, or within 24 hours of exposure. A pesticide with a high acute toxicity is deadly even when a very small amount is absorbed. Acute toxicity levels are used as a way to assess and compare how poisonous pesticides are. The acute toxicity of a pesticide is used as the basis for the warning statements on the label. Acute toxicity may be measured as acute oral toxicity, acute dermal toxicity, and acute inhalation toxicity.

***Chronic* toxicity** is the delayed poisonous effect from exposure to a substance. Chronic toxicity of pesticides concerns the general public, as well as those working directly with pesticides because of potential exposure to pesticides on/in food products, water, and the air. It is measured in experimental conditions after three months of either continuous or occasional exposure.

A material that has high acute toxicity does not necessarily have high chronic toxicity. Nor does a chemical with low acute toxicity necessarily have low chronic toxicity. For many pesticides, the toxic effects following single acute exposures are quite different from those produced by chronic exposure. If, for example, large amounts of the pesticide cryolite are eaten by rats at one time little or no harmful effects will be observed. It quickly passes through the intestinal tract and is eliminated without harmful effects. However, if rats are fed small amounts of cryolite every day in their feed, they become ill and die. Cryolite is a very insoluble compound, meaning that it does not readily dissolve. The small amount of chemical that is absorbed from a one-time exposure is not sufficient to cause illness, but absorption of the same small amount every day, day after day, can cause chronic illness and death. The effects of both acute toxicity and chronic toxicity are dose-related; the greater the dose, the greater the effect.

While you cannot change the inherent toxicity of pesticides, you can limit the possibility of poisoning by preventing and/or limiting exposure. In other words, the risk of harm from pesticide exposure is equal to how poisonous the pesticide is, multiplied by the amount and route of exposure to the pesticide, or:

RISK = TOXICITY X EXPOSURE

Types of Pesticide Exposures

A pesticide exposure is defined as coming in contact with a pesticide. There are two types of exposure that may occur, acute and chronic.

Acute exposure refers to a one-time contact with a pesticide. When experimental animals are exposed to a pesticide to study its acute toxicity, acute exposure is defined as contact for 24 hours or less. Acute effects can be readily detected and more easily studied than chronic

effects. Immediate toxic effects are more likely to be produced by those pesticides that are rapidly absorbed.

Chronic exposure refers to a repeated contact with a pesticide. The study of chronic toxicity is accomplished by repeatedly exposing test animals for more than three months. In addition to producing long-term low-level effects, chronic exposure to pesticides may result in immediate, "acute" effects after each exposure. In other words, frequent exposure to a chemical can produce acute and chronic symptoms. The potential for a chronic effect is related to the level and frequency of exposure received.

Routes of Entry

There are three specific ways in which pesticides may enter your body. You may be poisoned no matter how they enter. Sometimes you can even be poisoned without knowing it, especially if the pesticide enters through the skin or lungs.

Dermal Route - Wet, dry, or gaseous forms of pesticides can be absorbed through the skin. This may occur if pesticides are allowed to get on the skin while mixing or applying, or if pesticide-contaminated clothing is not removed promptly and properly cleaned before being worn again. Oil or paste forms allow greater absorption through the skin than water-based pesticides. Some pesticides do not pass through the skin very readily. Others are quickly absorbed through the skin and can be as dangerous as if they were swallowed. Skin varies in its capacity to act as a barrier to pesticide absorption. The eyes, ear drums, scalp and groin area absorb pesticides more quickly than other areas on the body. Damaged or open skin can be penetrated by a pesticide much more readily than healthy, intact skin. Once they are absorbed through skin, pesticides enter the blood stream and are carried throughout the body.

Inhalation Route - Whether as dusts, spray mist, or fumes, pesticides can be drawn into your lungs as you breathe. Inhalation of pesticides can occur during the mixing of wettable powders, dusts, or granules. Poisoning can also occur while fumigating or spraying without a self contained breathing apparatus or a proper respirator in enclosed or poorly ventilated areas such as greenhouses, apartments, or grain bins. The largest particles that are inhaled tend to stay on the surface of the throat and nasal passages, and do not enter the lungs. Smaller particles can be inhaled directly into the lungs. The number of particles needed to poison by inhalation depends upon the concentration of the chemical in the particles. Even inhalation of dilute pesticides can result in poisoning. Once they are absorbed through the surfaces of the lungs, chemicals enter the blood stream and are distributed to the rest of the body.

