

GLOSSARY OF CLASSES OF NON-PERSISTENT PESTICIDES

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Overview

Non-persistent pesticides are compounds that break down quickly in the environment. Several different classes of pesticides make up this group:

- Cholinesterase-inhibiting pesticides, which includes the organophosphates and carbamates
- Chlorinated phenols
- Herbicides
- Pyrethroids
- Fungicides
- Repellents

Non-persistent pesticides became widely used after persistent organochlorine pesticides were banned from manufacture and use in the United States in the 1970s. Non-persistent pesticides are less harmful to the environment because they do not build up but they have to be applied more often to households and crops to be effective.

How exposure to non-persistent pesticides affects most people is unknown. We do not know whether exposure to non-persistent pesticides at the levels reported among the participants of the Churchill County leukemia study can cause health problems.

More information about non-persistent pesticides, including the trichlorophenols, the organophosphates, and the fungicide O-phenylphenol, can be found in FAQ (frequently asked questions) sheets following this glossary.

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Cholinesterase-inhibiting pesticides

Cholinesterase-inhibiting pesticides are a group of human-made chemicals that poison insects and mammals by damaging an enzyme in the body called acetylcholinesterase. The damage to this enzyme is fatal to pests and can cause unwanted side effects to exposed humans. These insecticides break down quickly and do not build up in the environment. Organophosphate pesticides (such as diazinon) and carbamate pesticides (such as carbaryl) are the two major types of cholinesterase-inhibiting pesticides.

Organophosphate pesticides are the most widely used insecticides available today.

Organophosphates are used in agriculture, the home, gardens, and veterinary practice. They all have a common mechanism of toxicity and can cause similar symptoms in humans who have too much exposure.

Carbamate pesticides are widely used in homes, gardens, and agriculture. Illnesses caused by exposure to carbamate pesticides usually are shorter and easier to treat than illnesses caused by exposure to organophosphate pesticides.

Route of exposure

People are exposed to these pesticides through eating, drinking, or breathing, or contact with eyes or skin. Eating contaminated food and contact during home use are the main sources of exposure to cholinesterase-inhibiting pesticides.

Health effects

Symptoms of acute poisoning by a cholinesterase-inhibiting pesticide develop during or after exposure, depending on the method of contact. Toxic symptoms show up fastest after exposure by breathing, followed by eating and skin contact. Common symptoms are headache, confusion, dizziness, difficulty breathing, small pupils, vomiting and diarrhea, weakness, and seizures.

Patients exposed to organophosphate pesticides over time (chronic exposure) can develop more long-lasting effects, such as memory loss, personality changes, and numbness and tingling of the hands and feet (neuropathy).

Some studies in humans linked organophosphate exposure to lymphoma and leukemia but the results from these studies are controversial. These exposures were not definitely linked with cancer.

The effects of cholinesterase-inhibiting pesticide exposure on the general population at current levels of exposure are unknown. Whether the levels reported to participants of the Churchill County leukemia study can cause a health problem is not known.

Measuring exposure

Urine samples in the Churchill County leukemia study population were analyzed to look for the original compounds and breakdown products (metabolites) of various organophosphates and carbamate pesticides. The metabolites are not considered toxic, but are markers of exposure to organophosphates and carbamates in the few days prior to testing. Linking some of these metabolites to a specific organophosphate or carbamate parent compound is not possible without additional information. The presence of these metabolites in a person following exposure may not be associated with clinical symptoms.

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Chlorinated phenols

Chlorophenols are a group of chemicals that are made by adding chlorines to phenol. Phenol is a compound made from benzene. There are five basic categories of chlorophenols and 19 different chlorophenols.

Some chlorophenols are used as pesticides. Others are used in antiseptics. Small amounts are produced when water is disinfected with chlorine. They are also produced in bleaching wood pulp with chlorine to make paper.

The chlorophenols have a strong medicinal taste and odor; small amounts (at parts per billion [ppb] to parts per million [ppm] concentrations) can be tasted in water. Very small amounts of chlorophenols can also make fish taste bad.

Chlorophenols can enter the environment when they are being made or used as pesticides. Most chlorophenols released to the environment go into water. Small amounts of chlorophenols enter the air. In the air, sunlight helps destroy these compounds, and rain washes them out of the air. Chlorophenols stick to soil and sediments at the bottom of lakes, streams, and rivers. Low levels of chlorophenols in water, soil, or sediment are broken down and removed from the environment in a few days to weeks by microscopic plants and animals.

Route of exposure

Most people are exposed to very low levels of chlorophenols in chlorinated drinking water. Some chlorophenols are in city air. People can be exposed if they work with chlorophenols or use them as pesticides. People also can be exposed if they make or use treated wood. Certain persistent pesticides (e.g., lindane) are metabolized to the trichlorophenols in the body so exposure to these persistent pesticides may lead to the detection of trichlorophenols in the body.

Health effects

Lab animals that ate or drank high levels of chlorophenols in food or water developed liver and immune system effects. Long-term use of high doses of 2,4,6-trichlorophenol in food caused leukemia in lab rats and liver cancer in mice. High levels of chlorophenols given to pregnant lab rats in their drinking water reduced the number of babies they had and caused low birth weights. Chlorophenols have not caused birth defects in animals.

Workers exposed to pesticides that contain chlorophenols can have acne and liver problems. The effects of chlorophenol exposure on the general population at current levels of exposure are not known. 2,4,6-trichlorophenol exposure in humans has not been linked with any cancers, including leukemia.

Whether chlorophenol pesticides at the levels reported to the participants of the Churchill County leukemia study can cause of health problems is not known.

