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Gloves for Pesticide Applicators[1]

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Introduction

When working with pesticides, protecting oneself from possible exposure is of upmost importance; and the easiest way to do this is by the proper use of reliable personal protective equipment (PPE). Furthermore, protecting hands and forearms with properly fitting gloves should be our highest priority since these areas are the most at risk for pesticide exposure. Hands are used for all sorts of other activities including eating, touching other parts of the body, and touching other pieces of equipment. Thus, keeping them clean from pesticides is critically important. This publication is intended for those who use pesticides and want to know the different types of gloves, how to find the correct fit, and how to best use and maintain those gloves.

Types of Gloves

Materials

Gloves can be made from a variety of materials, all of which have specific uses and offer distinct levels of protection. Not all types of gloves are the same, and some would not be appropriate for protection from chemical exposure (pesticides). Cotton gloves may be comfortable and helpful against scratches while harvesting crops but provide no protection against chemicals. To protect from pesticides, one should wear chemical-resistant gloves— not gloves simply labeled "waterproof" nor those made from or lined with absorbent materials. Chemical resistant gloves are made from many different materials (Table 1), each of which has pros and cons. For example, barrier laminate provides high levels of protection but might not provide enough dexterity to perform fine tasks. Therefore, it is important to consult the label before applying pesticides to ensure that the proper gloves are available for use and that they allow you the ability to easily perform the task(s) at hand.

Figure 1. Barrier laminate gloves.
Credits: Christine Krebs, UF/IFAS

Figure 2. Neoprene rubber gloves.
Credits: Christine Krebs, UF/IFAS

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Figure 3. Butyl rubber gloves.
Credits: Christine Krebs, UF/IFAS

Figure 4. Natural rubber gloves.
Credits: Christine Krebs, UF/IFAS

Figure 5. Nitrile rubber gloves.
Credits: Christine Krebs, UF/IFAS

Figure 6. Nitrile gloves with textured grip.
Credits: Christine Krebs, UF/IFAS

Figure 7. Polyvinyl chloride gloves.
Credits: Christine Krebs, UF/IFAS

Figure 8. Safety ratings and protection information.
Credits: Christine Krebs, UF/IFAS

Table 1. Materials used for chemical resistant gloves.

Category	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 formulations)	High	High	High	High	High	High	High	High
B (ketones)	High	High	Slight	Slight	None	Slight	Slight	Slight
C (alcohols)	High	High	High	High	Moderate	Moderate	High	High
D (acetates)	High	High	Moderate	Moderate	None	None	None	Slight
E (aliphatic petroleum distillates)	High	Slight	High	High	Slight	None	Moderate	High
F (aromatic petroleum distillates <40%)	High	High	High	Moderate	Slight	None	Slight	High
G (aromatic petroleum distillates≥40%)	High	Slight	Slight	Slight	None	None	None	High
H (halogenated hydrocarbons)	High	Slight	Slight	Slight	None	None	None	High

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. (Environmental Protection Agency, 2016)

Sizing

Having gloves that properly fit your hand is critical for both protection and comfort. Gloves that are too tight can rip when taken on/off and reduce dexterity and blood flow to the fingers. Alternatively, gloves that are too loose can cause chaffing or even fall off while in use. Trying on various sizes in the style of glove you will wear most often can help determine the best size. Gloves will either be labeled with a number for sizing (6-13) and measured in millimeters, or more qualitatively with sizes from XS–XXL, as preferred by US manufacturers. To understand these sizes, you need to measure the circumference around the widest part of your palm. You can also measure the length of your hand from the tip of the middle finger to the bottom edge of the palm. Refer to Table 2 for guidance, but always check the manufacturer's sizing guidelines for best fit.

Additionally, gloves will be labeled by thickness. Though thicker gloves provide less dexterity, they are more resistant to tears and holes from wear. Thinner gloves may feel better on the hand but are more prone to damage. Gloves typically range from 4 mm–22 mm in thickness, and it is important to balance need for dexterity with length of protection. A job that requires you to wear gloves for long periods of time while using your hands might be better for thicker gloves. However, you must ALWAYS meet the minimum thickness that is specified on a pesticide label.

Table 2. Glove size reference chart.

