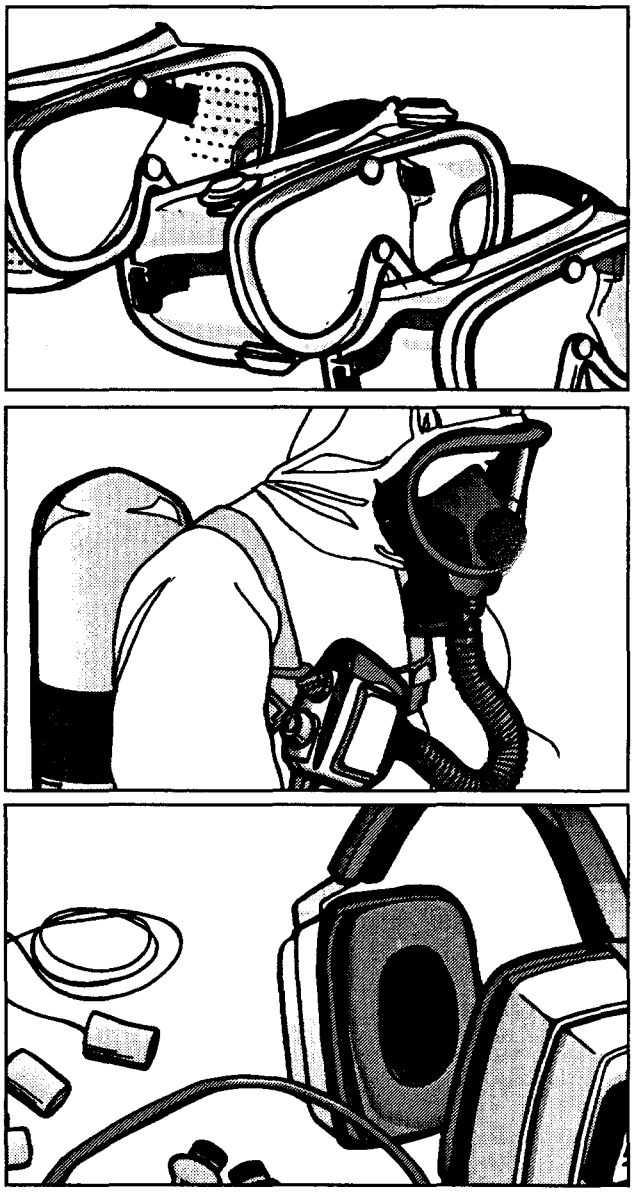
Personal Protective Equipment for Pesticide Work



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Agricultural work is hazardous to the human body. There are countless ways to get hurt while working in agriculture. Many injuries and fatalities point to the need for protective equipment.

The Agricultural Occupational Health Nurses of North Dakota reported 1,308 agricultural injuries in 1994. Many injuries could have been prevented or minimized with the use of protective equipment. Sixty-two percent of the poisonings from agricultural chemicals in 1994 involved pesticides; many of these could have been prevented if protective equipment had been used.

Personal protective equipment (PPE) does not prevent accidents, but it does prevent or reduce injury and even fatalities when used.

Protective equipment must be selected carefully. Always test fit the protective equipment to be sure it fits properly and comfortably. If it isn't comfortable – it won't be worn; if it isn't worn – it won't protect.

Figure 1. Sample precautionary statements found on pesticide containers.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

WARNING

MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH THE SKIN. RAPIDLY ABSORBED THROUGH THE SKIN. DO NOT GET IN THE EYES, ON SKIN, OR ON CLOTHING. AVOID BREATHING OF SPRAY MIST.

PERSONAL PROTECTIVE EQUIPMENT

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

Applicators and other handlers must wear:

- Coveralls over short-sleeved shirt and short pants.
- Chemical-resistant gloves, such as barrier laminate or butyl rubber ≥ 14 mils or nitrile rubber ≥ 14 mils or viton ≥ 14 mils.
- Chemical-resistant footwear plus socks.
- Protective eyewear.
- Chemical-resistant headgear for overhead exposure.
- Chemical-resistant apron when cleaning equipment, mixing, or loading.
- A respirator with either an organic vapor-removing cartridge with a prefilter approved for pesticides (MSHA/NIOSH approval prefix TC-23C), or canister approved for pesticides (MSHA/NIOSH approval number prefix TC-14G).

Discard clothing and 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, use detergent and hot water. Keep and wash PPE separately from other laundry.

Eye Protection

Vision is one of our most important senses and damage from eye injuries is often permanent. Eyes are exposed to many dangers in agriculture, physical and chemical.

