

Make the Connection:

Health & Environment

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Hazards of household Pesticides

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PESTICIDES:

WHY SHOULD WE BE CONCERNED?

MAKE THE CONNECTION

Making the connection between environment and health can make a big difference in how we feel. As we age, many of us have come to accept that not feeling well is part of the process of aging. If we don't feel well, but don't have an illness like cold or flu, we tend to assume we're feeling ill as a result of being tired, run down, or stressed out. Rarely do we look at our surroundings as the cause of aches and pains. But the truth is, there are many products we use around the home or at work that can affect the way we feel. Products such as personal care products that are loaded with fragrances, air fresheners, synthetic fabrics in furnishings and floor coverings, cleaning products, pesticides, even natural gas used for heating and cooking, can all cause the vague symptoms that we collectively call "not feeling well." Furthermore, since these products are generally used on a daily basis, the potential for re-exposure is constant. So, when we use many different products around the home, we can never really escape chemical exposures.

The simple solution to improving the way we feel is to reduce the number of chemicals we use around our homes. Since most product containers don't provide a list of ingredients, most people really don't realize how many different chemicals they are introducing into their environment. The result is that our bodies are faced with more chemicals than they can handle, so the body reacts by producing vague symptoms such as fatigue, headache, general achiness, joint pain or stiffness, sore throat, nagging cough, frequent infections, this list goes on.

Our bodies are complex machines designed to detoxify every chemical that enters it, with the liver being the primary organ used in the detoxification process. For each chemical that enters the body, there is a specific and often unique method that the body uses to dispose of it. Over the eons our bodies have evolved to handle thousands of chemicals. But with the explosion of new chemicals that have hit the market in the last 40 years, our detoxification systems simply have not been able to adapt fast enough to develop a disposal strategy for every new chemical that enters the body. Furthermore, many of the chemicals, including many pesticide products, can either damage or impair the liver. This means that the body's ability to detoxify can slow down, giving the chemicals more time to cause damage to our cells. The more chemicals we are exposed to, the slower the system becomes, and that is when illness and disease can set in. The only way to minimize the slowing down of

the detoxification system is to reduce the number and amount of chemicals that our bodies must dispose.

THE PROBLEM WITH PESTICIDES

Every day we are faced with decisions that may impact the long term health and well being of ourselves and our family members. Most of the time we have adequate information with which to weigh the risks and benefits before making our final decision. But sometimes we don't realize that we may not have all the available information. So, while it may appear that we've made a safe decision, we may have made a dangerous one instead. Unfortunately, it may be years before the risk of such hazards were realized, and by then the link between the exposure and the outcome may have been lost. Such is often the case with lawn care products and insecticides.

As consumers, we have been lulled into a false sense of security in believing that our health and welfare is protected by government regulations. We believe that if a product is readily available on the open market then it has been tested and deemed safe for consumer use. The reality is, there are many products out there for sale to the general public that can either temporarily, or permanently, harm our health.

HIDDEN DANGERS

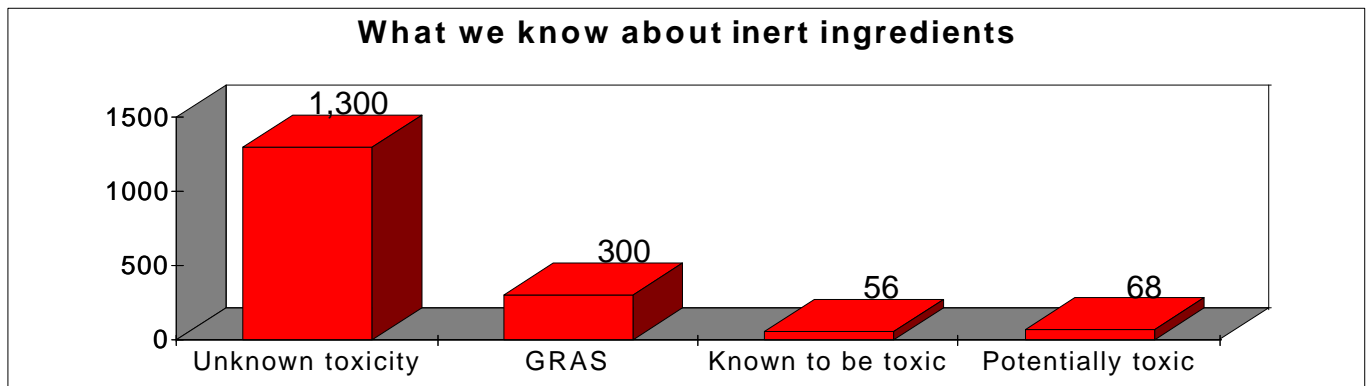
Most people are surprised to learn that of the 24 most common active ingredients in pesticide and herbicide products available to the general public, 9 are suspected or confirmed carcinogens, 9 are suspected of causing birth defects, 7 may be capable of causing changes in our DNA, 10 may inhibit fertility, 11 can cause serious neurological effects, 5 are potent allergens, and nearly all can damage or impair liver function. In fact, in my review of these active ingredients, I was only able to find 2 chemicals, the insect growth regulator methoprene (Precor), and the insecticide *Bacillus Thuringiensis*, that were reasonably free of serious short term and long term health effects.

UNKNOWN 'INERT' INGREDIENTS

But what is of even greater concern is that pesticide and herbicide product labels are only required to list the 'active' ingredient in the product, which is often less than 1% of the chemicals used. The 'active ingredient' is defined as the chemical that makes the pesticide kill the target organism. The remainder of the ingredients are allowed to be listed under the heading 'inert.' That makes it sound like the remaining ingredients are not toxic, but all it really means is that the remaining ingredients do not kill plants or bugs. The government has allowed manufacturers to

use this labeling loophole in order to ‘protect’ their formulations from being copied by competitors. Often these inert ingredients make the active ingredient work better... and may make them even more toxic to humans.

The problem is, there are more than 1,700 chemicals listed as ‘inert’ ingredients and the government knows very little about the hazards they pose to human health. Of the 1,700 chemicals listed as ‘inert,’ we know that 56 are known to be toxic, 68 are potentially toxic, 300 are Generally Regarded As Safe (GRAS), and 1,300 are of unknown toxicity, meaning that they have never been tested with respect to this form of use. Regardless of the lack of toxicity data, these 1,300 ingredients are allowed to be used in pesticide products. So without knowing what the ‘inert’ ingredients are the general public has no way to determine the relative safety of the products they are purchasing for use around their home. The result is that the products consumers thought were safe are actually responsible for as many as 150,000 reported pesticide related injuries every year. The question is, how many additional people were injured by pesticides but didn’t realize that it was the pesticide that was making them sick.



Source: National Institute of Environmental Health Sciences

WHAT WE KNOW ABOUT ‘INERTS’

Based on existing toxicity data, we do have some information on the hazards of some of the chemicals used as inert. For example, some of the chemicals used are also used in industrial applications, so some toxicity data do exist. Some of the ‘inert’ ingredients used are a class of chemicals called ‘hydrocarbon solvents.’ These types of chemicals must be used when the ‘active ingredient’ must be applied in liquid form but is not soluble in water (i.e. floats on water like oil). There is quite a bit of data that indicates that these hydrocarbon solvents can cause health effects, sometimes serious ones.

Other types of ‘inert’ ingredients are used to make a solid granule for the pesticide to adhere to. These solid ingredients are sometimes benign (i.e. cellulose,

cardboard), but others may be more threatening. One compound that may be used in solid products or emulsions is latex. For most people, latex is not a health risk, but for some people, latex exposure can cause such a severe allergic reaction that death can result. The lack of labeling can pose a serious problem for people who must avoid latex as a matter of life and death. How can a latex sensitive person protect themselves if they don't know whether latex is used in a product they are considering?

THE MAIN POINT ABOUT 'INERTS'

Since 'inert' ingredients are not required to be listed on the label the consumer has no way of knowing whether they are about to purchase a product that can harm their health. Thus, the labels are missing vital information, and the consumer is left without adequate protection.

WITH CHEMICAL MIXTURES, 1+1 DOES NOT EQUAL 2

To further complicate matters, when pesticide 'active ingredient' chemicals are tested for their toxicity, they are often tested alone, and not in conjunction with other chemicals that may be in the same product. The problem with this is that two chemicals may work together to be even more toxic than either chemical alone. That means that a commercially available product that contains two or more active ingredients may be far more toxic than would be suggested by the toxicities of the individual ingredients. But since chemical mixtures aren't tested for toxicity, we simply don't know just how toxic a product is.

LACK OF DETAIL ON LABELS PROVIDES FALSE SENSE OF SECURITY

What's even more troubling is that labels on pesticide products—the one thing that is supposed to protect the user even though it lacks full disclosure of ingredients—are still inadequate in terms of protecting public health. Labels are required to carry a signal word (i.e. caution, warning, or danger), but they aren't required to give a detailed explanation of why those words are there, and most people aren't aware what these words signify. Further, there are no health warnings posted on shelving, and staff people who may assist the customer are not trained in the hazards of these products. There is simply no information that would cause the consumer to question the safety of the product they are considering. And that's the crux of this issue—without adequate information the consumer can not make an informed decision based on risk versus benefit of the products in question.