Oral Route - Pesticides can enter the body through the mouth (also called ingestion). This can occur when hands are not properly washed before eating or smoking. They may be swallowed by mistake, if they are improperly stored in food containers. Ingested materials can be absorbed anywhere along the gastrointestinal tract; the major absorption site is the small intestine. Once absorbed, they eventually enter the blood stream by one of several means, and circulate throughout the body.

Which Route Is More Important?

You can be poisoned no matter which way pesticides enter your body. While there are few chemicals that are equally poisonous by all routes of entry, some pesticides can enter all three ways and poison you. (For example, parathion is toxic regardless of how it is absorbed).

The dermal and inhalation routes of pesticide entry are likely to be the most important routes of pesticide applicator exposure. It is unlikely that you would purposely eat or drink the chemicals you are using, but you may breathe them in, splash them on your skin, or expose yourself to pesticide "fallout."

Healthy skin can slow the absorption of a pesticide when dermal contact occurs. Liquid pesticides containing solvents and oil based pesticides are absorbed quickly compared to dry pesticides. The applicator must know that damaged skin (chapped, cut, or abraded) has lost its ability to slow the entry of a pesticide into the body.

The Qualities of the Exposed Individual

The qualities of the exposed individual influence the toxicity of a pesticide since different individual characteristics will affect how the person responds to a pesticide. Some examples of these individual qualities include:

- ♦health conditions: heredity, pregnancy, and disease may cause individuals to respond differently.
- ♦age: youngest and oldest individuals tend to be most sensitive.
- ♦gender/sex: male and female individuals may respond very differently.
- ♦environment: exposure to other toxic substances in food, air, water, etc.
- ♦health behaviors: customs or habits such as smoking, dietary practices, drug use, personal hygiene, etc.

♦body size: the effect of a dose is closely related to body weight. The heavier the individual, the more poison needed to cause an effect.

Effects of Toxicity

In addition to being acute or chronic, toxic effects can be any of the following:

*__Local or systemic__ (Both effects can occur with some pesticides.)

Local effects refer to those that take place at the site of contact with a material. Examples of this include: skin inflammation on the hand, in response to hand contact with a pesticide; or irritation of the mucous membrane lining the lungs, due to inhalation of toxic fumes.

Systemic effects are quite different because they occur away from the original point of contact. Systemic effects may occur when pesticides are distributed throughout the body, or "system". An example of a systemic effect is the blocking of an essential chemical of the nervous system, called "cholinesterase" (pronounced ko-li-nes-ter-ace), upon exposure to some types of pesticides.

***Immediate or delayed** (Both effects can occur with some materials.)

Immediate toxic effects are those which are experienced upon or shortly after exposure. (For example, a sneezing attack in response to inhaling pesticides during mixing).

Delayed effects occur after some time has passed. While they may not be obvious, such as long term reproductive effects, delayed effects can result from a single exposure. Tumors may not be observed in chronically exposed people for 20 to 30 years after the original exposure to a cancer-causing or "carcinogenic" chemical.

***Reversible or irreversible** - Reversible effects are not permanent and can be changed or remedied. Skin rash, nausea, eye irritation, dizziness, etc. are all considered reversible toxic effects. Injury to the liver is usually reversible since this organ has an ability to regenerate itself.

Irreversible effects are permanent and cannot be changed once they have occurred. Injury to the nervous system is usually irreversible since its cells cannot divide and be replaced. Irreversible effects include birth defects, mutations, and cancer.

***Additive, antagonistic, or synergistic**

An **additive** effect is one in which the combined effect of two pesticides is equal to the sum of the effects of each (ie. 2 + 2 = 4.)

An **antagonistic** effect occurs when the toxic effect of the combination of pesticides is less than what would be predicted from the individual toxicities. Antagonism is like adding 2 + 2 and getting 3 as the result.

A **synergistic** effect occurs when the combined toxic effect of two pesticides is much greater, or worse, than the sum of the effects of each by itself. Synergism is similar to adding 2 + 2 and getting 5 as the result.

