**Airblast applications can result in drift and exposure to unprotected people, including the applicator if not properly protected.**

# Avoiding harmful effects of pesticides

**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.

Pesticides can have harmful effects on people, animals and the environment. The government tests and regulates pesticides and requires a pesticide license to limit harmful effects. Reviewing what you learned about harmful effects when you got your license is helpful to keep you and the environment safe.

Pesticide exposure occurs when a pesticide enters the body through the skin, lungs, mouth or eyes. The body may react in different ways. Whether and how a person is harmed by this exposure depends on the toxicity of the chemical, or the ability of the pesticide to cause short-term or long-term injury. Risk of harmful effects is reduced when you understand the routes of exposure, follow label directions, use the proper personal protective equipment (PPE) and apply the pesticide correctly.

Toxicity and the potential for harm can be expressed as an equation: Hazard (risk) = toxicity x exposure. The hazard of a very toxic chemical can be reduced by careful control of exposure. Likewise, a very low-toxicity chemical can be a problem with constant, heavy exposure. This is why there are strict regulations on testing, labeling and using chemicals. This is also why you are required to have a pesticide applicator license to use restricted-use pesticides.

## RISK ASSESSMENT

The Environmental Protection Agency (EPA) conducts risk assessments of pesticides to determine their potential for health and ecological effects. New pesticides are evaluated before they can enter the market, and older pesticides are periodically reviewed. Reregistration is required when new data become available or when safety standards change. In this process, scientists evaluate ecological, human health and cumulative risk. These assessments are multi-step processes.

Ecological risk assessment includes determining what plants and animals are at risk and need protection, to what degree they are exposed and whether that level of exposure is likely to cause harmful effects.

Human health risk assessment estimates the nature and probability of current and future effects from exposure to chemicals in the environment. This includes hazard identification, dose response assessment, exposure assessment and risk characterization.

Cumulative risk can occur when several pesticides have a similar mechanism of toxicity and therefore exposure potential must be grouped together for evaluation. Before a pesticide may be used on a food crop, tolerances are set for the maximum amount of a pesticide that may remain on or in the raw agricultural commodity.

An example of hazard versus risk can be seen in the recent concerns over glyphosate. The International Agency for Research on Cancer recently reclassified glyphosate as a probable carcinogen. This means that glyphosate has the potential to cause chronic toxicity, just as hair products, red meat, beverages over 150 degrees and

shiftwork have been shown to be probable carcinogens. This is the hazard of glyphosate, but we know that the hazard = risk x exposure.

All pesticides, and many common substances, are hazardous if they are misused. What is the risk of glyphosate? The EPA evaluates pesticides by their risk as well as hazard and works to reduce that risk through requiring safe use. Examples include requiring licensing or training before use, limiting the number of times a pesticide can be used in a year or limiting the amount applied. The rules to ensure safe use of a pesticide are on the label and that is why the "label is the law." The EPA has decided that based on the scientific evidence, if glyphosate is used appropriately in accordance with the label, that it is safe.

**Proper personal protective equipment will reduce the chance of pesticide exposure.**

## MINIMIZE EXPOSURE

Regardless of toxicity, what can you do to make sure you are minimizing exposure to any chemical you use? First, understand the routes of exposure. The skin, lungs, mouth and eyes are the common routes, but have you really thought about the tricky ways that chemicals can enter these routes? Think about the residues that might get on your cell phone and be transferred to your eyes, mouth or lungs with transfer from your hands on the phone. Are you careful when you remove your gloves and other personal protective equipment (PPE) not to get residues on your skin?

What about residues that may be on the equipment or plants? Wash your gloves and hands carefully after applications and wear PPE when you are working with spray equipment or entering a field before the re-entry interval is expired. Are you careful when you blow out a clogged nozzle or measure out pesticide concentrates? Splashes can get into your mouth or eyes if you are not careful during these activities. Overhead and blower applications can result in drift that gets into your eyes, lungs or skin. It only takes once to cause a problem with some chemicals, but even with low-toxicity chemicals you should not reduce your vigilance.

An immune response to the first exposure of a person to a substance is called sensitization. It may appear as asthma, shock, or irritation of the skin, eyes or nose. Later exposure may result in an allergic response that can get progressively worse with more exposure. Make sure you never experience that first sensitization by never having a

first exposure. Also, remember that not all people have the same level of sensitivity to a chemical.