NOW FOR THE GOOD NEWS

The good news is that there are very low or non-toxic alternatives for every problem for which pesticide products are designed to manage. These alternatives utilize many everyday products found in the kitchen pantry. Granted, they do take a little longer to work, but they do work without threatening the health of your family. Details of these alternatives can be found in the booklet titled "Home Remedies for Pest Control," available from Health & Environment Resource Center (see Resources, page 34).

HOW TO USE THIS BOOKLET

This booklet is designed to act as a reference manual for the safe use of pesticides in the home environment. If you feel you must use pesticides around the home, take this booklet to the store with you and use it to help select the least toxic product that will do the job you want done.

If you call in a professional exterminator or lawn care specialist, ask what chemicals they plan on using and look them up in this booklet. When hiring professionals, always request a Material Safety Data Sheet (MSDS). It will give you additional information about the products they plan to use.

Obviously, the decision to use pesticides is a personal one, but at least with this booklet you will have more information with which to make an informed decision.

MAKING SENSE OF THE HEALTH HAZARD PROFILES

As you read the health hazard profiles you will notice that each one is broken into sections. Following is a description of each section and what it means.

COMMON NAME: The short name used for a chemical. This is the name most likely to show up on the label.

CHEMICAL NAME: The technical name for the chemical. It is often very long and difficult to pronounce. Sometimes the label will list the chemical name after the common name, other times the chemical name may be the only name on the label.

TRADE OR OTHER NAMES: Different manufacturers may have their own name for the chemical.

USES: This lists the different uses for which the chemical is registered. It is against the law to use pesticides for any purpose other than for which it is registered.

REGULATORY STATUS: The U.S. Environmental Protection Agency (EPA) regulates the use of pesticides. Pesticides are categorized as either 'General Use Pesticides' (GUP) or 'Restricted Use Pesticides' (RUP). General use pesticides are permitted for use by the general public; restricted use pesticides require a licensed applicator. The EPA also requires certain signal words (i.e. caution, warning, and danger) to be listed on the label. See Table 2, page 9.

ACUTE TOXICITY: This indicates the manner in which the pesticide may get into the body. Some pesticides must

be ingested (i.e. eaten or drunk), others can be inhaled (vapors or dust), while others may be absorbed through the skin.

SYMPTOMS: These are the symptoms that might be experienced immediately after being exposed to a toxic amount of the pesticide. If a person were to experience these symptoms immediately after an exposure they should be treated at a hospital for pesticide poisoning. Some symptoms may be quite severe, or even become life threatening. Some of these symptoms may show up at some time after exposure as well. When this happens the link between exposure and symptom is often missed. If you should experience symptoms that develop within a few days of having used a pesticide product, consult a physician.

CHRONIC TOXICITY: These are the effects that might occur if one were to be exposed to the pesticide, even at doses too low to cause acute symptoms, over a long period of time. A good example of a long term exposure is the use of herbicides on a lawn. Once the pesticide is applied, it can remain present in the soil for up to several months. This means that every time you come in contact with the soil you are being exposed to the chemical. It may not be enough to cause immediate effects at the time, but over time it may accumulate in the body and cause damage at the microscopic level.

Reproductive Effects - Indicates whether exposure to the chemical might impair fertility or cause adverse pregnancy outcomes (i.e. miscarriage).

Teratogenic Effects - Indicates whether exposure to the chemical might cause birth defects in a developing fetus.

Mutagenic Effects - Indicates whether the chemical might be able to alter DNA, or make other changes in the way a cell operates.

Carcinogenic Effects - Indicates whether it is capable of causing cancer. Being exposed to a compound that is considered a carcinogen does not guarantee that you will develop cancer, but it might increase the chances that you may someday develop cancer.

Target Organ(s) - These are the organs in the body that are most adversely affected by the chemical. Bear in mind that all chemicals will pass through the liver and kidney on their way to being excreted, so there is also a possibility that those organs may be affected microscopically as well.

Fate in Humans and Animals - This indicates how long the chemical will stay in the body and the primary route by which it is removed from the body.

No Observed Affect Level - This is the highest dose or exposure level of a poison that produces no noticeable toxic effect on animals.

Biopersistence - This is the length of time the chemical may be present after it has been applied. This is important because it means that the exposure potential is continuous as long as the chemical is present. It is also important because many pesticides are re-applied long before the residues from previous applications have degraded, so multiple re-applications of a chemical can cause of buildup of residues in the soils. The biopersistence is often expressed as a half-life, meaning the length of time it takes for one half of the original concentration to degrade. So, for a chemical that has a half-life of one month, one half of the original concentration has degraded, while one half still remains.

MEASURES OF EXPOSURE

The effects of exposure to toxins vary with the amount of exposure, which is another way of saying "the dose." Usually when we think of dose, we think in terms of taking one vitamin capsule a day or two aspirin every four hours, or something like that. Contamination of food or water or soils with chemicals can also provide doses of chemicals each time we eat or drink or work in the contaminated areas. Some commonly used measures

for expressing levels of contaminants are listed in table 1. These measures tell us how much of the chemical is in food, water, soil or air. The amount we eat, drink, or breathe determines the actual dose we receive.

Concentrations of chemicals in the environment are most commonly expressed as ppm and ppb. Remember that these are extremely small quantities. For exam-

ple, if you put one teaspoon of salt in two gallons of water the resulting salt concentration would be approximately 1,000 ppm and it would not even taste salty!

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Table 1. Measurements for Expressing Levels of Contaminants in Food and Water.

Dose	Abbrev.	Metric equivalent	Abbrev.	Approx. amt.in water
parts per million	ppm	milligrams per kilogram	mg/kg	1 teaspoon per 1,000 gallons
parts per billion	ppb	micrograms per kilogram	µg/kg	1 teaspoon per 1,000,000 gallons

DOSE-EFFECT RELATIONSHIPS

The dose of a poison is going to determine the degree of effect it produces. One of the more commonly used measures of toxicity is the LD₅₀. The LD₅₀ is defined as the dose at which 50 percent of the animals tested died. It is usually expressed in milligrams of chemical per kilogram of body weight (mg/kg). The LD₅₀ gives a good indication of the relative toxicities of chemicals, but says nothing about other symptoms that might occur. As a result, many compounds that appear to have a low toxicity because it took a large dose to kill 50 percent of the test animals, may end up causing symptoms that occur well below the lethal dose and thus require more stringent handling methods than indicated if the LD₅₀ were considered alone. The LD₅₀ of a poison may vary considerably based on the species of animal and the way exposure occurs. Some poisons may be extremely toxic if swallowed (oral exposure) and not very toxic at all if splashed on the skin (dermal exposure).

The potency of a poison is a measure of its strength compared to other poisons. The more potent the poison, the less it takes to kill; the less potent the poison, the more it takes to kill. The potencies of poisons are often compared using signal words or categories as shown in the example in table 2.

The designation toxic dose (TD) is used to indicate the dose (exposure) that will produce signs of toxicity in a certain percentage of animals. The TD₅₀ is the toxic dose for 50 percent of the animals tested. The larger the TD the more poison it takes to produce signs of toxicity. The toxic dose does not give any information about the lethal dose because toxic effects (for example, nausea and vomiting) may not be directly related to the way that the chemical causes death. The toxicity of a chemical is an inherent property of the chemical itself. It is also true that chemicals can cause different types of toxic effects, at different dose levels, depending individual susceptibility.

Table 2. Toxicity Rating Scale and Labeling Requirements for Pesticides.

Category	Signal word required on label	LD50 oral mg/kg (ppm)	LD50 dermal mg/kg (ppm)	Probable oral lethal dose
I highly toxic	DANGER- POISON (skull and cross-bones)	less than 50	less than 200	a few drops to a teaspoon
II moderately toxic	WARNING	51 to 500	200 to 2,000	over 1 teaspoon to 1 ounce
III slightly toxic	CAUTION	over 500	over 2,000	over 1 ounce
IV practically non-toxic	none required			



HEALTH HAZARD PROFILES

COMMON NAME: 2,4-D

CHEMICAL NAME: (2,4-dichlorophenoxy) acetic acid

TRADE OR OTHER NAMES: There are many forms or derivatives (esters, amines, salts) of 2,4-D. Products containing 2,4-D include Weedtrine-II, Aqua-Kleen, Barrage, Plantgard, Lawn-Keep, Planotox and Malerbane.

USES: 2,4-D is used to control many types of broadleaf weeds. This compound is used in cultivated agriculture and in pasture and rangeland applications, forest management, home and garden situations and for the control of aquatic vegetation.

REGULATORY STATUS: Most formulations of 2,4-D are classified as General Use Pesticides (GUP) in the United States. Products containing 2,4-D must carry the signal word "**Danger**" on the label.

