

More information can be found in other publications in the *Family Pesticide Safety* series. A single copy of each is available free at any Iowa State University Extension county office. Ask for these titles:

- *Understand label precautions*, PM 1663a;
- *What to do when clothes are soiled with pesticides*, PM 1663b;
- *Wear the right gloves*, PM 1663c; and
- *Use eye and lung protection*, PM 1663e.

Prepared by Janis Stone, professor and extension textiles and clothing specialist; edited by Julie L. Todd, extension program specialist; reviewed by Joyce Hornstein, extension program specialist, Department of Entomology; and layout by Erin Holmes, extension communications intern, Iowa State University. Original artwork by Rex Heer, senior graphic designer.

No endorsement of products or firms is intended, nor is criticism implied of those not mentioned. Suggestions in this publication are intended to alert pesticide users to safety concerns, however, following these procedures cannot guarantee total protection from pesticides.

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... and justice for all

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Wear coveralls and aprons



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Wear coveralls and aprons

Coveralls and aprons worn over regular work clothing offer additional protection when you dilute, mix, or apply pesticides around the home or farm. Pesticide labels may require them for certain pesticides so you can better protect yourself and keep your work clothing reusable. Work clothing with splashes or spills of concentrates must be discarded.

Chemical-resistant coveralls, protective suits, and aprons are available in a variety of materials that may be disposable (single use) or reusable. In recent years, the marketing terms used in advertising have made choosing work clothing and personal protective equipment (PPE) confusing. For example, coveralls formerly marketed as *disposable* or *single use* are now sold as *limited use*. This term suggests if outside contamination from the pesticide application is minimal and the pesticide is not highly toxic, the items can be worn again. Limited use also assumes that the pesticide has not penetrated to the inside of the material so reuse would not cause skin contamination or health risk. You must decide when the limited use should end.

Limited use does not mean repeated wear over a period of several days or weeks or until the material disintegrates, but its exact meaning and its difference from *reusable* is unclear. Limited-use items usually cannot be refurbished by laundering, whereas it is generally assumed that reusable ones can. However, little research-based information is available on effective cleanup methods for reusable materials other than cotton or cotton/blends.

Reuse of contaminated items is hard to manage without contaminating your hands and storage areas. The questions about the trade-off between replacement costs of single-use items and the hazards of unknown health risks associated with repeated use have no concrete answers.

Limited-use coverall materials

Single- and limited-use coveralls, suits, and aprons differ in the materials used, their design (e.g., seaming and whether a hood is attached),

closures, and sizing. Most nonwoven fabrics are covered with thin layers of film to reduce moisture penetration. The fabrics are not intended to be washed or cleaned and they may be damaged by these procedures. If they are polypropylene or polyethylene they melt in high heat. Unless they are labeled as flame retardant, they are flammable. Flame retardant means they are slow to ignite, burn somewhat slowly, and usually self-extinguish when the source of ignition is removed.

Characteristics and uses of some of the trademarked fabrics currently used in single-use coveralls, suits, and aprons on the market are described below.

Tyvek® is a spunbonded olefin (polypropylene) material that is lightweight, breathable, and strong. It is a barrier to dry pesticides and granules. DuPont, the manufacturer, claims that independent laboratory tests proved it is an effective barrier to carbaryl. Other research has shown that Tyvek® gives about the same protection from dusts and fine spray mists as cotton twill coveralls and that it gives better protection from liquid sprays, but it is not waterproof. It is available in denim blue and other colors.

Tyvek®QC is spunbonded olefin coated with a thin layer of polyethylene film (like a plastic bag) so that it has better chemical resistance than Tyvek® and repels water. It is recommended for use with pesticides with CAUTION and WARNING labels. It is bright yellow or gray. Tyvek® laminated with Tychem®SL or Saranex® is recommended for use with DANGER (skull and crossbones) label pesticides. Saranex®-coated materials are bright yellow. Tychem®SL is white. These materials lack breathability. Regardless of coating, Tyvek® is not recommended for chlorinated hydrocarbons.

Kleenguard®Ultra is a tough, triple-layer spunbonded polypropylene with a microporous film middle layer to allow heat and perspiration to evaporate. It offers splash and barrier resistance to CAUTION label pesticides.

Kleenguard® Heavy Duty offers protection against fine dusts and liquid splashes. Its middle layer is a matrix of microfibers to filter out dusts and water-based liquids. Microfibers form an ultrafine filter because they are approximately 100 times finer than human hair.

Kleenguard® Extra Protection has an antistatic coating and it is promoted for agricultural spraying because it offers better protection from oils and alcohols than Kleenguard® General Protection, which is not specifically noted for this purpose.

Kleenguard® LP coveralls are advertised as comfortable and durable limited-use coveralls that act as a spray and splash barrier to low-toxicity CAUTION label pesticides, both oil- and water-based.

Pro-Shield® 1, 2, and 3 spunbonded (nonwoven) polypropylene fabrics are advertised for comfort, breathability, and barrier resistance to liquids.

