Protecting people from pesticide exposure

By Danielle Sprague

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.

The proper selection and use of personal protective equipment (PPE) can greatly reduce potential pesticide exposure. While proper selection and use of PPE can reduce pesticide exposure, it does not eliminate it.

All pesticide handlers, applicators, mixers/loaders and early-entry agricultural workers are legally required to completely follow PPE instructions on product labels. The label lists the minimum PPE required while handling a pesticide. It is always acceptable to wear more PPE than the label lists, but never less. This article will cover some different types of PPE and considerations for selection and usage.

THE LABEL

The only way to determine the proper PPE needed to handle a pesticide is to read the pesticide label. For pesticide handlers, including applicators and mixers/loaders, the minimum PPE required can be found under the Precautionary Statements section of the label. For early-entry agricultural workers, minimum requirements can be found under the Agricultural Use Requirements as this activity falls under the Worker Protection Standard, 40 CRF Part 170.

Required PPE may vary depending on the specific task. In the example shown in Figure 1 (page 26), both applicators and mixers/loaders are required to wear long-sleeved shirts, long pants, waterproof gloves, shoes and socks. Mixers/loaders must additionally wear a respirator. When tank-mixing pesticides, you must use the PPE from the pesticide label that is most restrictive or protective.

The label also gives instructions for care of PPE or how to handle any clothing that may become contaminated with pesticide. Any clothing that might be exposed to pesticides should be laundered separately from other clothing. Discard any clothing that become heavily soiled.

TYPES OF PPE

Gloves

Hands and forearms get the most exposure to pesticides. As a result, product labels might require the use of waterproof or chemical-resistant gloves during handling and mixing. Keep in mind that waterproof materials are not necessarily chemical resistant. Water-resistant PPE will prevent a small amount of fine spray particles or small liquid splashes from penetrating the clothing and reaching the skin. Waterproof material keeps water-soluble materials out but may not necessarily keep out oil solvent-based products. Chemical resistant, on the other hand, means that no measurable movement of the pesticide through the material occurs during use. Always consult the label for which type and thickness of gloves are required.

Not all chemical-resistant materials will give you the same level of protection. In some cases, a pesticide label's PPE description may refer you to a code letter (A-H) on the Environmental Protection Agency's (EPA) chemical-resistance category selection chart (Table 1, page 28). The chart refers the handler to several PPE materials to choose from for each category. It also tells the handler how long a given material can be expected to withstand chemical exposure.

For example, the label directions from Figure 1 (page 26) advise handlers to "follow the instructions for Category A on the EPA chemical-resistance category selection chart." Based on the chart's recommendations, suitable materials for handling this product would be barrier laminate, butyl rubber, nitrile rubber, neoprene rubber, natural rubber, polyethylene, polyvinyl chloride or Viton. Never wear

cotton, canvas or leather gloves when handling pesticides as these materials will absorb the pesticides.

Body Protection

It is common to see long-sleeved shirt, long pants, shoes and socks listed on pesticide labels. This is to minimize the amount of exposed skin that could absorb fine particles of spray or be subject to splashing. Chemicals that are more corrosive or have a higher hazard may require additional protection, such as an apron.

A chemical-resistant apron provides an extra layer of protection from splashes that can occur while mixing and loading product or cleaning equipment. For an apron to provide proper protection, it should extend from the mid-chest to at least the knees to cover the front of the body. Aprons can be easily worn over other protective clothing. Aprons are constructed of many of the chemical-resistant materials listed in Table 1 (page 28).

Some products may require a handler to wear coveralls or a chemical-resistant suit. Coveralls should be made of sturdy material such as woven cotton, polyester or a non-woven fabric such as Tyvek. When wearing coveralls, the opening should be closed securely so the entire body — except the feet, hands, neck and head — are covered. With two-piece coverall suits, the shirt or coat should flow loosely and not be tucked into the waist. Some suits may be water-resistant and disposable.

Suits are usually made from rubber or plastic and sold as one piece or two pieces consisting of a jacket worn over coveralls. Chemical-resistant suits make the body hot and can cause heat stress, which is their biggest drawback. Chemical-resistant suits are by design not very breathable, and the risk of overheating is elevated compared to more breathable materials. More frequent breaks may need to be considered for products that require the use of these suits.

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS
CAUTION

Harmful if absorbed through skin or swallowed. Causes moderate eye irritation. Avoid contact with skin, eyes, or clothing.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Some materials that are chemical resistant to this product are listed below. If you want more options, follow the instructions for Category A on an EPA chemical resistance category selection chart.