ACUTE TOXICITY: While laboratory tests suggests that it is only moderately toxic, it has produced serious eye and skin irritation among agricultural workers, causing it to be considered highly toxic.

SYMPTOMS: In humans, prolonged breathing of 2,4-D causes coughing, burning, dizziness, and temporary loss of muscle coordination. Symptoms of poisoning include: fatigue and weakness with nausea. On rare occasions there can be inflammation of the nerve endings with muscular effects following high levels of exposure.

CHRONIC TOXICITY: Routine ingestion over long period of time may result in stupor, signs of incoordination, weak reflexes, and urinary incontinence.

Reproductive Effects - There is sufficient evidence to suspect that 2,4-D may be capable of causing reproductive problems.

Teratogenic Effects - 2,4-D has a very limited ability to cause birth defects consisting of skeletal abnormalities. Up to 20% of 2,4-D absorbed passes through the placenta in animal studies.

Mutagenic Effects - 2,4-D has been very extensively tested for mutagenicity, however the evidence is too equivocal to draw any firm conclusions.

Carcinogenic Effects - Possible human carcinogen. Some evidence suggest an association of 2,4-D exposure with cancer, specifically non-Hodgkin's lymphoma.

Target Organ(s) - Liver, blood

Fate in Humans and Animals - The absorption of the herbicide is almost complete in mammals after ingestion and nearly all of a dose is excreted unchanged in the urine. The compound is readily absorbed through the skin and lungs also. The half-life is between 10 and 20 hours in living organisms. There is little evidence to suggest that the compound accumulates to any significant level. Peak concentrations of 2,4-D were found in the blood, liver, kidney, lungs and spleen with lower levels in muscle and brain between six and eight hours after exposure. After 24 hours there were no detectable tissue residues.

No Observed Affect Level - 1 mg/kg (rats)

Biopersistence - Half-life in soils is 2-16 days, depending on conditions.

COMMON NAME: ACEPHATE

CHEMICAL NAME(S): O,S-dimethyl acetylphosphoramidothioate (IUPAC); O,S-dimethyl acetic phosphoramidothioate; N-[methoxy(methylthio)phosphinoyl] acetamide

TRADE OR OTHER NAMES: Orthene, Asataf, Pillarhene, Kitron, Aimthane, Ortran, Ortho 12420, Ortil, Chevron RE 12420, and Orthene 755

USES: For control of a wide range of biting and sucking insects, especially aphids, including resistant species, in fruit, vegetables (e.g. potatoes and sugar beets), vine, and hop cultivation and in horticulture (e.g. on roses and chrysanthemums grown outdoors). It also controls leaf miners, lepidopterous larvae, sawflies and thrips in the previously stated crops as well as turf, mint and forestry.

REGULATORY STATUS: Acephate is considered a general use insecticide. Products containing acephate must bear the signal word "**Caution**" on their label

ACUTE TOXICITY: Acephate is moderately toxic by inhalation and ingestion.

SYMPTOMS: Exposure effects of acephate in humans can include: cardiac responses (bradycardia/tachycardia, heart block), central nervous system impairment, eye problems (miosis/mydriasis, loss of accommodation, ocular pain, sensation of retrobulbar pressure, tearing,

dark or blurred vision, conjunctiva hyperemia, cataracts), gastrointestinal problems (abdominal cramps, heart burn, hyperperistalsis), respiratory effects (apnea, dyspnea, hypopnea, atelectasis, bronchoconstriction, bronchopharyngeal secretion, chest tightness, productive cough, rales/ronchi, wheezing, pulmonary edema, laryngeal spasms, rhinorrhea, oronasal frothing) and death due to respiratory failure.

CHRONIC TOXICITY: Extended exposure to acephate may cause depression of cholinesterase levels.

Reproductive Effects - Acephate is considered a fetotoxin (can poison the fetus) and there is some evidence of hormonal effects.

Teratogenic Effects - Studies have not shown an effect

Mutagenic Effects - Studies have not shown an effect

Carcinogenic Effects - Studies have not shown an effect

Target Organ(s) - Central nervous system, respiratory system, and eyes.

Fate in Humans and Animals - Unknown

NOEL -

Biopersistence - The half-life of acephate in soil is 3-6 days.

COMMON NAME: ALLETHRIN

CHEMICAL NAME: (2-methyl-1-propenyl)-2-methyl-4-oxo-3-(2-propenyl)-2-cyclopenten-1-yl ester or mixture of cis- and trans-isomers.

TRADE OR OTHER NAMES: Allethrin: Alleviate, Pynamin. d-trans allethrin: D-Trans Concentration 90%, bioallethrin, MGK 264 and Esbiothrin.

USES: Allethrin is used for control of flies and mosquitoes, and in combination with other pesticides to control flying or crawling insects.

REGULATORY STATUS: Pesticides containing allethrin must bear the signal word "**Caution**" on the product label. Containers of technical d-trans allethrin must bear the signal "**Warning**".

ACUTE TOXICITY: Allethrin is slightly to moderately toxic by dermal absorption and ingestion.

SYMPTOMS: Short-term dermal exposure to allethrin may cause itching, burning, tingling numbness, a feeling of warmth, with no dermatitis. Exposure to large doses by any route may lead to nausea, vomiting, diarrhea, hyperexcitability, incoordination, tremors, convulsive twitching, convulsions, bloody tears, incontinence, muscular paralysis, prostration and coma. Persons sensitive to ragweed pollen are at increased risk from exposure to allethrin. Allethrin is a central nervous system stimulant. Heavy respiratory expo-

sure caused incoordination and urinary incontinence in mice and rats.

CHRONIC TOXICITY: Animal studies suggest that long term exposure may affect the liver.

Reproductive Effects - are unknown

Teratogenic Effects - appear to be negative

Mutagenic Effects - may occur under certain conditions, but association in humans is weak

Carcinogenic Effects - are negative

Target Organ(s) - Central nervous system, liver, kidney.

Biopersistence - Unknown

COMMON NAME: BACILLUS THURINGIENSIS (B.t)

TRADE OR OTHER NAMES: Berliner (B.t. variety kurstaki); Dipel, Thuricide, Bactospeine, Leptox, Novabac, Victory; Certan (B.t. variety aizawa); Teknar (B.t. variety israelensis).

USES: Bacillus thuringiensis (B.t.) is a naturally-occurring soil bacterium that produces poisons which cause disease in insects. There are different strains of B.t., each with specific toxicity to particular types of insects. Insects managed include: wax moth larvae in honeycombs; mosquitoes, blackflies and some midges; lepidopterous insects, including the gypsy moth and cabbage looper; certain beetle species and the boll weevil. More than 150 insects, mostly lepidopterous larvae, are known to be susceptible in some way to B.t.

REGULATORY STATUS: This microbial insecticide was originally registered in 1961 as a general use insecticide.

ACUTE TOXICITY: Research results suggest that the use of B.t. products can cause few, if any, negative effects. B.t. did not have acute toxicity in tests conducted on birds, dogs, guinea pigs, mice, rats, humans, or other animals. Very

slight irritation was observed in test animals from inhalation and dermal exposure.

CHRONIC TOXICITY: There is no evidence of chronic B.t. toxicity in dogs, guinea pigs, rats, humans or other test animals.

Reproductive Effects - None expected

Teratogenic Effects - None expected

Mutagenic Effects - None in humans

Carcinogenic Effects - None expected

Target Organ(s) - B.t. does not appear to affect humans in any way.

Fate in Humans and Animals - Rapidly excreted

NOEL - Unknown

Biopersistence - B.t. is a naturally-occurring pathogen that readily breaks down in the environment. As a biological entity, it is subject to death and inactivation in the same fashion as all living things. B.t. is degraded very rapidly when exposed to UV light. Its half-life under normal sunlit conditions is 3.8 hours.

COMMON NAME: CAPTAN

CHEMICAL NAME: 3a,4,7,7a-tetrahydro-2-[(trichloromethyl)thio]-1H-isoindole-1,3(2H)-dione

TRADE OR OTHER NAMES: Orthocide, Clomitan, Vancide 89, Agrox and Merpan.

USES: To control diseases of many fruit, ornamental, and vegetable crops.

REGULATORY STATUS: Most uses of captan on food crops have been cancelled in the United States since 1989. Captan has a low acute toxicity and generally carries the signal word "**Caution.**" However it may carry the "**Danger**" label if it is packaged in a concentrated form, often as a dust or powder.

ACUTE TOXICITY: Captan has a low acute toxicity with very high doses required for symptom development. Symptoms may include: eye irritation including burning, itching and tearing; and skin irritation.

CHRONIC TOXICITY: Captan has been classified as a probable human carcinogen, but studies are unclear on other potential chronic effects of captan exposure in humans. Sym-

ptoms may include loss of appetite and decrease in body weight.

Reproductive Effects - Studies indicate it does not cause reproductive effects in humans at usual levels of exposure.