Harm caused by a single, one-time exposure event, termed acute toxicity, is much more evident and easier to treat. However, sometimes the harm is delayed, and you may not realize that it is caused by a pesticide. Repeated small doses of a harmful substance over time can cause chronic toxicity that may not be recognized for years. It could result in carcinogenesis, the production of malignant tumors; mutagenesis, changes in genetic structure; oncogenesis, the production of tumors which may or may not be malignant; or teratogenesis, the production of birth defects.

Chronic exposure to pesticides should be avoided at all costs. Remain vigilant even if the chemical is "low toxicity," particularly because all effects may not be known when the chemical is first introduced and registered.

## EXPOSURE SYMPTOMS

Ninety percent of pesticide poisoning cases involve only minor harm and can typically be treated at home with dilution or observation. However, be sure to get medical advice even if you think the symptoms are minor. According to the poison control centers, there are seven classes of chemicals that are much more likely to require medical attention: organophosphates, pyrethrins/pyrethroids, disinfectants, carbamates, organochlorines, herbicides and rodenticides.



Be aware of the common symptoms of exposure after using a pesticide because early first-aid responses may save a life or prevent permanent injury. Err on the side of caution and do not wait to seek medical attention if you suspect poisoning or a serious exposure event.

First aid is listed on the label of each pesticide. When seeking medical attention, be sure to take the pesticide label (or a copy of the label), the safety data sheet or at least the EPA registration number of the product. Do not carry the pesticide container in the passenger area of any vehicle.

The symptoms of exposure are often correlated to the type of pesticide poisoning. Borate insecticides used around the home may irritate the skin, nose and respiratory system. Organophosphate and carbamate insecticides may cause systemic symptoms like muscle twitching, breathing difficulty, chest pain and unconsciousness that result in respiratory failure and death. Synthetic pyrethroid insecticides may cause nausea, dizziness, weakness, nervousness and irritation of the eyes and skin. Some related herbicides like 2,4-D, dicamba, MCPA and MCPP are irritating to the skin and mucous membranes, and may cause vomiting, headaches, diarrhea and confusion. Bloody noses and gums may be the result of exposure to anticoagulant-type rodenticides.

It is important to know the classes of chemicals and their modes of action (MOA) — not just to be sure to rotate MOA to fight resistance in the target organism(s) but also to know the symptoms they can cause in humans. Sometimes the symptoms may be caused or worsened by the additives and not the active ingredient itself.

The flu, pneumonia, asthma, infections, hangovers and heat stress can sometimes look like pesticide exposure. In a hot, humid environment, heat stress is common when the body cannot take the heat generated by activity in hot PPE and hot surroundings. Heat exhaustion may be distinguished from organophosphate/carbamate pesticide poisoning by dry mouth, no tears, no saliva, fast pulse and prompt recovery from fainting. The opposite of these reactions is found with pesticide poisoning.

Heat illness and pesticide poisoning can be a combined problem that may be life-threatening, so get medical help if there is any doubt. Train workers and supervisors to recognize heat stress and work to prevent it. Gradually work up to longer time periods working in heat, allow longer rest periods, manage activities to work during cooler hours and rotate tasks. Special cooling garments like vests with frozen packets at key spots on the body or cooler respirators may be helpful to reduce the chances of heat-related illness.

## SUMMARY

The equation hazard = toxicity x exposure gives an idea of what you can do to avoid pesticide poisoning. Using fewer toxic pesticides and ensuring minimal exposure are the keys to reducing risk. Be vigilant in reducing potential exposure. Be aware of what poisoning symptoms look like, especially for the chemicals you are using. Prompt medical attention that includes having the information on the label can save your life.

**Sources:** Applying Pesticides Correctly 7th Edition by F. Fishel, www.na-ipc.org/webinars/glyphosate-friend-or-foe/, www.cancer.org/cancer/cancercauses/othercarcinogens/generalinformationaboutcarcinogens/known-and-probable-human-carcinogens, www.epa.gov/pesticide-science-and-assessing-pesticide-risks-overview-risk-assessment-pesticide-program, www.epa.gov/pesticide-tolerances/setting-tolerances-pesticide-residues-foods

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