Pro-Shield 2 and 3 have the spunbonded polypropylene laminated to a microporous polypropylene film. Pro-Shield 1 has higher comfort rating with comparatively less barrier protection. Pro-Shield 2 combines high comfort with high barrier resistance. Pro-Shield 3 has higher barrier protection and a somewhat lower comfort rating. Worn over regular work clothing, coveralls of these materials are useful to prevent exposure to low toxicity pesticides in low-exposure situations, but they do not claim to offer true chemical protection.

Pro-Shield NexGen® is for nontoxic liquid and spray hazards. It provides a liquidproof barrier and is advertised for agricultural applications. Independent laboratory tests show it provides a barrier to diazinon and malathion.

Tempro® is a disposable material that is lightweight, breathable, and water- and grease-repellent, and it has been treated for flame retardance. It is recommended for cleanup tasks and welding work.

Reusable PPE

Reusable coveralls, suits, and aprons are made of many materials that offer different levels of protection and in general are both heavier and thicker than limited-use materials.

Recommendations for use are based on laboratory tests with selected chemicals and solvents and few materials have been evaluated for resistance to formulated pesticides.

Cotton or cotton/blend twill coveralls are a good option for protection from low-toxicity pesticides with CAUTION labels, but they may be considered regular work clothing rather than PPE. They are comfortable to wear and must be large enough to fit over other clothes and underwear. They also provide a layer of protection from dry and granular pesticides that is comparable to that of regular Tyvek®. Cottons must be washed after every wearing and the cost of laundering and maintenance should be considered. They absorb moisture quickly and are not suitable for greenhouse or orchard spraying. They must be discarded if a full-strength liquid concentrate pesticide is spilled or splashed on them accidentally.

Reusable coveralls, suits, and aprons of other materials such as nitrile, neoprene, or polyvinyl chloride (PVC) resist water and solvent-based pesticides. These materials are often backed with cotton knit, nylon knit, or other support fabrics for strength. These backings may be absorbent and easily contaminated if not handled carefully. Usually, no definite cleanup guidelines are offered and frequency of replacement is a choice left to you, with few clear guidelines.

Waterproof rainwear also may be chemical resistant; an example is a nylon fabric coated on both sides with PVC film.

Other chemical-resistant materials include **Barricade®** and **Responder®**. However, these materials are very expensive and used mainly for totally encapsulating suits for jobs with hazardous materials in enclosed environments or for hazardous waste cleanup.

Regardless of advertising claims about materials, it is your responsibility to choose a material that is appropriate for your job and to decide when it should be discarded.

Consider fit

Fit is important for comfort as well as safety. If coveralls are too big, they may interfere with work. If they are too small, they may rip or be difficult to take on and off. Raglan sleeves provide greater freedom of movement. Nonwoven fabrics may rip in the crotch, shoulder, or arms because the fabrics do not stretch much.

Sizes may be limited to S, M, L, and XL but can include XXL and XXXL. Standard sizes may be too long for smaller people, and the torso length too short for people who are heavy or tall. You may find nonstandard sizes in catalogs. For safety, cut off excess length rather than roll up arms and legs; nonwoven fabrics don't ravel.

Look for lapped or sealed seams to keep out dust and liquid, as well as lapped zippers—not snaps or buttons. If the coveralls you select do not have a hood, they should fasten closely around the neck to prevent pesticides from going down your back.

Protective aprons

By wearing an apron over your regular work clothes you can help prevent contamination of the clothing underneath. Bib aprons to protect your chest are better than those that come to the waist. They should be long enough to cover your knees. Some styles are split to tie around your legs. Aprons may have attached sleeves or you also can get separate sleeve covers that extend from your chemical-resistant gloves on up your arm. Aprons are available in materials such as those used in coveralls and chemical-resistant gloves.

Safe practice tips

- Watch for high temperatures and humidity; coveralls and extra layers of protective gear can contribute to heat stress.
- If you've been working with pesticides, always remove coveralls and aprons before entering the house, a motor vehicle, or a noncontaminated workspace.

Cleaning cotton reusables

- Handle wearing rubber gloves. Before and during washing, keep separate from family clothes.
- Wash with every wearing in hot water with a strong detergent.
- Line dry or use regular heat setting on dryer. Refer to *Family Pesticide Safety: What to do when clothes are soiled with pesticides*, PM 1663b, for details.

Cleaning nitrile- or PVC-coated suits

- Hose inside and out on a line outdoors or over a drain area.
- Drip-dry away from sunlight, which can damage rubberlike materials.
- Never put them in a washing machine because the film may be damaged.
- Never put them in a dryer because heat can melt or deform the materials.

Tips for disposables

- Never wear more than once.
- Do not wash. The inside will get contaminated and they may fall apart in your machine.
- For safe disposal, cut up coveralls when you take them off and put them in a garbage bag. This keeps others from intentionally or accidentally reusing the item. Dispose of contaminated clothing in the same way as you do pesticide containers.

Web sites to visit

You can find additional information about personal protective clothing at the following Web sites:

www.gemplers.com

This mail-order catalog company has many PPE products.

www.kappler.com

See their SuitSmart selection guide.

www.safetyonline.com

This site links to other companies and their products.

www.dupont.com/corp/markets/apparel/protective/

DuPont is the maker of Tyvek®.