Teratogenic Effects - Studies indicate that captan does not produce birth defects

Mutagenic Effects - Captan is either non-mutagenic or has very low mutagenicity in animals

Carcinogenic Effects - The EPA classifies captan as a **probable human carcinogen.**

Target Organ(s) - Eyes, skin, gastrointestinal tract, and kidneys.

Fate in Humans and Animals - Studies in several animal species have shown that captan is rapidly absorbed from the GI tract and is rapidly metabolized. Residues are excreted primarily in the urine.

NOEL - (rats) 12.5 mg/kg/day

Biopersistence - Captan has a relatively short persistence in soil with a half-life of one to ten days in most soil environments.

COMMON NAME: CARBARYL

CHEMICAL NAME: 1-naphthol N-methylcarbamate

TRADE OR OTHER NAMES: Carbamine, Denapon, Dicarbam, Hexavin, Karbaspray, Nac, Ravyon, Septene, Sevin, Tercyl, Tricarnam, and Union Carbide 7744.

USES: Carbaryl is a wide-spectrum carbamate insecticide which controls over 100 species of insects on citrus, fruit, cotton, forests, lawns, nuts, ornamentals, shade trees, and other crops, as well as on poultry, livestock and pets. It is also used as a molluscicide and an acaricide.

REGULATORY STATUS: Carbaryl is a general use pesticide. Products containing carbaryl must be labeled with the signal word "**Warning.**"

ACUTE TOXICITY: Carbaryl is moderately to very toxic. It can produce adverse effects in humans by skin contact, inhalation or ingestion.

SYMPTOMS: Direct contact of the skin or eyes with moderate levels can cause burns. Inhalation or ingestion of very large amounts can be toxic to the nervous and respiratory systems resulting in nausea, stomach cramps, diarrhea and excessive salivation. Other symptoms at high doses include sweating, blurring of vision, incoordination, and convulsions.

CHRONIC TOXICITY: It may cause minor skin and eye irritation. Subjects exposed to carbaryl over extended periods did not show symptoms, but tests indicated slight changes in their body chemistry.

Reproductive and Teratogenic Effects - Are negative

Mutagenic Effects - When carbaryl is ingested or absorbed into the bloodstream it is capable of combining with nitrates (present in many foods and naturally in saliva) to create Nitrosocarbaryl which has been shown to be highly mutagenic at low levels in laboratory test systems. Carbaryl has been shown to affect cell mitosis (cell division) and chromosomes in rats.

Carcinogenic Effects - Carbaryl alone does not appear to be carcinogenic, but N-nitrosocarbaryl

has been shown to be carcinogenic in rats at high doses.

Target Organ(s) - Heart, lungs, kidneys, liver, central nervous system and immune system.

Fate in Humans and Animals - Most animals, including humans, readily break down carbaryl and rapidly excrete it in the urine and feces. 74% of the dose may be excreted within 24 hours.

NOEL : 0.06 mg/kg/day

Biopersistence - Degradation of carbaryl in the soil is mostly due to sunlight and bacterial action. It is bound by organic matter and can be transported in soil runoff. Carbaryl has a half-life of 7 to 28 days depending on conditions.

COMMON NAME: CHLOROBENZILATE

CHEMICAL NAME: 2,4,6,8-Tetramethyl-1,3,5,7-tetroxocane

TRADE OR OTHER NAMES: Metaldehyde Antimilace, Antimitace, Ariotox, Cekumeta, Halizan, Limatox, Meta, Metason, Namekil, Ortho Metaldehyde 4% Bait, Slug Death, Slug Pellets, Slug-Tox, Slugit Pellets.

USES: Used to attract and kill slugs and snails. It is used in a variety of vegetable and ornamental crops in the field or greenhouse, on fruit trees, small-fruit plants, or in avocado or citrus orchards, berry plants and banana plants.

REGULATORY STATUS: Classified by the U.S. Environmental Protection Agency (EPA) as a Restricted Use Pesticide (RUP). Restricted Use materials may be purchased and used only by certified applicators. All product labels must include the following statement on the front panel, "This pesticide may be fatal to dogs or other pets if eaten. Keep pets out of treated areas." Products containing metaldehyde must bear the signal word "**Caution**" or "**Warning**."

ACUTE TOXICITY: Metaldehyde is highly toxic by inhalation, moderately toxic by ingestion and slightly toxic by dermal absorption. Skin and eye irritation may result from exposure to this material.

SYMPTOMS: Inhalation of vapors of metaldehyde may cause severe irritation of the mucous membranes lining the mouth, throat, sinuses and lungs. Ingestion of this molluscicide causes irritation of the stomach and intestines. Metaldehyde can also cause kidney and liver damage. One to three hours after ingestion, the following symptoms may appear: severe abdominal pain, nausea, vomiting, diarrhea, fever, convulsions, and coma. Other symptoms of acute exposure include increased heart rate, panting, asthma attack, depression, drowsiness, high blood pressure, inability to control the release of urine and feces, incoordination, muscle tremors, sweating, excessive salivation, tearing, cyanosis, acidosis, stupor, and unconsciousness. Kidney injury and liver cell death ('necrosis') may also occur. Mental deficiencies and memory loss from ingestion poisoning may persist for one year or more. Death may occur due to kidney or lung failure.

CHRONIC TOXICITY: Long-term, repeated skin exposure to metaldehyde can result in dermatitis, the inflammation of skin in humans. Prolonged eye exposure can cause conjunctivitis.

Reproductive Effects - Studies suggest that metaldehyde may cause reproductive effects.

Teratogenic Effects - Studies suggest that metaldehyde is not teratogenic.

Mutagenic Effects - Metaldehyde is suspected of causing mutagenic effects.

Carcinogenic Effects - Studies suggest that metaldehyde is not carcinogenic

Target Organ(s) - Central nervous system, gastrointestinal tract, liver, and brain.

Fate in Humans and Animals - The central nervous system is either depressed or excited by

metaldehyde or its metabolites. Metaldehyde is slowly decomposed in the body to a substance called acetaldehyde, a chemical that acts like a narcotic. Death from metaldehyde poisoning generally results from over depression of control centers in the brain that are responsible for the normal function of respiratory and vasomotor systems. Metaldehyde is readily absorbed into the bloodstream from the gastrointestinal tract. Its metabolites can cross the blood-brain barrier, as evidenced by their effect on the level of consciousness of animals.

NOEL - Unknown

Biopersistence - While it does not adsorb strongly to soil particles, metaldehyde is insoluble in water and it has a short soil half-life.

COMMON NAME: CHLOROTHALONIL

CHEMICAL NAME: Tetrachloroisophthalonitrile

TRADE OR OTHER NAMES: Bravo, Chloro-thalonil, Daconil 2787, Exotherm Termil, Forturf, Mold-Ex, Nopcocide N-96, Ole, Pillarich, Repulse, and Tuffcide. The compound can be found in formulations with many other pesticide compounds.

USES: To control fungi that threaten vegetables, trees, small fruits, turf, ornamentals, and other agricultural crops. It also controls fruit rots in cranberry bogs, and is used in paints.

REGULATORY STATUS: Chlorothalonil is classified as a General Use Pesticide (GUP) by the U.S. Environmental Protection Agency. Chlorothalonil containing products have a range of signal words, including: "**Warning**" (Bravo 720, 500), "**Caution**" (Exotherm Termil), and "**Danger**" (Bravo W-75, Daconil W-75). Each of these products has a different formulation and product concentration and thus requires a different signal word.

ACUTE TOXICITY: Chlorothalonil is slightly toxic to mammals, but it can cause severe eye and skin irritation in certain formulations.

SYMPTOMS: Very high doses may cause a loss of muscle coordination, rapid breathing, nose bleeding, vomiting, and hyperactivity. Dermatitis, vaginal bleeding, bright yellow and/or bloody urine, and kidney tumors may also occur, followed by death.

CHRONIC TOXICITY: In studies on the chronic effects of exposure to chlorothalonil, kidney changes such as kidney enlargement were common. Cancer in the kidney, ureter and bladder has been found. Human eye and skin irritation is linked to chlorothalonil exposure. Allergic skin responses may also occur.

Reproductive Effects - Studies suggest that chlorothalonil will not affect human reproduction except at very high doses.

Teratogenic Effects - Chlorothalonil is not expected to produce birth defects in humans.

Mutagenic Effects - The compound is not expected to pose mutagenic risks to humans.

Carcinogenic Effects - Chlorothalonil is a **potential human carcinogen**, known to affect the kidney, ureter, and bladder in experimental animals.

Target Organ(s) - Kidney, Skin.

Fate in Humans and Animals - Chlorothalonil is rapidly excreted, primarily unchanged, from the body. It is not thought to be stored in animal tissues.

NOEL -

Biopersistence - In oxygen containing soils, the half-life for chlorothalonil is from one to three months. Increased soil moisture or temperature increases rate of chlorothalonil degradation. It is not degraded by sunlight on the soil surface.