Exposure to pesticides may also result in the following:

- **Reproductive effects:** effects on the reproductive system or on the ability to produce healthy offspring.
- **Teratogenic effects:** effects on unborn offspring, such as birth defects.
- **Carcinogenic effects:** produces cancer in living animal tissues.
- **Oncogenic effects:** tumor-forming effects (not necessarily cancerous.)
- **Mutagenic effects:** permanent effects on genetic material that can be inherited.
- **Neurotoxicity:** poisoning of the nervous system, including the brain.
- **Immunosuppression:** blocking of natural responses of the immune system responsible for protecting the body.

Measuring Toxicity - It is quite difficult to figure out the exact toxicity of a pesticide for humans. Animal testing is the primary way we measure toxicity. Many types of animals are used to test pesticide toxicity, including rats, rabbits, mice, guinea pigs and dogs. However, due to some differences between the way our bodies and the bodies of animals work, results of animal tests cannot always be applied or "extrapolated" to humans. In other words, a pesticide may be more or less toxic to humans than to the animals in which it was tested. Similarly, something that appears to be extremely toxic to test animals may not necessarily be poisonous in humans. **Toxicity studies are just guidelines for estimating and comparing toxic effects of pesticides**. The word "detected" is important when talking about measuring toxic effects. We can only talk about what we can see or observe. The term "No Observable Effect Level", or NOEL, means that at the stated dose, no effects were observed in test animals.

Acute Toxicity

Measures - To figure out how acutely toxic a pesticide is, scientists give laboratory animals short-term exposure to doses of the pesticide being tested. Experimental doses are given orally, as well as put on the eyes, skin, and in the air that the test animals breathe. The animals are then observed carefully for changes.

Lethal Dose Fifty - (LD50) "Lethal Dose Fifty" (LD50) is one way the toxicity of chemicals are measured. LD50 is the amount of a pesticide that has killed half of the animals in a laboratory test. The LD50 is found for both dermal and oral routes of exposure. For example, an acute oral LD50 indicates the amount of pesticide swallowed that has killed half of the animals tested.

The smaller the LD50 value, the less chemical required to kill half of the test animals, and the more poisonous the pesticide. So, a pesticide with a dermal LD50 of 25 (rabbit) is more poisonous than a pesticide with a dermal LD50 of 2000 (rabbit).

LD50's do not tell us how a chemical acts, nor do they tell us how sensitive different organs within an animal or human might be. They simply tell us how much of the chemical it takes to kill half of the test animals. LD50's for different chemicals can only be compared if the same test animal was used, and even then it cannot be taken as an indication of the ful toxic potential of either chemical.

Milligrams per kilogram (mg/kg) - Pesticide LD50 values are measured in units of weight called "milligrams" per "kilogram" (mg/kg). A single paper clip weighs about one gram. Cutting the clip into 1000 equal parts will make pieces that weigh one milligram each. There are approximately 28,000 milligrams in an ounce. A kilogram is about equal to 2.2 pounds. The LD50 value refers to the number of milligrams of pesticide that was needed to kill half of the test animals for each kilogram of the animal's body weight. For example, an acute oral LD50 of 5 mg/kg for pesticide A (rats) indicates that it is toxic when there are 5 mg of this chemical given orally for every kilogram (or 2.2 pounds) of the animal's weight.

Parts per million (ppm) - Another way of expressing how much pesticide is involved in toxic doses is referred to as "parts per million", abbreviated "ppm". One part per million means that for every million parts of a solution or mixture, there is one part of the substance being measured. The measures mg/kg and ppm are used interchangably since a milligram is one millionth of a kilogram. Other measures that you might come across when looking at the toxicity of a pesticide include: "parts per billion" (ppb) and "parts per trillion" (ppt). The following list may help you remember how small these concentrations are:

- *parts per million (ppm) = 1 milligram (mg)/kilogram (kg)
- 1 inch in 16 miles
- 1 minute in 2 years
- *parts per billion (ppb) = 1 inch in 16,000 miles
- 1 second in 32 years
- *parts per trillion (ppt) = 1 inch in 16,000,000 miles
- 1 second in 32,000 years

Lethal Concentration Fifty (LC50) - To figure out the "acute inhalation toxicity" of a pesticide, scientists add a known amount of the pesticide to air. The amount that causes half of the animals to die is the "Lethal Concentration Fifty" (LC50) of the pesticide. The lower the LC50 value, the more poisonous the pesticide. Lethal Concentration Fifty is measured in milligrams per liter (mg/l) or ppm and sometimes in milligrams per cubic meter (mg/m3).

