



At-a-glance safety information

By Juanita Popenoe

Editor's note: This article grants one continuing education unit (CEU) in the Core category toward the renewal of a Florida Department of Agriculture and Consumer Services restricted-use pesticide license when the accompanying test is submitted and approved.

Pesticide labels can be daunting. They seem so long and have tiny print. However, the label is the law. You need to be aware of the information contained in the label before you use the pesticide.

The human eye is naturally drawn to larger objects and pictures over small print. Manufacturers used this fact to provide important at-a-glance safety information. Icons and signal words are designed to inform you about the pesticide before you read the whole label.

The largest lettering after the brand name, and so one of the first things

you notice, is the signal word: Caution, Warning, Danger or Danger/Poison. But what do these terms really mean? The signal word tells you how toxic a pesticide is to humans by ingestion. It gives you an idea of how much of the product (active and inert ingredients) you would need to eat to be killed. However, the signal word does not indicate the risk of allergic reactions or possible delayed effects.

Danger/Poison, indicated by a red skull and crossbones, is on the label of pesticides that are highly toxic and very likely to cause acute illness through oral, dermal or inhalation exposure. If there is only the word "Danger," the product is toxic due to skin and eye irritation potential. A few drops to a teaspoonful are enough to cause a lethal oral dose to a 150-pound person.

Warning is on the label of pesticides that are moderately toxic. A teaspoonful to 1 ounce may cause a

lethal oral dose to a 150-pound person. Many people think that "Warning" is for pesticides that are not that dangerous, but these chemicals are still potent enough to cause death with a relatively small dose. I use more than a teaspoonful of sugar in my coffee.

Caution on the label may indicate a slightly toxic to a relatively non-toxic pesticide. Category III Caution, slightly toxic, may require an ounce to a pint or a pound of pesticide to be lethal. Category IV Caution, relatively non-toxic, means over a pint or a pound is required to be toxic to a 150-pound person.

LETHAL DOSES

How does the Environmental Protection Agency (EPA) determine how much of a chemical will kill someone? They certainly do not test it out on people! The experiments are carried out on laboratory animals, usually rats or rabbits. They are fed increasing doses until the researchers determine the amount that will kill 50 percent of the test population — the lethal dose to kill 50 percent (LD_{50}). The dose is represented as the milligrams (mg) of pesticide per kilogram (kg) of test animal weight, so you can extrapolate how much is required for various weights of people. The signal word is based on a 150-pound adult; therefore, a much smaller dose would be lethal to children. This is expensive testing that must be done with each formulation for licensing and registration.

To put this in perspective, there are many things you eat that also could be considered toxic. Caffeine has an oral LD_{50} of 192 mg/kg for rats. This is right between chlorpyrifos, which has an oral LD_{50} of 145 mg/kg, and pyrethrum, which has an oral LD_{50} of 200 mg/kg.

Even black pepper (piperine), which I always assert is just an irritant because I don't like spicy things, has an oral LD_{50} of 514, between malathion at 370 and atrazine at 672. Salt eaters beware! Sodium chloride (table salt) has an LD_{50} of 3,000, which means that 7.2 ounces can kill a 150-pound warm-blooded animal.

Aldicarb, which is no longer used, had an oral LD_{50} of 0.7 mg/kg. You can see why it was removed from our arsenal, even though it was an effective product. Hydrogen cyanamide, commonly used in blueberry production,

has an oral LD₅₀ of 142 mg/kg. Even garlic oil, an organic pesticide, has an LD₅₀ of 1,360, right between dicamba and picloram. That's right, organic pesticides can be lethal too.



BEE ADVISORY

One new at-a-glance symbol to catch your eye on the pesticide label is the bee advisory box. This symbol was created in response to repeated bee kills caused by pesticides used incorrectly and not according to the label. It should alert you to separate restrictions on the label that prohibit certain pesticide use when bees are present. The bee icon will appear in the pesticide directions for use section for each

application site and indicate what must be done to protect bees.