Measuring exposure

People in the Churchill County leukemia study were tested for four different chlorophenols: 2,4,5-trichlorophenol; 2,4,6-trichlorophenol; 2,4-dichlorophenol; and pentachlorophenol. Detection of one or more chlorophenols in a person's urine shows recent exposure but does not mean that the levels of the chlorophenols detected can cause a health problem.

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Fungicides

Fungicides are widely used in industry, agriculture, and the home and garden. One fungicide tested for in the Churchill County leukemia study was O-PhenylPhenol (OPP). OPP is used to control fungi and bacteria growth on stored crops such as fruits and vegetables.

OPP is also a disinfectant compound. A disinfectant is a substance used to kill or inactivate microscopic disease-producing plants and animals on inanimate (nonliving) objects. OPP is commonly found in hospital disinfectant products and used in various industries such as timber, paper, and citrus.

Route of exposure

People can be exposed to OPP by breathing it and by skin contact with this compound at workplaces where OPP is produced or used.

People can be exposed to OPP by breathing indoor and outdoor air, ingesting food and drinking water contaminated with OPP, and through skin contact with this compound.

Health effects

Exposure to OPP can cause irritation of the skin, eyes and respiratory tract. Large exposures can cause headache, dizziness, nervousness, blurred vision, weakness, nausea, cramps, vomiting, diarrhea, sweating, small pupils, tearing, and salivation.

Not enough information is available to show whether OPP causes cancer in humans.

The effects of fungicide pesticide exposure on the general population at current levels of exposure are not known. Whether fungicide pesticides at the levels reported to the participants of the Churchill County leukemia study can cause of a health problems is not known.

Measuring exposure

Finding OPP in a person's urine indicates a recent exposure but does not mean the level of OPP can cause a health problem.

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Herbicides

Herbicides are chemical agents intended to kill unwanted vegetation such as broadleaf weeds and woody plants. They are used in agriculture and on residential properties.

Route of exposure

People can be exposed to herbicides by breathing them or by skin contact from their residential use or living near application sites, and by eating contaminated food and drinking contaminated water.

Health effects

Most of the available herbicides are not very toxic in humans. Irritation to the skin, eyes, and respiratory tract are the most common health problems.

The effects of herbicide pesticide exposure on the general population at current levels of exposure are not known. Whether herbicides at the levels reported to participants in the Churchill County leukemia study can cause health problems is not known.

Measuring exposure

People in the Churchill County leukemia study were tested for four different herbicides: two chlorophenoxy herbicides (2,4-D and 2,4,5-T), one triazine herbicide (atrazine), and one chloroacetamide herbicide (alachlor).

Detection of one or more herbicides in a person's urine shows a recent exposure but does not mean that the levels of the herbicides can cause a health problem.

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Pyrethroids

Pyrethroids are human-made insecticides that act in a similar way to pyrethrins, which are derived from chrysanthemum flowers. Pyrethroids were developed to produce more environmentally stable products. Pyrethroids are widely used for controlling insects in agriculture and in homes and gardens, and to kill parasites such as fleas, lice, and ticks. This type of pesticide quickly paralyzes insects; it is called a “knock down” agent.

Route of exposure

People can be exposed to these pesticides by eating or drinking contaminated food or water, breathing contaminated air, or getting them on your skin.

Health effects

Pyrethroids usually are not very toxic to humans. However, after a large exposure, a person can have dizziness, headache, vomiting, diarrhea, numbness of the exposed skin, and seizures.

The effects of pyrethroid pesticide exposure on the general population at current levels of exposure are not known. Whether pyrethroid pesticides at the levels reported to the participants of the Churchill County leukemia study cause of a health problems is not known.

Measuring exposure

People in the Churchill County leukemia study were tested for 3-phenoxybenzoic acid, which is a common metabolite (breakdown product) of many pyrethroids, including permethrin.

Detection of this metabolite in a person’s urine shows a recent exposure to one of the various pyrethroids but not to which pyrethroid.

Detection of 3-phenoxybenzoic acid in a person’s urine does not mean that the level of this pyrethroid metabolite can cause a health problem.

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Repellents

A repellent is an agent that repels harmful pests such as mosquitoes, ticks, and mites.

DEET (chemical name, N,N-diethyl-meta-toluamide) is the active ingredient in many insect repellent products. It is used to repel biting pests such as mosquitoes and ticks, including ticks that can carry Lyme disease. Every year, about one third of the U.S. population is expected to use DEET.

After the U.S. Army developed it in 1946, DEET was registered for use by the general public in 1957. Approximately 230 products containing DEET are made by about 70 companies.

Route of exposure

Products containing DEET are available to the public in liquids, lotions, and sprays. DEET is designed to be applied to human skin to repel insects rather than to kill them. Formulations for direct application to human skin contain 4% to 100% DEET. DEET is not used on food.

Health effects

Considering the widespread use of DEET, relatively few people become sick. However, if they are used improperly, ingested, or used in a high concentration on children, especially repeatedly over large skin surfaces, DEET can be toxic.

DEET irritates the eyes and can irritate the skin. After large exposures to DEET, children can have headaches, irritability, difficulty walking, loss of consciousness, and seizures, but these problems are rare.

The effects of repellent exposure on the general population at current levels of exposure are not known. Whether DEET at the levels reported to the participants of the Churchill County leukemia study cause health problems is not known.

In terms of a cause of cancer, one previous study did find a small association between the use of DEET and the development of testicular cancer.

Measuring exposure

People in the Churchill County leukemia study were tested for a commonly used insect repellent, DEET, and breakdown products (metabolites) of other pest repellents, 2-naphthol and 2,5-dichlorophenol.

Finding a repellent in a person's urine indicates a recent exposure but does not mean the level of the repellent can cause a health problem.

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