Chronic Toxicity Measures - There is no standard measure like LD50 for chronic toxicity studies. Often the length of the experiment is in days, months, or years and the amount of each dose is stated. For example, a study of chronic oral toxicity might look like this: " 8 milligrams of pesticide were fed to rats daily for two years. No symptoms of poisoning appeared."

Two classes of pesticides, the organophosphates and carbamates, can slowly poison by attacking an essential body chemical called "cholinesterase". The chronic exposure to organophosphate pesticides can be measured by monitoring changes in blood cholinesterase levels. In humans, decreased blood cholinesterase levels are a sure sign that exposure to these types of pesticides should be avoided until the level is measured as being normal again. (For more on this subject, see Chapter VIII on cholinesterase tests).

Acute Toxicity Label Warning Statements - Based on the LD50 and the results of other acute tests, each pesticide is classified into a "toxicity category" and given an associated "signal word". A signal word must appear on every product label so that pesticide users are alerted to the pesticide's acute toxicity. Toxicity categories are based on the acute oral, dermal, and inhalation toxicities, as well as eye and skin irritation effects of each pesticide. A pesticide is categorized by its **highest level** of toxicity. For example, if the acute oral toxicity and acute dermal toxicity of a pesticide are in the slightly toxic category, but its acute inhalation toxicity is in the highly toxic category, the pesticide label will have the signal words for a highly toxic pesticide.

The following table indicates the four categories of pesticide toxicity:

Categories of Acute Toxicity

Category	Signal Word Required on Label	Oral Ld50 Mg/kg	Dermal LD50 mg/kg	Inhalation LC50 mg/l	Approximate Oral dose that can Kill an Average Person
I Highly toxic	DANGER-*[Poison! Skull Crossbones]	From 0 to 50	From 0 to 200	From 0 to 0.2	A few drops to 1 teaspoon full [or a few drops on the skin]
II Moderately Toxic	WARNING!	From 50 to 500	From 200 to 2000	From 0.2 to 2	Over 1 teaspoonful to 1 ounce
III Slightly Toxic	CAUTION!!	From 500 to 5000	From 2000 to 20,000	From 2.0 to 20	Over 1 ounce to 1 pint or 1 pound
III Slightly Toxic	CAUTION!!	More than 5000	More than 20,000	Greater than 20	Over 1 pint or 1 pound

* Not used for skin and eye irritation effects.

Hazard

Hazard is the risk of danger. It is the chance that harm will come from the use of a pesticide to the applicator, bystanders, livestock, wildlife, crops, consumers, water, etc. Hazard is often confused with toxicity, but they are not necessarily the same. The hazard of a toxic chemical is always based on two things; its ability to harm (i.e. its toxicity, corrosiveness) and the ease with which a person can come in contact with the chemical. For example, a highly toxic pesticide is usually considered "hazardous" because of the risk that it poses to the public or the environment. However, with proper handling, a highly toxic pesticide can actually pose a low risk or low hazard. Many factors besides a pesticide's actual toxicity can make it hazardous. These include: the skill of the applicator; the target pest involved; the type of pesticide; the formulation chosen; the other chemicals involved in the formulation; and the concentration and dosage used.

Concentration and Dosage. Usually, the more concentrated a formulation is the more hazard it poses. Dilute the concentrated pesticide and you reduce the hazard. For example, one ounce of pesticide A contains a lethal oral dose. If the same one ounce of pesticide A is diluted in ten gallons of water, each ounce of the dilute mixture will contain 0.0008 ounces of pesticide A. The handling of the dilute mixture is thus reduced when compared to the concentrate. Use good judgment when figuring out the concentration and dosage of a pesticide; try to use the lowest concentration and/or dosage that is necessary to control the target species.