Advisory language on the different routes of exposure for bees, whether contact from foliar application, ingestion of nectar and pollen from applications via seed treatment, soil treatment, trunk injection, as well as foliar application is included in this section. In addition, best management practices to reduce exposure to bees, such as not applying the pesticide until all petals have fallen and how to report bee kills to the EPA, are provided.

GLOBALLY HARMONIZED SYSTEM

The Globally Harmonized System (GHS) of classification and labeling was developed by the United States and other nations to provide specific warnings about dangerous chemicals. The system was agreed upon by the United Nations in 2002 with a goal of 2008 implementation.

The U.S. Occupational Safety and Health Administration (OSHA) adopted these rules to apply to all hazardous chemicals to provide a common

approach to classifying and communicating hazard information on labels and safety data sheets by 2015. The EPA is the regulatory agency for pesticides and pesticide use. However, OSHA gets involved when anything involves worker health, like respirator quality and the GHS system for chemical safety labeling. OSHA establishes industry, chemical and process-specific standards to address workplace hazards that warrant additional regulatory measures. This ensures employees' occupational safety and health, and thus the GHS chemical safety labeling rules.

The GHS provides pictograms (graphic symbols) that illustrate the type of danger each chemical poses. Each pictogram is a symbol on a white background framed within a red border. The symbols are not meant to require reading ability to understand them. However, many growers find the pictograms hard to decipher, and many do not know that their workers must be trained to understand them.

Each pictogram covers a range of related hazards. The pictogram must be accompanied by a more detailed



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description of the hazard but serves as an at-a-glance warning. Some of the descriptions overlap, and the more detailed hazard statement will identify the issues more specifically.



The **Health Hazard** pictogram indicates carcinogen, mutagenicity, reproductive toxicity, respiratory sensitizer, target organ toxicity or aspiration toxicity. This is a large range of effects for some nasty stuff. The pictogram is meant to indicate something that strikes right at the heart of a person's health, but many people have interpreted it in different ways.

A carcinogen is anything that causes cancer. Cancer may be caused by repeated long-term exposure to carcinogenic chemicals and would be considered a delayed effect. Mutagenicity is a little different than a carcinogen but is similar in some ways. A mutagen is something that causes cells to genetically mutate more than the natural background level. This is not something that will make you an X-Man, but something that may cause some cells to mutate and grow a tumor or change enzymatic activity. Many genetic mutations can cause cancer, so mutagens are often carcinogens as well, but not always. Reproductive toxicity may be caused by a mutation that prevents reproduction, like alterations in chromosome numbers.



The **Exclamation Mark** pictogram indicates a skin and eye irritant, skin sensitizer, acute toxicity, narcotic

effects, respiratory tract irritant or hazard to the ozone layer. It is not evident that this pictogram symbolizes anything to do with health, so it is important to learn this one. These effects do not all seem to be related to each other and cover such a broad range that a non-specific symbol may have been the best catchall choice. Narcotic effects may be related to eye and skin irritation in that narcotics may cause constricted pupils, watery eyes and itching as well as euphoria followed by drowsiness, nausea and vomiting.



The **Skull and Crossbones** is an international symbol indicating acute toxicity (fatal or toxic) as used with the signal words. This one is pretty easy to understand.

The **Corrosive** symbol represents both physical and/or health hazards of corrosive material. The pictogram clearly indicates skin corrosion/burns and corrosion to metals, but this category also includes the potential for eye damage. Corrosion refers to a chemical, which could be an acid, oxidizer or base, that will dissolve the structure of an object. The pictogram indicates that the object destroyed may be skin or other surfaces.

The **Exploding Bomb** pictogram obviously indicates explosives, self-reactives or organic peroxides.

The **Flame** symbol indicates flammables, pyrophorics, self-heating, emits flammable gas, self-reactives or organic peroxides.

The **Flame over Circle** pictogram indicates an oxidizer. The difference between the Flame and the Flame over Circle may not seem obvious. An oxidizer, represented by the Flame over Circle, is a chemical which can cause or contribute to the combustion of other material. The Flame indicates the chemical itself is combustible.