COMMON NAME: CHLORPYRIFOS

CHEMICAL NAME: O,O-diethyl O-3,5,6-Trichloro-2-pyridyl phosphorothioate

TRADE OR OTHER NAMES: Brodan, Detmol UA, Dowco 179, Dursban, Eradex, Lorsban, Piridane, Stipend.

USES: Chlorpyrifos is used for the control of a variety of insects, including fleas, cutworms, corn rootworms, cockroaches, grubs, flea beetles, flies, termites, fire ants, and lice. It is used as an insecticide on grain, cotton, field, fruit, nut and vegetable crops, and well as on lawns and ornamental plants. It is also registered for direct use on sheep, turkey, for horse site treatment, for treatment of dog kennels, and for domestic dwellings, farm buildings, storage bins, and commercial establishments

REGULATORY STATUS: The EPA has established a 24-hour reentry interval for entering crop areas treated with emulsifiable concentrate or wettable powder formulations of chlorpyrifos without protective clothing. Products containing chlorpyrifos must bear the signal word "**Warning**" or "**Caution**," depending on the toxicity of the formulation.

ACUTE TOXICITY: Chlorpyrifos is moderately toxic to humans through inhalation, ingestion, and skin absorption. Poisoning from chlorpyrifos may affect the central nervous system, the cardiovascular system, and the respiratory system. It is also a skin and eye irritant, however skin absorption of chlorpyrifos is more

limited unless the skin is broken or abraded. Persons with respiratory ailments, recent exposure to cholinesterase inhibitors, cholinesterase impairment, or liver malfunction are at increased risk from exposure to chlorpyrifos.

SYMPTOMS: Chlorpyrifos inhibits the neurochemical cholinesterase. Inhalation: respiratory effects which may include bloody or runny nose, coughing, chest discomfort, difficult or short breath, and wheezing due to constriction or excess fluid in the bronchial tubes. Skin contact: may cause localized sweating and involuntary muscle contractions. Eye contact: may cause pain, bleeding, tears, pupil constriction, and blurred vision. Exposure by any route: systemic effects may begin within a few minutes or be delayed for up to 12 hours, including: pallor, nausea, vomiting, diarrhea, abdominal cramps, headache, dizziness, eye pain, blurred vision, constriction or dilation of the eye pupils, tears, salivation, sweating, and confusion. Severe poisoning will affect the central nervous system, producing incoordination, slurred speech, loss of reflexes, weakness, fatigue, involuntary muscle contractions, twitching, tremors of the tongue or eyelids, and eventually paralysis of the body extremities and the respiratory muscles. In severe cases there may also be involuntary defecation or urination, psychosis, irregular heart beats, unconsciousness, convulsions and coma. Death may be caused by respiratory failure or cardiac arrest.

NOTE: Some organophosphates may cause delayed symptoms beginning 1 to 4 weeks after an acute exposure which may or may not have produced immediate symptoms. In such cases, numbness, tingling, weakness and cramping may appear in the lower limbs and progress to incoordination and paralysis. Improvement may occur over months or years, and in some cases residual impairment will remain.

CHRONIC TOXICITY: Repeated or prolonged exposure to chlorpyrifos may result in the same effects as acute exposure, including the delayed symptoms. Other effects include impaired memory and concentration, disorientation, severe depression, irritability, confusion, headache, speech difficulties, delayed reaction times, nightmares, sleepwalking and drowsiness or insomnia. An influenza-like condition with headache, nausea, weakness, loss of appetite, and malaise has also been reported. In some animal species, chlorpyrifos may produce neurotoxicity, or harm to nerve tissue.

Reproductive Effects - are unknown

Teratogenic Effects - Once in the bloodstream, chlorpyrifos may cross the placenta.

Mutagenic Effects - EPA has determined that chlorpyrifos is not mutagenic.

Carcinogenic Effects - EPA has determined that chlorpyrifos is not carcinogenic.

Target Organ(s) - Central nervous system.

Fate in Humans and Animals - In humans, chlorpyrifos and its principal metabolites are eliminated relatively rapidly, primarily through the kidneys in urine, following a single dose. It is readily absorbed into the bloodstream through the gastrointestinal tract if it is ingested, through the lungs if it is inhaled, or through the skin if there is dermal exposure. After a single oral dose, its half-life in the blood appears to be about one day. Following intake, some chlorpyrifos becomes stored in fat tissues, with a half-life of about 62 hours. Chlorpyrifos can be found in its original form in the blood, brain and liver.

NOEL - 100 ug/kg/day (human)

Biopersistence - Chlorpyrifos adheres strongly to soil particles and it is not readily soluble in water. The soil half-life of chlorpyrifos can range from 11 to 141 days. Chlorpyrifos is degraded by UV light, chemical hydrolysis and microbes. Thus it can be very persistent when applied indoors, and it may remain in carpets, furnishings and house dust for years causing repeated exposures. Since chlorpyrifos is not water soluble, washing covered surfaces may not effectively remove residues.

COMMON NAME: **DIAZINON**

CHEMICAL NAME: O,O-diethyl O-2-isopropyl-6-methyl pyrimidin-4-yl phosphorothioate

TRADE OR OTHER NAMES: Knox Out, Spectracide and Basudin. Diazinon may be found in formulations with a variety of other pesticides such as pyrethrins, lindane and disulfoton.

USES: Diazinon is used on home gardens and farms to control a wide variety of sucking and leaf eating insects. It is used on rice, fruit trees, sugarcane, corn, tobacco, potatoes and on horti-

cultural plants. It is also an ingredient in pest strips. Diazinon has veterinary uses against fleas and ticks.

REGULATORY STATUS: Diazinon carries the signal words "**Caution**" or "**Warning**" depending on formulation.

ACUTE TOXICITY: Diazinon is classified as slightly toxic to moderately toxic, depending on the formulation. Toxic effects of diazinon are due to the inhibition of acetylcholinesterase. The toxicity of encapsulated formulations is relatively

low because diazinon is not released readily while in the digestive tract.

SYMPTOMS: Weakness, headaches, tightness in the chest, blurred vision, non-reactive pinpoint pupils, salivation, sweating, nausea, vomiting, diarrhea, abdominal cramps, and slurred speech. Death has occurred in some instances from both dermal and oral exposures at very high levels.

CHRONIC TOXICITY: Diazinon has been shown to inhibit enzyme function in red blood cells, in blood plasma, and in brain cells.

Reproductive and Teratogenic Effects - May cause skeletal abnormalities and neurochemical inhibition.

Mutagenic Effects - Unevaluated in humans, though animal studies indicate a potential for mutagenicity.

Carcinogenic Effects - not considered carcinogenic.

Target Organ(s) - Central Nervous System and enzymatic processes.

Fate in Humans and Animals - Metabolism and excretion rates for diazinon are rapid, being excreted through urine and in the feces. The half life of the pesticide in animals is about 12 hours. It may be stored in fat tissues.

NOEL - 0.02mg/kg/day humans

Biopersistence - Diazinon can stay biologically available for six months under some conditions, though the average half-life is from two to four weeks.

COMMON NAME: DICAMBA

CHEMICAL NAME: 3,6-dichloro-O-anisic acid

TRADE OR OTHER NAMES: Metambane, Dianat, Banfel, Banvel, Banvel CST, Banvel D, Banvel XG, Mediben.

USES: Controls annual and perennial broadleaf weeds in grain crops and grasslands, and it is used to control brush and bracken in pastures.

REGULATORY STATUS: Products containing dicamba must bear the signal word "**Warning**" on the label.

ACUTE TOXICITY: Dicamba is moderately toxic by ingestion and slightly toxic by inhalation or dermal exposure.

SYMPTOMS: Loss of appetite (anorexia), vomiting, muscle weakness, slowed heart rate, shortness of breath, central nervous system effects (victim may become excited or depressed), benzoic acid in the urine, incontinence, cyanosis (bluing of the skin and gums), and exhaustion following repeated muscle spasms. In addition to these symptoms, inhalation can cause irritation of the linings of the nasal passages and the lungs,

and loss of voice. Most individuals who have survived severe poisoning from dicamba have recovered within 2 to 3 days with no permanent effects. Dicamba is very irritating and corrosive and can cause severe and permanent damage to the eyes. In some individuals, dicamba is a skin sensitizer. It may cause skin burns.

CHRONIC TOXICITY: Chronic exposure can lead to the development of the same symptoms as described for acute exposure. Consumption of dicamba at high levels over a long period of time has been shown to cause adverse health effects in animal studies, including changes in the liver and a decrease in body weight.

Reproductive Effects - Studies do not indicate reproductive effects.

Teratogenic Effects - Dicamba is suspected of being a human teratogen.

Mutagenic Effects - Dicamba has not been shown to be a mutagen.

Carcinogenic Effects - Data are inadequate to determine carcinogenicity.

Target Organ(s) - Liver.

Fate in Humans and Animals - Dicamba is rapidly absorbed into the bloodstream

from the gastrointestinal tract. Dicamba is transported to the liver and then excreted unchanged in the urine.

NOEL - Has not been determined.