Applicator. A skilled, experienced applicator using a highly toxic material will be less of a hazard to himself and others than perhaps a homeowner who applies pesticides on his/her property. A certified applicator should have the skill and knowledge to handle all pesticides safely.

Target. The site of application is called the target. It can consist of plants, soil, insects, animals, structures and many other things. The intended use of a pesticide on a target is to control specific target pests without harming fragile "nontarget species." The ideal pesticide controls the target pest and poses little or no hazard to nontarget species, as well as the target area itself.

Formulation. The hazard of a pesticide is also influenced by the way a pesticide is put together, or made into a formulation for use. Depending on the original toxicity of the pesticide, formulations that are easily absorbed or inhaled may pose more of a hazard than those that are less easily absorbed or inhaled. Keeping in mind all the factors that influence the toxicity of the pesticide, formulations generally pose the following toxicity hazard in decreasing order: emulsifiable concentrate > oil solution > water emulsion > water solution > wettable powder/flowable (in suspension) > dust > granular. Choose the safest formulation available to do the job. (See Chapter XV for a more detailed explanation on formulations).

All pesticides can be hazardous. Use caution whenever you handle them!

Want some credit? See quiz on page 13 ⟶

Pesticide Contacts at the **Vermont Agency of Agriculture, Food & Markets**
http://www.vermontagriculture.com/ARMES/index.html

Philip R. Benedict, Director

James Leland - Assistant Director	(802) 828-3478	jim.leland@state.vt.us
Wendy Anderson – Enforcement Chief	(802) 828-3475	wendy.houston-anderson@state.vt.us
Jeff Comstock - Soil Scientist	(802) 828-3473	jeff.comstock@state.vt.us
Cary Giguere - Agrichemical Program Supervisor	(802) 828-6531	cary.giguere@state.vt.us
Emily Inoue - Cooperative Ag Pest Survey Coordinator	(802) 241-3544	emilie.inoue@state.vt.us
Annie Macmillan - Agrichemical Toxicologist	(802) 828-3479	anne.macmillan@state.vt.us
Tim Schmalz - Plant Pathologist	(802) 241-3544	tim.schmalz@state.vt.us
Jon Turmel - State Entomologist	(802) 241-3545	jon.turmel@state.vt.us
Matthew Wood - Pesticide Certification & Training Coordinator	(802) 828-3482	matthew.wood@state.vt.us

Pesticide Contacts at the **University of Vermont Extension Service**
http://www.uvm.edu/~uvmext/

Lorraine Berkett - IPM Specialist	(802) 656-2630	lorraine.berkett@uvm.edu
Sid Bosworth - Agronomist, UVM	(802) 656-0478	sid.bosworth@uvm.edu
Jeff Carter - Field and Forage Specialist	(802) 388-4969	jeff.carter@uvm.edu
Sam Comstock - Extension Livestock Specialist	(802) 773-3349	sam.comstock@uvm.edu
George Cook - Extension Maple Specialist	(802) 888-4972	george.cook@uvm.edu
Heather Darby - Extension Agronomist and Nutrient Management Specialist	(802) 524-6501	heather.darby@uvm.edu
Betsy Greene - Extension Equine Specialist	(802) 656-2108	betsy.greene@uvm.edu
Vern Grubinger - Berry and Vegetable Specialist	(802) 257-7967	vernon.grubinger@uvm.edu
Ann Hazelrigg - Plant Diagnostic Clinic, Pesticide Education and Safety Program	(802) 656-0493	ann.hazelrigg@uvm.edu
Chet Parsons - Extension Sheep Specialist	(802) 524-6501	chester.parsons@uvm.edu
Leonard Perry - Greenhouse and Nursery Specialist	(802) 656-0479	leonard.perry@uvm.edu
Margaret Skinner - Entomologist	(802) 656-5440	margaret.skinner@uvm.edu
Julie Smith - Extension Dairy Specialist	(802) 656-4496	julie.m.smith@uvm.edu

News from UVM Extension Service

Results and Implications of the Agricultural Health Study

By Ann Hazelrigg,
UVM PESP Coordinator

A long term health study exploring the potential causes of cancer and other diseases among certified private and commercial pesticide applicators and their spouses has been in progress since 1994. The Agricultural Health Study, sponsored by the National Institutes of Health, EPA and the National Institute of Environmental Sciences, was designed to identify occupational, lifestyle and genetic factors that may affect the rate of disease in farming populations. The results from the study have already revealed significant information on pesticide exposures related to farming. The Ag Health study is unlike many other studies because it was designed to look at the health effects of lower doses of pesticides over a long period of time.