The **Gas Cylinder** indicates gases under pressure. Gases under pressure, whether compressed, liquefied, refrigerated liquefied or dissolved, may explode if heated. Refrigerated liquefied gases may also cause cryogenic burns or injury.

The **Environmental Hazards** symbol is non-mandatory and at the manufacturer's discretion to include on product labeling. The pictogram shows a dead fish, indicating aquatic toxicity. Pesticides that cause these types of problems will have the details under the environmental hazards section of the label and may not display this pictogram. Products labeled for use in aquatic areas may have the same active ingredient as other products, but they are formulated to be safer in aquatic environments. Be sure to read the label and not just assume that if the active ingredient is the same than the products can be used in the same sites.

CONCLUSION

The label is very important to convey information about pesticides and chemicals. At-a-glance pictograms and signal words help to quickly get the applicator's attention about safety and hazards of use. Familiarity of these signal words and pictograms is key to safe use. Make sure you and your workers understand these important visual keys to product safety.

Sources: Applying Pesticides Correctly, 7th Edition by Fred Fishel; www.osha.gov; www.epa.gov

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If you have questions regarding this form, test or CEUs, email Juanita Popenoe at jpopenoe@ufl.edu or call 352-343-4101, ext. 2727. Please allow two weeks to process your CEU request.

‘At-a-glance safety information’ test

To receive one Core continuing education unit (CEU), read “At-a-glance safety information” in this issue of Citrus Industry magazine. Answer the 20 questions on the magazine’s website (www.CitrusIndustry.net) or send the answers and application information to the address at the end of the article. After one year, this test will no longer grant a CEU. You must answer 70 percent of the questions correctly to receive one Core CEU. Circle the correct answer:

1. Signal words include Caution, Warning, Danger and Danger/Poison. T F
2. Danger/Poison is the same as Danger, just another way of showing it. T F
3. A teaspoonful to 1 ounce of a Warning chemical is enough to be a lethal oral dose for a 150-pound person. T F
4. It will take a pint or a pound of Caution-labeled pesticide for a lethal oral dose to a 150-pound person. T F
5. LD₅₀ means the amount of active ingredient it takes to kill 50 laboratory animals. T F
6. Organic products all carry a Caution label because they are safe for the environment. T F
7. The Globally Harmonized System (GHS) was developed by the United States to lead the rest of the world in chemical safety measures. T F
8. The GHS is implemented by the Environmental Protection Agency to ensure pesticide safety. T F
9. Each GHS pictogram covers a specific danger. T F
10. The Health Hazard symbol with a star on the heart of a person indicates that the product can cause heart attacks. T F
11. The Exclamation Mark indicates a skin and eye irritant, skin sensitizer, acute toxicity, narcotic effects, respiratory tract irritant and/or hazard to the ozone layer. T F
12. The Skull and Crossbones, a symbol that only English-speaking people would understand, indicates acute toxicity. T F
13. An oxidizer is a chemical that can stop the combustion of other materials. T F
14. The Environmental Hazards category is non-mandatory and is not required to be placed on labels. T F
15. Gas under pressure is represented by the Exploding Bomb. T F
16. The Health Hazard symbol indicates:
 - Dangers from spiders
 - Carcinogen, mutagenicity and reproductive toxicity
 - Dangers to your heart
 - Eye irritant and skin sensitizer
17. The Exclamation Mark indicates:
 - Explosives, self-reactives, organic peroxides
 - Pyrophorics, self-heating, emits flammable gas
 - A skin and eye irritant, skin sensitizer, acute toxicity
 - Corrosive material
18. The LD₅₀ is expressed as:
 - The ounces of pesticide per pound of test animal weight
 - The weight in milligrams required to kill a 150-pound person
 - The weight in ounces required to kill a 150-pound person
 - The milligrams of pesticide per kilogram of test animal weight
19. The Bee Advisory Box indicates:
 - The pesticide is safe for bees.
 - The pesticide is good for pollinators.
 - There are special concerns about this pesticide around bees.
 - The pesticide attracts bees.
20. The GHS was agreed on by the United Nations in 2002 with a goal of 2008 implementation but was delayed until 2015. T F

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Pesticide Applicator CEU Form

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