



Pesticide Toxicity

How safe is this product? ? This general question about a pesticide can mean

--how dangerous is it to apply it, breathe it, or enter a place where it's been applied?

--what does it do to the environment or to other organisms? How long does it last?

We use the term "toxicity" to refer to the likelihood of damage to a person or animal, and "persistence" to refer to how long it lasts.

Sources of information:

Your local nursery professionals, hardware store staff, or Master Gardeners? They may not have had specific training in toxicity issues, but might be familiar with the relative safety of the products sold there. Pesticides are also sold in stores where there is nobody with specific training about them, so read the label before you buy it.

The label of the product.

The Signal Word tells you whether it is relatively safe (Caution), moderately toxic (Warning), or very toxic (Danger) **if used as directed**. In California, even materials which are practically non-toxic must have the label Caution if they are sold as pesticides, and must be labeled to "Keep Out Of Reach Of Children."

The Precautionary Statements tell you what to wear when applying it, how long to stay out of the area (if necessary), and any caution about pets, wildlife, or spraying near water. These are very specific guidelines for professional applicators, and homeowners should follow them (e.g., if it says to protect your eyes, wear goggles). The exact wording of these is regulated by the Dept. of Pesticide Regulation (DPR) in the California Dept. of Food and Agriculture. The Manufacturer's Safety Data Sheet (MSDS), provided to retailers and applicators by the manufacturer, is a source of technical information about the product.

On the Internet, you can find information from four sources:

The manufacturer of the active ingredient may have Manufacturer's Safety Data Sheets available on line. If they sell to the public or to professionals they may have sales information about their products. A more likely source of info would be the web sites of companies who buy the active ingredient and formulate it for sale (e.g., Ortho).

Advocacy groups have information about the safety of many products, especially the Northwest Coalition for Alternatives to Pesticides (NCAP), which publishes the Journal of Pesticide Reform (JPR). Keep in mind that these groups have agendas (reducing the use of pesticides) and their publications are not peer-reviewed. Their articles can be good starting points for reading about what is dangerous about a pesticide, but they do not attempt to provide balance.

Online forum boards often get involved in long discussions about the pros and cons of different products. All the ones I've read contain the mix of useful and biased opinions you would expect. I have found that many people in these discussions don't understand the concepts of relative toxicity or risk assessment.

The Extension Toxicity Network is an online resource with lots of information about specific pesticides in a searchable database. "EXTOXNET is a cooperative effort of University of California-Davis, Oregon State University, Michigan State University, Cornell University, and the University of Idaho. Primary files are maintained and archived at Oregon State University." What makes this site especially useful is that each pesticide is described in the same format, and that the authors have no agenda.

Type in the brand name, common name, or chemical name in the Search box. This will give a list of publications containing any reference to that name. Look for the ExToxNet PIP (Pesticide Information Profile--usually the first listing) and click on that. This will give you a page with lots of technical information, including the following subjects.

Regulatory Status: this information may not be useful due to the many formulations of a particular product, but it will tell you which Signal Words must be used for the material. It may include all three: Danger, Warning, or Caution. (these are in descending order of toxicity). Homeowner formulations tend to be the least toxic formulations because they are the most dilute.

Toxicological Effects:

How poisonous is it by swallowing, through the skin, by inhaling the spray? How likely is it to cause skin or eye irritation? There are specific tests for all of these.

"Oral route" means swallowed. The LD₅₀ is a relative measure of how poisonous it is this way. It is the amount, in milligrams of pesticide per kilogram of body weight, it took to kill 50% of the population of adult male rats. This measure is used for all pesticides because it tells you how toxic one is in relation to another, and because rats and humans have surprisingly similar metabolisms. A high LD₅₀ = low toxicity (i.e., it takes lots).

For the other types of toxicity, look for terms such as "slightly, moderately, or very" toxic, or it may be described as "practically nontoxic." Pesticides differ widely in how toxic they are by these different means of absorption into your body.

"Dermal route" is through the skin. Certain pesticides, especially the group called carbamates (Sevin and Temik are the best-known), may be especially toxic this way.

"Inhalation" refers to how toxic it is to breathe the spray vapor.

"Skin and eye irritation" are measured by a specific test where the material is applied to the bare skin or eyes of rabbits.

There may be additional comments about observed health results from wide-scale spraying if it has been used extensively around humans (for killing insects to prevent diseases, for example). Comments about cholinesterase are for professional applicators who apply certain chemicals frequently. These cholinesterase inhibitors can have a cumulative effect on your body's ability to digest food, so people who spray for a living take a baseline test and then get their cholinesterase monitored periodically to make sure it is not being suppressed.

Animal testing is how we get information about chronic (long-term) toxicity and about reproductive (causing damage to reproductive organs), teratogenic (causing birth defects), mutagenic (causing mutations), and carcinogenic (causing cancer) effects. Similar tests are done to all pesticides so that they can be compared. Long-term feeding studies using high doses of the product are done for chronic toxicity, to see if there are any effects on certain organs or if more deaths occur over time. Animal populations are fed higher and higher doses to determine when reproductive damage occurs. The test animals are checked for cell division or chromosome damage, and for the development of tumors. In some cases human studies have been done using low daily doses to see whether there are any basic chemical changes that might be of concern.

Ecological Effects. The toxicity to birds is measured in LD₅₀ (see above). Toxicity to specific types of fish is measured in LC₅₀ (comparable to LD₅₀, except it is the Lethal Concentration in milliliters/liter of fluid, rather than in milligrams/kilogram of weight). The accumulation of the material in other fish species (such as catfish) is measured to see whether it occurs in them in levels greater than in the water, because species higher up the food chain can be affected by feeding on them. This kind of "bioaccumulation" was the major concern about DDT. Toxicity to honeybees is specifically tested; toxicity to beneficial insects is sometimes mentioned.

Environmental Fate. The "persistence in the soil" is measured in the half-life. "Soil binding" refers to whether the chemical is adsorbed (chemically bound) by the soil; soils with lots of clay or organic matter are more likely to adsorb chemicals than are sandy soils. If the chemical isn't adsorbed it is likely to run off to surrounding soils when excess water is applied. "Solubility in water" tells you how likely it is to contaminate groundwater. "Breakdown in plants" refers to whether it can be taken up into plants (systemically) and how long it stays there.

The ExToxNet PIP usually lists the Basic Manufacturer, which is the company that makes the active ingredient. They may license that out to many other companies to mix with various other active or inert ingredients which are in the product you buy. The same active ingredient may be in any number of different brands, or in various products made by the same manufacturer. The same chemical may have different common names, and various different brand names, so the chemical name is what you see on the front of the bottle.