Participants in the Study

After a national competition, the states of Iowa and NC were selected for the study due to their strong ag sectors and their diversity of commodities and production methods. Enrollment in the program and continued participation by the subjects is completely voluntary. Willing applicators completed a questionnaire (often while attending a pesticide meeting) early in the study. Spouses could enroll by completing a questionnaire by mail or phone. Confidential information has been already been gathered from 89,000 subjects in the two states tracking details on pesticide safety practices plus information on lifestyle and diet on a periodic basis. The entire group of subjects includes 50,000 farmers, 32,000 spouses, 2,000 nursery workers and 5,000 commercial pesticide workers. Some of the studies also included children of the farmers. Data will continue to be collected from the subjects for several years.

Health of Farmers

Previous research has suggested with certain diseases and health issues, farmers are healthier than the general population. Lower death rates among farmers for heart disease and lung, colon, bladder and esophageal cancers may have to do with a more active lifestyle and lower smoking rates. However, farmers may have a higher rate of leukemia, myeloma, non-Hodgkin's lymphoma and cancers of the lip, stomach, skin, brain and prostate than those living in cities. Asthma, miscarriages and neurological disorders may also be higher in a farming population and may be related to agricultural exposures. Farmers, farm workers and their families may be exposed to substances such as pesticides, engine exhausts, solvents, dusts, animal viruses, fertilizers, fuels, and specific microorganisms that may account for some of the elevated risks of cancers. Until now, many human studies have not allowed researchers to sort out which of these factors may be linked to certain cancers.

Early Health Discoveries from the Study

Fourteen percent of all the applicators in the study reported having at least one high pesticide exposure incident in their careers, usually with one of 5 pesticides; alachlor, atrazine, trifluralin (Treflan), 2,4-D and phorate (Thimet.) Although research has shown that correct proper protective equipment (PPE) use can reduce pesticide exposure by 90%, poor choices for the wrong gloves (fabric or leather) was 18% in NC and 4% in Iowa. Applicators also admitted delaying changing clothes or washing clothes after pesticide application and mixing pesticide-soiled clothes with the family wash.

Continued on next page →

Some Preliminary Results

- Applicator cancer rates were found to be lower than the general population except with prostrate cancer (14% higher in male applicators) and skin melanoma (50% higher among farm wives.)
- There was no evidence of an association between breast cancer in farmer's wives and exposure to pesticides.
- There was a possible association of lung cancer with certain pesticides including the herbicides metalochlor and pendimethalin and the insecticides chlorpyrifos and diazinon.
- Prostate cancer was found to be associated with those who used methyl bromide fumigants and in men over 50 who worked with chlorinated pesticides like aldrin, chlordane, DDT, dieldrin, endrin, hexachlor and toxophene.
- There was a consistent degeneration of retinas in eyes associated with fungicide use in both applicators and farm wives.
- Of the 32,300 farm wives ages 21-40, pesticide users had longer menstrual cycles and more missed periods than non pesticide users.
- Wheeze (narrowed airways in lungs) is associated with the pesticides paraquat, parathion, malathion, chlorpyrifos, atrazine alachlor and EPTC. Wheeze is also associated with diesel tractor use, solvent use and some animal production.

Find out more

To find out more about this important study that is assessing the long term effects of low pesticide doses over time on farmers, farm wives, pesticide applicators and farm children, go to the website http://aghealth.nci.nih.gov/index.html

Get some credit! See quiz on page 15 ⟶

Legislative Update

The 2008 Legislative session will see activity on two bills that have implications for pesticide applicators that operate in the State of Vermont.