Biopersistence - Degradation by soil microorganisms is the major pathway by which dicamba is removed from the soils. Sunlight also plays a role. Dicamba is very soluble in water, so in humid areas, dicamba will be removed from the soil in 3-12 weeks. The half-life of dicamba in soil has varied from 4 to 555 days with the typical half-life being 1 to 4 weeks.

COMMON NAME: DIQUAT DIBROMIDE

CHEMICAL NAME: 9,10-dihydro-8a,10a-diazoniaphenanthrene, bromide salt

TRADE OR OTHER NAMES: Aquacide, Dextrone, Reglone, Reglox, Weedtrine-D, Aquakill, Vegetrole, Deiquat, Reglon, Tag.

USES: Diquat dibromide is an herbicide and plant growth regulator. It is used to desiccate potato vines and seed crops, to control flowering of sugarcane, and for industrial and aquatic weed control.

REGULATORY STATUS: Diquat dibromide is classified as a general use herbicide. Containers of diquat bear labels with the signal word "**Warning.**"

ACUTE TOXICITY: Diquat dibromide is a moderately toxic chemical. It may be fatal to humans if swallowed, inhaled, or absorbed through the skin, with the possibility of poisoning increasing with each exposure.

SYMPTOMS: Concentrated solutions may cause severe irritation of the mouth, throat, esophagus and stomach followed by nausea, vomiting, diarrhea, severe drying out of bodily tissues, gastrointestinal discomfort, chest pain, diarrhea, kidney failure, and toxic liver damage. Very large doses of the herbicide can result in convulsions and tremors. Diquat dibromide also causes eye irritation that can worsen over time. Direct or excessive inhalation of diquat dibromide spray mist or dust may result in oral or nasal irritation, nosebleeds, headache, sore throat, coughing, and symptoms similar to those from ingestion of diquat.

CHRONIC TOXICITY: Chronic exposure to diquat can cause cataract formation. The effects of repeated, or prolonged, dermal contact with diquat dibromide range from inflammation of the skin, to general bodily ('systemic') poisoning, as evidenced by injury to internal organs, primarily the kidneys. Chronic exposure may damage skin, which allows more absorption of the herbicide. Repeated inhalation exposure caused inflammatory changes in connective tissues, damage to the kidneys and heart, abnormal levels of several liver enzymes, low white blood cell counts, high red blood cell counts, and depressed cholinesterase activity in animals.

Reproductive Effects - Not known to cause reproductive effects.

Teratogenic Effects - Thought by researchers to have the potential to cause birth defects.

Mutagenic Effects - Undetermined

Carcinogenic Effects - Undetermined but unlikely

Target Organ(s) - Gastrointestinal tract, kidneys, liver, lung and eye.

Fate in Humans and Animals - Diquat dibromide is excreted primarily in the feces when ingested orally, but through urine when absorbed through dermal and inhalation exposure. Complete elimination may occur within a few days after exposure has ceased.

Biopersistence - Traces, or residues, of diquat have been found to persist in soil for many years with very little degradation

COMMON NAME: GLYPHOSATE

CHEMICAL NAME: N-(phosphono methyl) glycine

TRADE OR OTHER NAMES: Roundup, Rodeo, and Pondmaster. It may be used in formulations with other herbicides.

USES: Glyphosate is a broad-spectrum, non-selective systemic herbicide, useful on essentially all annual and perennial plants including grasses, sedges, broad-leaved weeds and woody plants. It can be used on non-cropland and among a great variety of crops.

REGULATORY STATUS: Glyphosate is a general use pesticide. Formulations containing glyphosate must carry the signal word "**Warning**" on the label.

ACUTE TOXICITY: Glyphosate is a moderately toxic herbicide because it can cause significant eye irritation, though it otherwise exhibits low toxicity. Technically it is an organophosphate, but does not inhibit cholinesterase activity.

CHRONIC TOXICITY: Very high amounts of glyphosate may produce only a slight reduction of body weight and some microscopic liver and kidney changes. Changes in Blood chemistry, cellular components, and organ function have not been observed even at the highest doses.

Reproductive Effects - It is unlikely that the compound would produce any reproductive effects in humans.

Teratogenic Effects - can cross placental barrier but is not known to cause birth defects.

Mutagenic Effects - The compound poses little mutagenic risk to humans.

Carcinogenic Effects - is not considered carcinogenic.

Target Organ(s) - does not appear to affect any organs, other than eyes.

Fate in Humans and Animals - Glyphosate is poorly absorbed from the digestive tract and is largely excreted unchanged by mammals. Glyphosate has no significant potential to accumulate in animal tissue.

NOEL - 175 mg/kg/day (rabbit); unknown in humans

Biopersistence - The half-life ranges from 1 to 174 days. Because glyphosate is so tightly bound to the soil, little is transferred by rain

or irrigation water, though the herbicide could move when attached to soil particles in erosion run-off. One estimate showed less than two percent of the applied chemical lost to runoff.

COMMON NAME: MALATHION

CHEMICAL NAME: diethyl (dimethoxy phosphinothioyl) thiobutanedioate

TRADE OR OTHER NAME: Malathion is also known as carbophos, maldison and mercaptothion. Trade names for products containing malathion include Celthion, Cythion, Dielathion, Karbofos, Maltox, El 4049, Emmaton, Fyfanon and Exathion among many others. Malathion may also be found in formulations with many other pesticides.

USES: The control of sucking and chewing insects on fruits and vegetables; to control mosqui-

toes, flies, household insects, animal parasites (ectoparasites) and head and body lice.

REGULATORY STATUS: Malathion is a general use pesticide. Formulations containing malathion must carry the signal word "**Caution**" on the label.

ACUTE TOXICITY: Malathion is classified as slightly toxic, with human exposures occurring through ingestion, inhalation, and absorption through the skin.

SYMPTOMS: Nausea, headache, tightness in the chest, and other symptoms typical of acetylcholinesterase inhibition (see Chlorpyrifos). Unconsciousness, convulsions, and a "prolonged worsening illness" are also typical of malathion poisoning at high doses. May also suppress the immune system in susceptible individuals.

CHRONIC TOXICITY: Studies show no significant effects on blood cholinesterase activity. Healthy adults may not be seriously affected, but adults with immune system deficiencies and children are more susceptible to accidental poisoning.

Reproductive and Teratogenic Effects - Several studies have documented developmental and reproductive effects due to high doses of malathion in test animals. However, malathion fed to animals at a low dosages caused no reproductive effects. It has been shown to cross the placental barrier, though the effect is unknown.

Mutagenic Effects - Malathion produced detectable mutations in three different types of cultured human cells, including white blood cells and lymph cells. It is possible that malathion could pose a mutagenic risk to humans chronically exposed.

Carcinogenic Effects - Research data is inconclusive

Target Organ(s) - Adrenal glands, liver and blood, central nervous system, immune system.

Fate in Humans and Animals - Malathion is rapidly and effectively absorbed by practically all routes including the gastrointestinal tract, skin, mucous membranes, and lungs. Up to 83% is excreted in urine after 24 hours. Malathion may be stored in the fat tissues.

NOEL - 25 mg/kg/day (human), based on cholinesterase

Biopersistence Degradation in soil is rapid; the average half-life for the compound is six days.

COMMON NAME: MECOPROP (MCP)

CHEMICAL NAME: 2-(4-chloro-2-methyl phenoxy) propionic acid

TRADE OR OTHER NAMES: Mecoprop is commonly called MCP. Trade names include Kilprop, Mecopar, Triester-II, Mecomin-D, Triamine-II (with MCPA and 2,4-DP), Triplet (with 2,4-D and dicamba), TriPower (with MCPA and dicamba), Trimec (with 2,4-D and dicamba), Trimec-Encore (with MCPA and dicamba), and U46 KV Fluid (1, 2).

USES: Control of surface creeping broadleaf weeds such as clovers, chickweed, lambsquarters, ivy, plantain and others. It is also used on wheat, barley, and oats.

REGULATORY STATUS: Mecoprop is a general use pesticide (GUP). Products containing mecoprop bear the Signal Word "**Caution.**"

ACUTE TOXICITY: Mecoprop is slightly toxic and is irritating to skin and eyes. It causes redness and swelling and can cause cloudy vision.

CHRONIC TOXICITY: Little information is available on the long term effect of exposure to mecoprop. Some studies suggest it may have the potential to cause cancer. Lack of data does not signify that this product is safe.

Reproductive Effects - No information is currently available.

Teratogenic Effects - Studies in animals suggest that mecoprop may have teratogenic properties.

Mutagenic Effects - Studies show that mecoprop may be mutagenic at very high doses.

Carcinogenic Effects - Some studies have shown an association with MCP and **cancer of soft tissues and non-Hodgkin's lymphoma**. However, the data is still inconclusive.

Target Organ(s) - Kidneys, lymphatic system.

Fate in Humans and Animals - Mecoprop is eliminated unchanged in the urine.