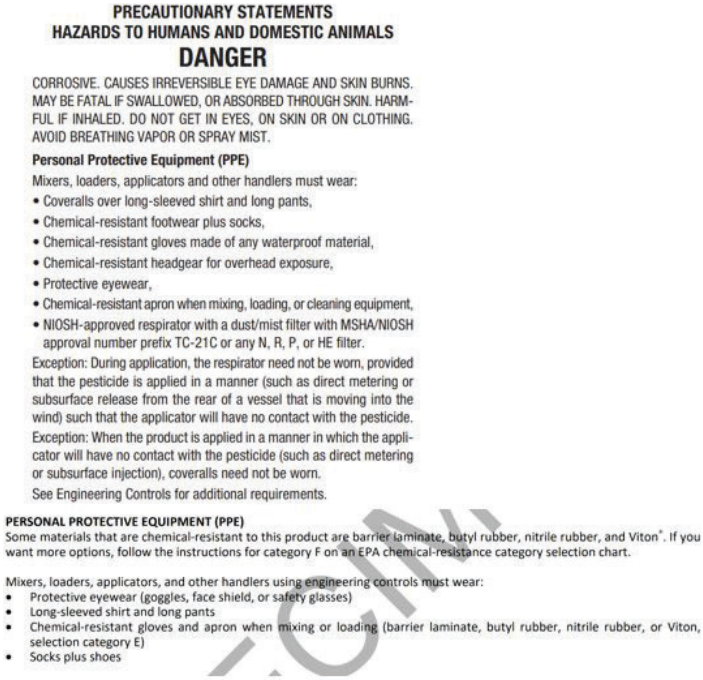
Glove Size – US	Glove Size – EU	Circumference of Palm	Length of Hand
XS – Extra Small	6	6 – 7 inches; 152 – 178 mm	6 5⁄16 inches; 160 mm
S – Small	7	7 – 8 inches; 178 – 203 mm	6 ¾ inches; 171 mm
M – Medium	8	8 – 9 inches; 203 – 229 mm	7 3⁄16 inches; 182 mm
L – Large	9	9 – 10 inches; 229 – 254 mm	7 9⁄16 inches; 192 mm
XL – Extra Large	10	10 – 11 inches; 254 – 279 mm	8 1⁄16 inches; 204 mm
XXL – Double Extra Large	11	11 + inches; 279 mm+	8 7⁄16 inches +; 215 mm+

Use, Cleaning, and Maintenance

As always, the pesticide label specifies which gloves must be worn in its Precautionary Statements section, under the PPE subsection. The instructions may be as simple as "wear chemical-resistant gloves" or as specific as listing particular glove types. All instructions on material type and thickness provided on the label must be followed.

After the appropriate glove has been selected, workers must consider how to wear gloves to ensure their safety. One question that comes up often is whether long sleeves be tucked into the gloves, or should they go over the gloves? The answer to this question depends on the nature of the work and how exposure is likely to occur. In most cases, when spraying target pests below eye level, it is best to

wear sleeves outside the gloves to prevent spray mix from entering the glove top and collecting around the fingers. Conversely, sleeves should be tucked into the gloves when you are working with pesticides overhead. This will prevent spray mix from running off the gloves and under the sleeve to bare skin. Always consider the job at hand and where exposure is most likely.



PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

CORROSIVE. CAUSES IRREVERSIBLE EYE DAMAGE AND SKIN BURNS. MAY BE FATAL IF SWALLOWED, OR ABSORBED THROUGH SKIN. HARMFUL IF INHALED. DO NOT GET IN EYES, ON SKIN OR ON CLOTHING. AVOID BREATHING VAPOR OR SPRAY MIST.

Personal Protective Equipment (PPE)

Mixers, loaders, applicators and other handlers must wear:

- Coveralls over long-sleeved shirt and long pants,
- Chemical-resistant footwear plus socks,
- Chemical-resistant gloves made of any waterproof material,
- Chemical-resistant headgear for overhead exposure,
- Protective eyewear,
- Chemical-resistant apron when mixing, loading, or cleaning equipment,
- NIOSH-approved respirator with a dust/mist filter with MSHA/NIOSH approval number prefix TC-21C or any N, R, P, or HE filter.

Exception: During application, the respirator need not be worn, provided that the pesticide is applied in a manner (such as direct metering or subsurface release from the rear of a vessel that is moving into the wind) such that the applicator will have no contact with the pesticide.

Exception: When the product is applied in a manner in which the applicator will have no contact with the pesticide (such as direct metering or subsurface injection), coveralls need not be worn.

See Engineering Controls for additional requirements.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Some materials that are chemical-resistant to this product are barrier laminate, butyl rubber, nitrile rubber, and Viton®. If you want more options, follow the instructions for category F on an EPA chemical-resistance category selection chart.

Mixers, loaders, applicators, and other handlers using engineering controls must wear:

- Protective eyewear (goggles, face shield, or safety glasses)
- Long-sleeved shirt and long pants
- Chemical-resistant gloves and apron when mixing or loading (barrier laminate, butyl rubber, nitrile rubber, or Viton, selection category E)
- Socks plus shoes

Figure 9. Two examples of PPE related to gloves that may be found on pesticide labels.