H.549 is a bill that proposes to establish 50-foot waterway buffers adjacent to waterways of the state in order to further the maintenance of safe and healthful conditions; prevent and control water pollution; protect spawning grounds, fish and aquatic life; control building sites, placement of structures, and land uses; preserve shore cover and natural beauty; etc. As you can see, this will affect almost all activities that take place within these buffers, including pesticide use.

S.70 "…proposes to empower municipalities to regulate the application of pesticides within their borders by establishing requirements that may involve the advance posting of outdoor pesticide applications, other notification of pesticide applications, and the establishment of buffer zones around waters of the state, provided all municipal regulations are in compliance with and at least as stringent as state and federal laws." (How's that for a sentence!)

Below is a link to the Vermont Legislative Bill Tracking Website where you can enter the Bill Number (**H.549** or **S.70**, no spaces) in order to keep up with the current status of the specific bill or resolution.
http://www.leg.state.vt.us/database/status/status.cfm?Session=2008

Home Study Quiz 1 – Toxicity of Pesticides

The following set of questions refers to the article on pages 5 - 9. Fill out the information on the back of the completed quiz and mail it to the Vermont Agency of Agriculture to receive (1) **one pesticide recertification credit.**

1. **T____F____** Acute toxicity is the basis for the warning statements on the label.

2. **T____F____** A material with a high acute toxicity will always have a high chronic toxicity as well.

3. **Fill in the blanks.** "The effects of both acute toxicity and chronic toxicity are_____;

the greater the _____, the greater the _____."

4. Which equation below best illustrates the relationship between risk, toxicity, and exposure?

   A. RISK=TOXICITY **+** EXPOSURE
   B. RISK=TOXICITY **±** EXPOSURE
   C. RISK=TOXICITY **X** EXPOSURE
   D. RISK=TOXICITY **÷** EXPOSURE
   E. RISK=TOXICITY ☺ EXPOSURE
   F. RISK=TOXICITY **/** EXPOSURE

5. Please list the (3) three specific ways in which pesticides may enter the human body.

6. What must the applicator know about skin that is cut, chapped or abraded as it pertains to pesticide exposure?

7. List (3) three qualities of an exposed individual that may affect how that person responds to a pesticide.

8. **Complete the sentence.** "A synergistic effect occurs when…"

9. **Define** LD50.

10. List the three signal words in order of toxicity, from highest to lowest.

Extra credit: When does 2+2=5?

Fill out the following information and mail the completed quiz to the Vermont Agency of Agriculture to receive <u>one (1) pesticide recertification credit.</u>

Name:		
Certificate #:		Please check: ☐Commercial ☐ Non-Commercial ☐Government ☐Private ☐ I don't know (shame on you!)
Street Address:		
City/State/Zip		
Company/Farm:		
Signature:	**Date:**	

Mail to:

Vermont Agency of Agriculture
Attn: Matthew Wood
116 State Street
Montpelier, VT 05620-2901

Home Study Quiz 2 – Results and Implications of the Agricultural Health Study

The following set of questions refers to the article on pages 11 and 12. Fill out the information on the back of the completed quiz and mail it to the Vermont Agency of Agriculture to receive (1) **one pesticide recertification credit.**

1. PPE can reduce pesticide exposure by what amount?

2. Why is this study unique?

3. What 2 states were selected for the study and why?

4. Farmers have a lower or higher death rate than the non farming public?

5. What cancers do farmers have in higher rates?

6. What type of pesticide use is associated with degeneration of the retina?

7. True___ False___ There was a strong correlation between breast cancer and pesticides in women.

8. Name two pesticides associated with wheezing lungs.

9. Which cancer is 14% higher in male pesticide applicators?

10. Which cancer is higher in farm wives than in non-farm women?

Vermont Agency of Agriculture, Food & Markets
Agriculture Resource Management & Environmental Stewardship
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Montpelier, VT 05620-2901

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Fill out the following information and mail the completed quiz to the Vermont Agency of Agriculture to receive one (1) pesticide recertification credit.

Name:		
Certificate #:		Please check: ☐Commercial ☐ Non-Commercial ☐Government ☐Private ☐ I don't know (shame on you!)
Street Address:		
City/State/Zip		
Company/Farm:		
Signature:	**Date:**	