There is a wide variety of eye protection available, ranging from safety glasses to totally protective goggles. Selection should be made according to the hazard and risk.

Perscription glasses and safety glasses offer little protection when working with chemicals that can splash or spread like fumes do. Safety glasses can be enhanced with side shields which offer some protection from splash around the sides. They rarely meet label requirements for pesticide safety.

Goggles offer more protection than safety glasses. They are shielded all around the lens, preventing entry of particles from any angle. Adequate protection is provided if the right type of venting is selected (Figure 2).

Safety goggles have three types of venting:

1. open vents for impact protection only
2. indirect vents for chemical splash protection
3. non-vented for protection from gases, mists and fumes.

Some goggles are made wider over the bridge of the nose so they are compatible with respirators. Be sure to select approved safety goggles that also meet ANSI Z87.1-1989 standards.

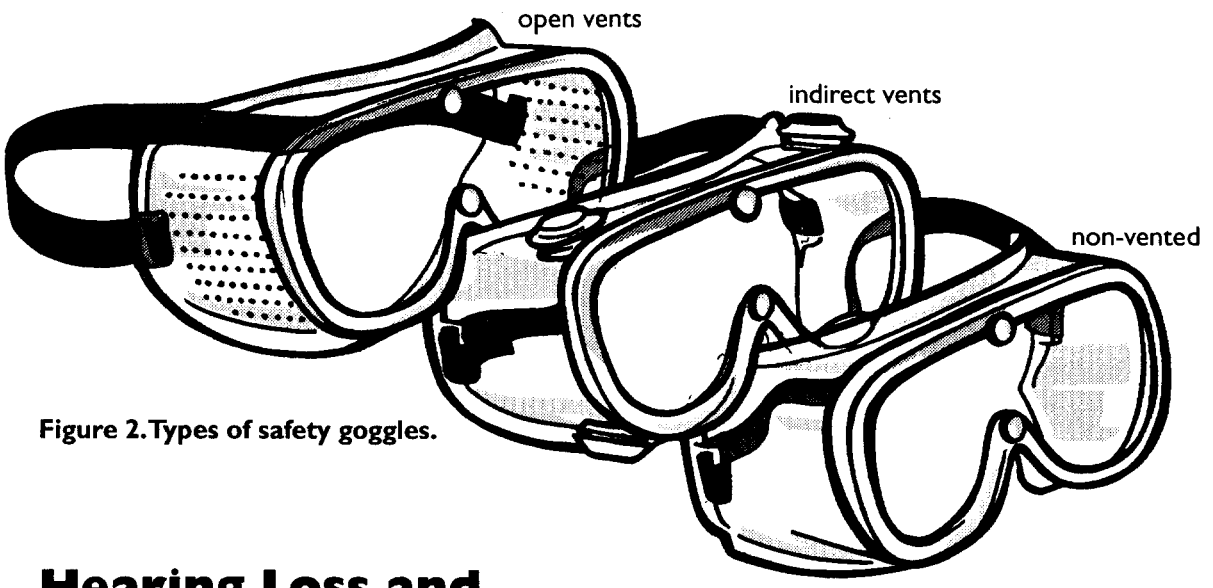

Figure 2. Types of safety goggles.

Hearing Loss and Ear Canal Protection

Pesticides are readily absorbed into the body through the ear canal. Ear plugs can prevent pesticide entry through the ears.

A wide variety of ear plugs is available, ranging from simple cylindrical foam plugs to contoured polyurethane foam inserts with a loss prevention cord or band (Figure 3). Ear plugs are not intended to have a long service life. Use them for a few wearings and then replace them. Some can be cleaned, but the low price makes them economical to replace.

Ear muffs are available for protective wear during pesticide work. However, their price keeps them from being considered disposable like ear plugs. Ear muffs will require careful cleaning when contaminated from pesticide exposure.

Ear plugs and muffs are not rated in regard to how well they keep pesticides out of the body, but they are rated in regard to protection from excessive noise. The protection from pesticide exposure is an added benefit. When selecting this protective equipment, be sure to consider the noise reduction rate (NRR) value for the product.

The higher the NRR value, the less sound will get through the protective equipment. The rating value indicates the decibels of sound that are reduced from the actual sound level. NRR values generally range from a low of 17 decibels to a high of 33 decibels for various products.