NOEL - 3 mg/kg/day (rats); unknown for humans

Biopersistence - The duration of mecoprop's residual activity in soil is about two months. MCPP may be present in storm water run-off.

COMMON NAME: METHOPRENE

CHEMICAL NAME: Isopropyl (E,E)-(RS)-11-methoxy-3,7,11-trimethyldodeca-2,4-dienoate

TRADE OR OTHER NAMES: Altosid, Apex, Diacon, Dianex, Kabat, Minex, Pharorid, Precor, ZR-515.

USES: Methoprene is most commonly found in flea killing products. It is also used in the production of a number of foods including meat, milk, eggs, mushrooms, peanuts, rice and cereals. It is also used in aquatic areas to control mosquitoes and several types of ants, flies, lice, moths, beetles and fleas

REGULATORY STATUS: Methoprene is classified by the EPA for general use as both an insecticide and a growth regulator. Products containing methoprene must bear the signal word "**Caution**" on the label.

ACUTE TOXICITY: Methoprene is relatively non-toxic when ingested or inhaled and slightly toxic by dermal absorption. No overt signs of poisoning have been reported in incidents involving accidental human exposure to methoprene. Methoprene is not an eye or skin irritant and it is not a skin sensitizer. It poses very little hazard to humans.

CHRONIC TOXICITY: No overt chronic effects have been observed in research studies.

Reproductive Effects - Experimental data indicate that there are no reproductive hazards associated with methoprene.

Teratogenic Effects - There are no teratogenic hazards associated with methoprene.

Mutagenic Effects - Methoprene is not mutagenic.

Carcinogenic Effects - Methoprene is not a carcinogenic compound.

Target Organ(s) - May affect the liver

Fate in Humans and Animals - In mammals, methoprene is rapidly and

completely broken down and excreted, mostly in the urine and feces. Some evidence suggests that methoprene breakdown products, or 'metabolites,' are incorporated into natural body components.

NOEL - 250 ppm for systemic toxicity

Biopersistence - Methoprene is not persistent in soils. In soil, microbial degradation is rapid and appears to be the major route of its disappearance from soil. Methoprene also degrades rapidly in sunlight. When used inside the home (e.g. for flea control), the chemical may persist in carpets and furnishings. However, methoprene is water soluble, so washing covered surfaces will likely remove it.

COMMON NAME: METHOXYCHLOR

CHEMICAL NAME: 1,1'-(2,2,2-trichloroethylidene)bis[4-methoxybenzene]

TRADE OR OTHER NAMES: Marlate, Chemform and Methoxy-DDT.

USES: Effective against a wide range of pests encountered in agriculture, households, and ornamental plantings. It is registered for use on fruits, vegetables, forage crops and on shade trees.

REGULATORY STATUS: Methoxychlor is a general use pesticide. Products containing methoxychlor must bear the signal word "**Caution**" on the label.

ACUTE TOXICITY: Methoxychlor is classified as slightly toxic, having a very low toxicity. Symptoms don't develop until an extremely high dose is either ingested or absorbed through the skin.

SYMPTOMS: Symptoms close to the lethal dose include Central Nervous System depression, progressive weakness and diarrhea. Extremely high doses can cause death within 36 to 48 hours.

CHRONIC TOXICITY: Human volunteers taking oral doses of 0.5 to 2.0 mg/kg/day for six

weeks had no adverse effects measured by routine enzyme (biochemical) or hematologic (blood) parameters. Methoxychlor does not accumulate to any significant degree in fat or other tissues of mammals.

Reproductive Effects - Chronic exposure to this pesticide may present a reproductive risk to humans.

Teratogenic Effects - Studies suggest that there may be a potential risk to human development following chronic exposure.

Mutagenic Effects - There is no evidence to suggest that methoxychlor is toxic to genetic material.

Carcinogenic Effects - Due to a study showing a possible association with **testicular cancer**, the U.S. EPA has not made an official determination on the carcinogenic status of the compound.

Target Organ(s) - Liver, kidney, central nervous system, reproductive organs

NOEL - 5.01 mg/kg/day (rabbit)

Biopersistence - Methoxychlor is very persistent in soil and its half-life is greater than six months.

COMMON NAME: OXYFLUORFEN

CHEMICAL NAME: 2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl) benzene

TRADE OR OTHER NAMES: Goal, Koltar and RH-2915.

USES: To control certain annual broadleaf and grassy weeds in vegetables, fruit, cotton, ornamentals and on non-crop areas.

REGULATORY STATUS: Products containing oxyfluorfen must bear the signal word "**Warning**" on the label.

ACUTE TOXICITY: Oxyfluorfen is moderately toxic by ingestion and slightly toxic by dermal absorption.

SYMPTOMS: Vapors may cause irritation of the nose, throat, skin and eyes, and other forms may cause irritation to skin and eyes.

CHRONIC TOXICITY: Long-term exposure to oxyfluorfen may cause the same symptoms as short-term exposure. Effects on the liver have been observed in long-term feeding studies with animals.

Reproductive Effects - Studies suggest oxyfluorfen may affect reproduction.

Teratogenic Effects - Studies suggest oxyfluorfen may have teratogenic properties.

Mutagenic Effects - Studies are inconclusive.

Carcinogenic Effects - EPA has classified oxyfluorfen as a **possible human carcinogen**.

Target Organ(s) - Liver

Fate in Humans and Animals - Because oxyfluorfen is highly hydrophobic, it is expected to

concentrate in the fatty tissues of animals. Once ingested it may remain in the body for a very long time.

NOEL - Unknown

Biopersistence - It is highly resistant to degradation in the soil environment. Decomposition by light occurs slowly. Its soil half-life can range from 1-6 months.

COMMON NAME: PENDIMETHALIN

CHEMICAL NAME: N-(1-ethylpropyl)-dinitro-3,4-xylidine

TRADE OR OTHER NAMES: AC 92553, Accotab, Go-Go-San, Herbadox, Penoxalin, Prowl, Sipaxol, Stomp and Way-Up.

USES: To control most annual grasses and certain broadleaf weeds in field corn, potatoes, rice, cotton, soybeans, tobacco, peanuts and sunflowers. It is used both preemergence, that is before weed seeds have sprouted, and early postemergence.

REGULATORY STATUS: Products containing pendimethalin must bear the signal word "**Caution**" or "**Warning**" depending on the formulation.

ACUTE TOXICITY: Pendimethalin is slightly toxic if ingested, inhaled or absorbed through the skin.

SYMPTOMS: Pendimethalin is a mild skin irritant. May cause temporary irritation to the cornea. Inhalation of dusts or fumes may be mildly to moderately irritating to the linings of the mouth, nose, throat and lungs.

CHRONIC TOXICITY: Long term exposure to pendimethalin may cause increases in alkaline phosphatase level and liver weight.

Reproductive Effects - There may be reproductive effects associated with very high doses.

Teratogenic Effects - None observed in laboratory studies

Mutagenic Effects - Several studies conclude that pendimethalin is not mutagenic.

Carcinogenic Effects - EPA is currently reviewing the carcinogenicity data.

Target Organ(s) - Liver

Fate in Humans and Animals - Studies indicate that ingested pendimethalin is largely unabsorbed by the bloodstream and is therefore excreted through the feces. Pendimethalin which does become absorbed into the bloodstream from the gastrointestinal tract is rapidly metabolized in the kidneys and liver and is then excreted in the urine (7).

NOEL - Unknown

Biopersistence - Its soil half-life is 90 days.

COMMON NAME: PERMETHRIN

CHEMICAL NAME: 3-phenoxybenzyl (1RS)-cis-trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylate

TRADE OR OTHER NAMES: Ambush, BW-21-Z, Cellutec, Ectiban, Eksmin, Exmin,

FMC-33297, Indothrin, Kafil, Kestril, NRDC 143, Pounce, PP 557, Pramiex, Qamlin and Torpedo.

USES: Permethrin is a broad spectrum insecticide, a chemical used to kill a variety of insects.

Permethrin is used against a number of pests, on nut, fruit, vegetable, cotton, ornamental, mushroom, potato and cereal crops. It is used in greenhouses, home gardens and for termite control. It also controls animal ectoparasites, biting flies, and cockroaches.

REGULATORY STATUS: Permethrin is classified by the EPA as Restricted Use Pesticide (RUP). Products containing permethrin must bear the signal word "Warning" or "Caution," depending on the toxicity of the particular product

ACUTE TOXICITY: Pyrethroids act by interfering with the transmission of nerve impulses along the neurons. Permethrin has low mammalian toxicity, however, contact with eyes, skin, or clothing should be avoided and handlers of permethrin should wash thoroughly after handling. Breathing of the spray mist or vapors of permethrin should be avoided.

CHRONIC TOXICITY: Long term exposure to permethrin may result in an increase in liver size and excessive formation of bile duct tissue. Long term low level exposure of permethrin

may suppress immune system activity in susceptible individuals.

Reproductive Effects - Studies indicate that permethrin may affect reproduction.

Teratogenic Effects - Permethrin is not teratogenic.