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Chemical resistant gloves made of any waterproof material such as polyethylene or polyvinylchloride
- Shoes plus socks

Mixers and loaders must wear:

A non-powered air purifying respirator equipped with a N, R, P, or HE series filter (NIOSH approved number prefix 84A) for mixing and loading.

Discard clothing or other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

Figure 1. This sample pesticide label requires different personal protective equipment for applicators and mixers/loaders.

Footwear

Some pesticide labels state that the only footwear required for handling is shoes and socks. Other labels may direct the handler to wear waterproof or chemical-resistant footwear. Leather boots are *not* considered chemical resistant, as leather tends to absorb organic compounds like pesticides. Chemical-resistant materials could include nitrile, butyl or rubber boots or shoe coverings. Pant legs should be worn outside and not tucked into boots or shoe coverings. This is so spilled pesticides do not drain into the boot.

Eye Protection

Use the appropriate eye protection when the label specifics the following:

- Protective eyewear – Use safety glasses with brow, front and temple protection, or a face shield, goggles or full-face respirator.
- Goggles – Use fully-enclosed, chemical-splash-resistant goggles or a full-face respirator.
- Face shield – Must extend below the chin and wrap around the face
- Full-face respirator – You must use a tight-fitting, full-face respirator.

It is important to note that if the label requires protective eyewear, that does not mean simply wearing sunglasses or vision-correcting glasses. Protective eyewear should meet or exceed impact-resistance specifications established by the American National Standards Institute Z87.1 eye protection standard. You will find this number on the bridge of the glasses, the temples or on the packaging and labeling when purchased. See edis.ifas.ufl.edu/publication/PI287 for more information about eyewear.

Respirators

Pesticides in the highest hazard classification, most fumigants or other volatile pesticides require the use of a respirator.

A respirator prevents users from breathing in pesticide-contaminated air and inhaling toxic chemicals. The product formulation, toxicity and type of application influence the type of respirator needed. If a respirator is required, the label will specify which type. However, it's not a bad idea to consider wearing one during any lengthy exposure with a high risk of pesticide inhalation.

Respirators must be approved by the National Institute of Occupational Safety and Health and will be stamped with a testing and certification (TC) number prefix. This signifies the respirators have been tested and certified for a specific level of protection. Pesticide labels often specify the type of respirator required by listing its TC number. Additionally, filters are classified by codes based on their resistance to oil degradation and filter efficiency. N filters are not resistant to oils but are excellent for dusts and granular formulations. R and P filters are either oil resistant (R) or oilproof (P). HE filters refer to high-efficiency filters for powered air-purifying units that can be used with oils.

Before handlers can use a respirator, they must:

- Get a medical evaluation by a physician or other licensed health care professional.
- Receive fit testing with a taste/smell/irritating indicator.
- Have training about the use, care and maintenance of the respirator.
- Perform a fit check before each use.

Once handlers are approved to use a respirator, the U.S. Occupational Safety and Health Administration respiratory protection standard requires that a fit check be performed every time a person puts on a respirator. Respirator training and fit testing are required annually, or when workplace conditions change, or a new type of respirator is used. Records and documentation of medical clearance, fit testing and training must be maintained for at least two years. Always consult respirator packaging and labeling for directions on storage, cleaning, shelf-life and use maximums.

MAINTAINING PPE

PPE can be disposable or reusable.

Disposable PPE items are not designed to be cleaned and reused and should be discarded when they become

Table 1. EPA chemical-resistance category selection chart for personal protective equipment

Selection Category on Pesticide Label	Type of Personal Protective Material							
	Barrier laminate	Butyl rubber >= 14 mils	Nitrile rubber >= 14 mils	Neoprene rubber* >= 14 mils	Natural rubber >= 14 mils	Polyethylene	Polyvinyl chloride >= 14 mils	Viton >= 14 mils
A (dry and water-based)	High	High	High	High	High	High	High	High
B	High	High	Slight	Slight	None	Slight	Slight	Slight
C	High	High	High	High	Moderate	Moderate	High	High
D	High	High	Moderate	Moderate	None	None	None	Slight
E	High	Slight	High	High	Slight	None	Moderate	High
F	High	High	High	Moderate	Slight	None	Slight	High
G	High	Slight	Slight	Slight	None	None	None	High
H	High	Slight	Slight	Slight	None	None	None	High

*Includes natural rubber blends and laminates

Resistance time limit key:
High: Highly chemical resistant. Clean or replace PPE at end of each day's work period. Rinse off pesticides at rest breaks.
Moderate: Moderately chemical resistant. Clean or replace PPE within an hour or two of contact.
Slight: Slightly chemical resistant. Clean or replace PPE within 10 minutes of contact.
None: Not chemical resistant. Do not wear this type of material as PPE when contact is possible.

contaminated. These items are made of thin vinyl, latex or polyethylene. They are inexpensive and may be a good choice for short intervals.

