# SIGNAL WORDS

## fact sheet

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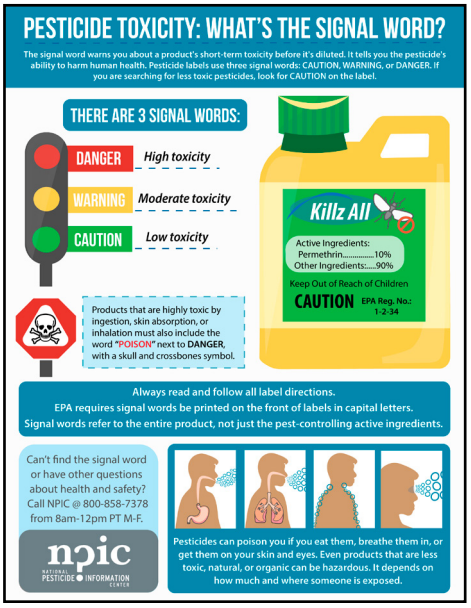
### What are signal words?

Signal words are found on pesticide product labels, and they describe the acute (short-term) toxicity of the formulated pesticide product. The signal word can be either: DANGER, WARNING or CAUTION. Products with the DANGER signal word are the most toxic. Products with the signal word CAUTION are lower in toxicity.[1] The U.S. Environmental Protection Agency (EPA) requires a signal word on most pesticide product labels. They also require it to be printed on the front panel, in all capital letters, to make it easy for users to find. The only pesticide products that are not required to display a signal word are those that fall into the lowest toxicity category by all routes of exposure (oral, dermal, inhalation, and other effects like eye and skin irritation).[2,3] See the table below titled "Toxicity Category."




**CAUTION** means the pesticide product is slightly toxic if eaten, absorbed through the skin, inhaled, or it causes slight eye or skin irritation. [2,4]

**WARNING** indicates the pesticide product is moderately toxic if eaten, absorbed through the skin, inhaled, or it causes moderate eye or skin irritation. [2,4]

**DANGER** means that the pesticide product is highly toxic by at least one route of exposure. It may be corrosive, causing irreversible damage to the skin or eyes. Alternatively, it may be highly toxic if eaten, absorbed through the skin, or inhaled. If this is the case, then the word "POISON" must also be included in red letters on the front panel of the product label. [2,4]

**TOXICITY CATEGORY (Signal Word)**[3]

| | High Toxicity (DANGER/Danger-Poison) Category I | Moderate Toxicity (WARNING) Category II | Low Toxicity (CAUTION) Category III | Very Low Toxicity (Optional Signal Word = CAUTION) Category IV |
|---|---|---|---|---|
| Acute Oral $LD_{50}$ | Up to and including 50 mg/kg (≤ 50 mg/kg) | Greater than 50 through 500 mg/kg (> 50 – 500 mg/kg) | Greater than 500 through 5000 mg/kg (> 500 – 5000 mg/kg) | Greater than 5000 mg/kg (> 5000 mg/kg) |
| Inhalation $LC_{50}$ | Up to and including 0.05 mg/L (≤ 0.05 mg/L) | Greater than 0.05 through 0.5 mg/L (>0.05 – 0.5 mg/L) | Greater than 0.5 through 2.0 mg/L (> 0.5 – 2.0 mg/L) | Greater than 2.0 mg/L (> 2.0 mg/L) |
| Dermal $LD_{50}$ | Up to and including 200 mg/kg (≤ 200 mg/kg) | Greater than 200 through 2000 mg/kg (> 200 - 2000 mg/kg) | Greater than 2000 through 5000 mg/kg (>2000 – 5000 mg/kg) | Greater than 5000 mg/kg (> 5000 mg/kg) |
| Primary Eye Irritation | Corrosive (irreversible destruction of ocular tissue) or corneal involvement or irritation persisting for more than 21 days | Corneal involvement or other eye irritation clearing in 8 – 21 days | Corneal involvement or other eye irritation clearing in 7 days or less | Minimal effects clearing in less than 24 hours |
| Primary Skin Irritation | Corrosive (tissue destruction into the dermis and/or scarring) | Severe irritation at 72 hours (severe erythema or edema) | Moderate irritation at 72 hours (moderate erythema) | Mild or slight irritation at 72 hours (no irritation or erythema) |

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## How are signal words chosen?

Before the EPA can determine the appropriate signal word for a pesticide product, the manufacturer performs research on laboratory animals to determine the toxicity of the formulation. Required studies include oral exposure (eating the product), inhalation exposure (breathing in the product), dermal exposure (spreading the product on the skin) and exposures to the skin and eyes to check for irritation. The study that shows the highest toxicity is used to determine the signal word.[3] For example, if a product demonstrated low toxicity when eaten, moderate toxicity when inhaled, and high toxicity when applied to skin, the EPA would assign the signal word DANGER, based on the most sensitive route of entry. In this example it was the skin.[1]

**LD50/LC50: A common measure of acute toxicity is the lethal dose ($LD_{50}$) or lethal concentration ($LC_{50}$) that causes death (resulting from a single or limited exposure) in 50 percent of the treated animals. $LD_{50}$ is generally expressed as the dose in milligrams (mg) of chemical per kilogram (kg) of body weight. $LC_{50}$ is often expressed as mg of chemical per volume (e.g., liter (L)) of medium (i.e., air or water) the organism is exposed to. Chemicals are considered highly toxic when the $LD_{50}/LC_{50}$ is small and practically non-toxic when the value is large. However, the $LD_{50}/LC_{50}$ does not reflect any effects from long-term exposure (i.e., cancer, birth defects or reproductive toxicity) that may occur at levels below those that cause death.**

See the text box on **$LD_{50}/LC_{50}$** for more details about the required toxicity tests.

## How are signal words useful?

Signal words help alert users to special hazards of a pesticide product. The signal word can be used by shoppers to select the least toxic product(s) of those that are sufficiently effective.[4]

Regardless of the signal word on the pesticide product, it is important to remember that every product still has the potential to poison (i.e., is harmful at high doses). Special care should be taken to carefully follow all of the directions on the label, each time a pesticide product is used.

### Where can I find more information?

For more detailed information please visit the list of referenced resources below, call the National Pesticide Information Center, Monday - Friday, between 8:00am - 12:00pm Pacific Time (11:00am - 3:00pm Eastern Time) at 800-858-7378, or visit us on the web at npic.orst.edu. NPIC provides objective, science-based answers to questions about pesticides.

**Date Reviewed: July 2008**

### References:


1. Whitford, F. *The Complete Book of Pesticide Management: Science, Regulation, Stewardship, and Communication*; Wiley & Sons: New York, 2002; pp 450-452.
2. *National Pesticide Applicator Certification Core Manual*; Randall, C., Hock, W., Crow, E., Hudak-Wise, C., Kasai, J., Eds.; National Association of State Departments of Agriculture Research Foundation: Washington, DC, 2006.
3. *Label Review Manual;* U.S. Environmental Protection Agency, Office of Prevention, Pesticides, and Toxic Substances, Office of Pesticide Programs, U. S. Government Printing Office: Washington, DC, 2007.
4. Labeling Requirements for Pesticides and Devices. *Code of Federal Regulations*, Part 156.64, Title 40, 2007.