Mutagenic Effects - Permethrin is not mutagenic.

Carcinogenic Effects - Permethrin is **suspected of having carcinogenic effects.**

Target Organ(s) - Liver and nerve tissues.

Fate in Humans and Animals - Permethrin is metabolized by the liver. Breakdown products, or 'metabolites,' of permethrin are quickly excreted and do not persist significantly in body tissues, with the exception of fat tissues. Permethrin may persist in fatty tissues, with half-lives of 4 to 5 days in brain and body fat.

NOEL - : 5.0 mg/kg/day or 100 ppm/day

Biopersistence - Permethrin was found to persist for 28 days in organic soils. It has a half-life of from three to six weeks.

COMMON NAME: PYRETHRINS

CHEMICAL NAME: (Z)-(S)-2-methyl-4-oxo-3-(penta-2,4-dienyl) cyclopent-2-enyl (1R)-trans-2,2-dimethyl-3-(2-methylprop-1-enyl) cyclopropane carboxylate

TRADE OR OTHER NAMES: Buhach, Chrysanthemum Cinerariaefolium, Ofirmotox, Insect Powder, Dalmation Insect Flowers, Firmotox, Parexan and NA 9184.

USES: Pyrethrin compounds have been used primarily to control human lice, mosquitoes, cockroaches, beetles and flies; to control insects in horticultural crops; in grain storage and in poultry pens and on dogs and cats to control lice and fleas.

REGULATORY STATUS: The EPA classifies pyrethrin-I as a Restricted Use Pesticide

(RUP). Products containing pyrethrum carry the signal word "**Caution**" on the label.

ACUTE TOXICITY: Pyrethrins vary in their toxicity, depending on formulation. Primary toxicity is in its potent allergenic activity.

SYMPTOMS: Pyrethrum can be a **potent allergen** in susceptible individuals. Inhaling high levels of pyrethrum may bring about asthmatic breathing, sneezing, nasal stuffiness, headache, nausea, incoordination, tremors, convulsions, facial flushing and swelling, and burning and itching sensations. Infants are especially at risk because they are not able to efficiently break down pyrethrum. Animals exposed to toxic amounts may experience tongue and lip numbness, nausea, and diarrhea. Animal symptoms may also

include incoordination, tremors, convulsions, paralysis, respiratory failure, and death.

CHRONIC TOXICITY: Absorption of pyrethrum through the stomach and intestines and through the skin is slow. However, humans can absorb pyrethrum more quickly through the lungs during respiration. Overall, pyrethrins are of low chronic toxicity to humans and the most common problems in humans have resulted from the allergenic properties of pyrethrum. Pyrethrins can produce skin irritation, itching, pricking sensations and local burning sensations. These symptoms may last for about two days.

Reproductive Effects - Overall, pyrethrins appear to have low reproductive toxicity.

Mutagenic Effects - No information was found.

Carcinogenic Effects - No carcinogenic status has been established for pyrethrins

Target Organ(s) - Liver, central nervous system, and immune system.

Fate in Humans and Animals - Pyrethrins, pyrethroids, and their metabolites are not known to be stored in the body, and are rapidly excreted.

NOEL - 10 mg/kg/day (rats)

Biopersistence - Pyrethrins are inactivated and decomposed by exposure to light and air.

COMMON NAME: TRICLOPYR

CHEMICAL NAME: [(3,5,6-trichloro-2-pyridinyl) Oxy] acetic acid

TRADE OR OTHER NAMES: Garlon, Turflon, Access, Redeem, Crossbow, Grazon and ET. It may be mixed with picloram or with 2,4-D to extend its utility range (8).

USES: Used for control of woody and broad-leaf plants along rights-of-way, in forests, on industrial lands and on grasslands.

REGULATORY STATUS: Some or all applications of the product Access may be classified as Restricted Use Pesticides (RUP). Products containing triclopyr will bear either the "**Danger**" or "**Caution**" signal word on the label depending on the specific formulation. Products marked "**Danger**" include Garlon 3A, Redeem, Turflon Amine.

ACUTE TOXICITY: Triclopyr is considered slightly to moderately toxic for skin, nasal and eye irritation.

CHRONIC TOXICITY: Long term exposure may affect the liver and kidney, though studies have not shown overt symptoms or ill effects.

Reproductive Effects - Data is inconclusive

Teratogenic Effects - Evidence suggests that the human risk of birth defects is fairly low **Mutagenic Effects** - Triclopyr is not considered to be mutagenic.

Carcinogenic Effects - Triclopyr is not considered carcinogenic

Target Organ(s) - Liver, kidney, eyes and skin.

Fate in Humans and Animals - Triclopyr may be found in the blood plasma, liver, kidneys and fatty tissues. It is primarily excreted in urine. It is not expected to accumulate in the body.

NOEL - 2.5 mg/kg/day (dog)

Biopersistence - The half-life in soil is from 30 to 90 days, depending on soil type and environmental conditions.

COMMON NAME: TRIFLURALIN

CHEMICAL NAME: α,α,α -trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine

TRADE OR OTHER NAMES: Flurene SE, Treflan, Tri-4, Trust, M.T.F., Trifluralina 600, Elancolan, Su Seguro Carpidor, Trefanocide, Treficon, Trim, L-36352, Crisalin, TR-10, Triflurex and Ipersan.

USES: Used to control many annual grasses and broadleaf weeds in a large variety of tree fruit, nut, vegetable, and grain crops.

REGULATORY STATUS: Products containing trifluralin must bear one of the signal words

"**Caution**" or "**Warning**," depending on the type of formulation.

ACUTE TOXICITY: Trifluralin is only slightly toxic by oral, dermal or inhalation routes of exposure. Pesticide products containing trifluralin may be moderately toxic to relatively non-toxic, depending on the type of formulation.

SYMPTOMS: Nausea and severe gastrointestinal discomfort may occur after ingestion; skin sensitization (allergies) may occur in some individuals. Inhalation may cause irritation of the lining of the mouth, throat or lungs.

CHRONIC TOXICITY: Prolonged or repeated skin contact with trifluralin may cause allergic dermatitis. Consumption of water contaminated with concentrations greater than 5 $\mu\text{g/L}$ over a long period of time has been shown to cause liver and kidney damage, decreased fetal weight and size, and increased miscarriages in some studies.

Reproductive Effects - None expected.

Teratogenic Effects - Studies show no evidence that trifluralin is teratogenic.

Mutagenic Effects - No evidence of mutagenicity has been observed.

Carcinogenic Effects - EPA considers trifluralin to be a **possible human carcinogen**.

Target Organ(s) - Liver and kidneys.

Fate in Humans and Animals - Primarily excreted in feces.

NOEL -

Biopersistence - The half-life of trifluralin in the soil is 45 to 60 days.

COMMON NAME: TRIFORINE

CHEMICAL NAME(S): 1,4-bis (2,2,2-trichloro-1-formamidoethyl) piperazine; 1,1'-piperazine-1,4-diyl-di-[N-(2,2,2-trichloroethyl)formamide]; N,N'-[1,4-piperazinediylbis (2,2,2-trichloro-ethylidene)] bisformamide

TRADE OR OTHER NAMES: Brolly, Denarin, Funginex, Nimrod T, Saprol, and Triforine DC. Triforine is in mixed formulations with carbendazim, permethrin, mancozeb, and bupirimate.

USES: For control of powdery mildew, rusts, black rot and scab on cereals, fruit, ornamentals, and vegetables on almonds, apples, asparagus,

blueberries, cherries, hops, ornamentals, peaches and roses.

REGULATORY STATUS: Triforine is a "restricted use" pesticide (RUP) with an EPA toxicity classification of I (highly toxic). Products containing triforine must bear the Signal Word "**Danger**" on their label.

ACUTE TOXICITY: Triforine and the formulated product Saprol have a low acute and dermal toxicity and have a moderate acute inhalation toxicity. This compound is rapidly absorbed and metabolized. Saprol is considered an irritant to the skin.

CHRONIC TOXICITY: Data are inconclusive on the long term effects of exposure to triforine.

Reproductive Effects - Studies indicate a potential for reproductive effects.

Teratogenic Effects - The formulated product Saprol is not considered a teratogen.

Mutagenic Effects - The formulated product Saprol is not considered a mutagen.

Carcinogenic Effects - In short and long-term studies of the formulated product Saprol, no irreversible or carcinogenic effects were observed.

Target Organ(s) - Red blood cells, lungs

Fate in Humans and Animals - Excreted within several days, primarily in urine.

NOEL -

Biopersistence - The half-life of triforine in soil is approximately 3 weeks.

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RESOURCES

Health & Environment Resource Center
<http://www.herc.org>

National Pesticide Telecommunications Network
1-800-858-7378

National Coalition Against The Misuse of Pesticides
202-543-5450

NW Coalition for Alternatives to Pesticides
503-344-5044

Pesticide Action Network North America
415-541-9140

Pesticide Info Net
703-305-7499

Pesticide Education Center
415-391-8511