When a job requires chemical-resistant gloves, consider double-gloving. This is where you have a pair of disposable, exam-style gloves underneath your thicker gloves (Figure 10). This accomplishes two things: the tighter fitting under-glove helps alleviate chaffing and keep hands dry while the over-glove protects from any nicks or holes. Additionally, double-gloving helps with keeping hands clean when removing gloves after using pesticides.

Figure 10. Double-gloving with exam gloves under chemical-resistant gloves.
Credits: Brett Bultemeier, UF/IFAS

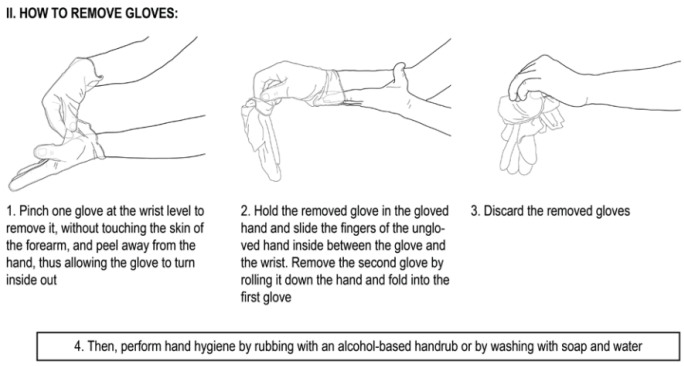
Removing Gloves Safely

It is important to remember that when removing gloves, a single clean hand is often required to touch the contaminated glove; one could be exposed to harmful chemicals if they perform this routine without caution.

Therefore, if not double-gloving, the gloves should be washed with soap and water (when possible) before removing them. This will remove a great quantity of pesticide residue and reduce the likelihood of exposure. Next, simply grip the glove with one hand near the fingers and pull the glove partway off. Then use the glove that was loosened to grab the other glove. Do this back and forth, being sure to never touch the outside with bare skin, until they can slide off. Once removed, grasp them by the inside of the gloves at the wrist (Video 1).

Video 1. Proper glove removal. (See end of publication for video transcript.) https://youtu.be/qJGeQ3fRKNI?si=7hEgvxmgCKYXLN_V
Credits: Videography by Christine Krebs, communications manager, UF/IFAS Center for Aquatic and Invasive Plants; demonstration and voice by Brett W. Bultemeier, UF/IFAS

If you are wearing a 2nd set of gloves, remove those using the sterile glove techniques outlined in Figure 11. Always wash your hands with soap and water when done working with pesticides.



II. HOW TO REMOVE GLOVES:

1. Pinch one glove at the wrist level to remove it, without touching the skin of the forearm, and peel away from the hand, thus allowing the glove to turn inside out

2. Hold the removed glove in the gloved hand and slide the fingers of the ungloved hand inside between the glove and the wrist. Remove the second glove by rolling it down the hand and fold into the first glove

3. Discard the removed gloves

4. Then, perform hand hygiene by rubbing with an alcohol-based handrub or by washing with soap and water

Figure 11. Sterile glove removal techniques.
Credits: adapted from World Health Organization, 2009

Once your reusable gloves have been properly cleaned, they should either be discarded or stored in a dry, secure place. It is best to store gloves in a sealed container (or sealed bag)—labeled and stored separate from any pesticides. Do not store used gloves with new gloves, in case they still contain pesticide residue and could contaminate the fresh set. Avoid storing gloves where they will be exposed to direct sunlight, as this often makes them brittle and likely to rip. Always inspect gloves before and after use to check for holes or any signs of excessive wear. A great way to test for holes is to trap air in the gloves and squeeze them to ensure air is not escaping. If in doubt on the condition of a glove, throw it out.

Identifying, selecting, using, and maintaining gloves are some of the most important parts of pesticide safety. The hands and forearms are the most likely to be exposed to pesticides, so ensuring you have the right equipment is essential. Read the label, wear the proper gloves according to the label, and, for the job at hand, inspect and care for the gloves to greatly reduce your chance of exposure to pesticides. These practices will decrease your overall risk of contamination.

References

Environmental Protection Agency. 2016. "Chapter 10: Worker Protection Labeling." In *Label Review Manual*. https://www.epa.gov/sites/default/files/2016-02/documents/chap-10-feb-2016.pdf

World Health Organization. 2009. "Glove Use Information Leaflet." https://cdn.who.int/media/docs/default-source/integrated-health-services-(ihs)/infection-prevention-and-control/hand-hygiene/tools/glove-use-information-leaflet.pdf?sfvrsn=13670aa_10

Video 1 Transcript

Never use bare hands to touch what could be dirty gloves.

These gloves could be contaminated with pesticides, and now your clean hands are covered.

To properly remove reusable gloves, you'll want to use one glove to grip the fingers of the other. Slowly work your arms and fingers back and forth until they can be removed, and then you can grab the gloves from the inside.