Reusable PPE is designed to be cleaned and reused several times. However, reusable PPE should not continue to be worn when it no longer provides adequate protection. Check reusable PPE for rips, leaks and any visible signs of damage before and after each use. Reusable PPE must be cleaned and stored properly after each use and discarded if any damage is found.

SUMMARY

Pesticides can be hazardous to handlers, but using the appropriate PPE as required on the pesticide label can help minimize the risk of accidental exposure. The PPE selected for a particular pesticide application will depend on the application procedure, the pesticide being applied and the label requirements. Remember, you are legally required to wear all PPE required by the label.

Sources: Applying Pesticides Correctly, 7th Edition by F. Fishel (ifasbooks.ifas.ufl.edu/p-104-applying-pesticides-correctly-a-guide-for-pesticide-applicators-core.aspx) and Personal Protective Equipment for Handling Pesticides by F. Fishel (edis.ifas.ufl.edu/publication/pi061).

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‘Protecting people from pesticide exposure’ test

To receive one Core continuing education unit (CEU), read “Protecting people from pesticide exposure” in this issue of Citrus Industry magazine. Answer the 20 questions on the magazine’s website (www.CitrusIndustry.net) or mail the answers and application information to the address at the end of the article. You must answer 70% of the questions correctly to receive one Core CEU. The article and test set are valid for up to one year from the publication date. After one year, this test will no longer grant a CEU.

		True	False
1.	Personal protective equipment (PPE) eliminates pesticide exposure.		
2.	You can wear less PPE than is stated on the label.	T	F
3.	Pesticide handlers are legally required to follow PPE requirements on the label.	T	F
4.	Minimum PPE required for handlers is listed under the Agricultural Use section on the label.	T	F
5.	Early-entry agricultural workers are required to wear PPE.	T	F
6.	Waterproof and chemical-resistant clothing can be used interchangeably.	T	F
7.	Chemical-resistant clothing means that no measurable movement of the pesticide through the material occurs during use.	T	F
8.	When applying two or more pesticides, follow the label that requires the least amount of PPE.	T	F
9.	Canvas and leather gloves are a good choice for mixing/loading pesticides.	T	F
10.	Leather boots are perfect for pesticide applications.	T	F
11.	Sunglasses are acceptable PPE eyewear.	T	F
12.	A respirator with the N filter is not resistant to oils.	T	F
13.	It is optional to have a medical evaluation prior to using a respirator.	T	F
14.	A fit check must be performed every time a respirator is used.	T	F
15.	Reusable PPE items are not designed to be cleaned and reused.	T	F
16.	Records for respirator medical clearance, fit tests, and training must be maintained for two years.	T	F

17. Which statement is true about PPE as required by the label?

A) You should not wear more PPE than the label requires.
B) Sometimes a label has different PPE requirements for pesticide applicators and mixers/loaders.
C) You are not required to wear all the PPE listed on the label.
D) Wearing the PPE listed on the label ensures that you will never be exposed to pesticides.

18. Based on the Environmental Protection Agency’s chemical-resistance category selection chart, _____ would be an appropriate chemical-resistant PPE choice for applying the pesticide in Category A.

A) Butyl rubber **B**) Nitrile rubber **C**) Neoprene rubber **D**) All of the above

19. _____ and _____ receive the most exposure to pesticides.

A) Hands and feet **B**) Hands and eyes **C**) Hands and forearms **D**) Eyes and feet

20. _____ requires that a medical fit test be performed before using a respirator.

A) Environmental Protection Agency **B**) American National Standards Institute
C) Occupational Safety and Health Administration **D**) National Institute of Occupational Safety and Health

Please circle the number below to rate this article and test:

Not very useful	1	2	3	4	5	6	7	8	9	10	Very useful

Pesticide Applicator CEU Form

First Name:_____ **Last Name:** _____

E-mail: _____ **Phone:** _____

Pesticide License Number: _____

Address: _____

City: _____ **State:** _____ **Zip:**_____