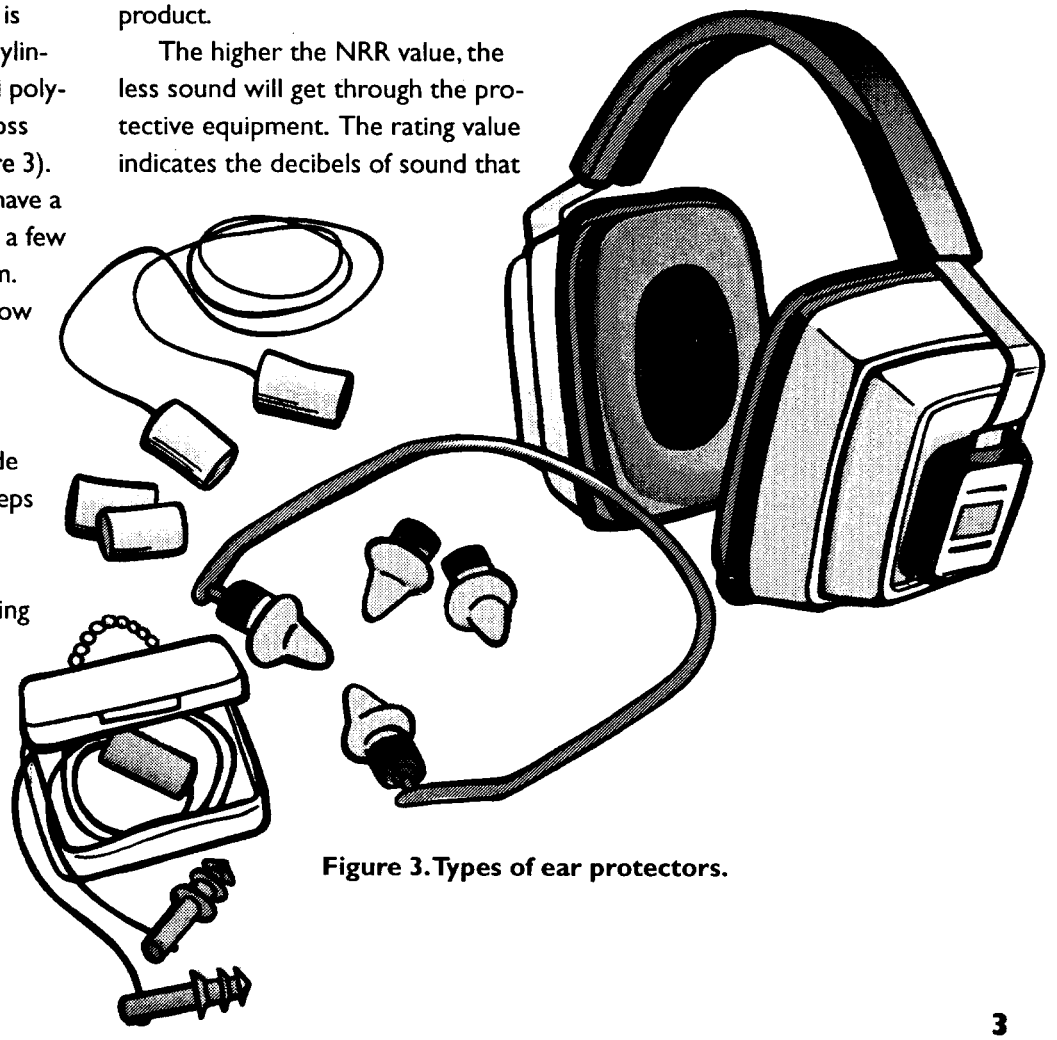

Figure 3. Types of ear protectors.

Respiratory Protection

Inhaling pesticide fumes and mists is a very common entry route of pesticides into the body. Absorption through the lungs is great and the sensitivity is high.

Inhalation accounted for 21 percent of the pesticide exposures in North Dakota during 1994, second only to dermal exposure. Inhalation exposure is one of the easiest to prevent, simply by wearing readily available adequate personal protective equipment.

NIOSH Approval

The National Institute for Occupational Safety and Health, under authority of the Federal Mine Safety and Health Act of 1977 and the Occupational Safety and Health Act of 1970, tests, approves, and certifies respiratory equipment as being safe for its intended purpose. Alwaysbe certain that the NIOSH compliance number is on the product before purchasing respiratory equipment.

Two systems of respiratory protection are available, depending on the type of respiratory risk involved: air-purification (filtering) and air-supplying. For most pesticide work, the air-purifying equipment is adequate and safe.

Air-Purifying Equipment

Air-purifying equipment filters pesticide particles and vapors from the air, but it does not provide oxygen where it is deficient. The pesticide can be in the form of a dust, mist, fume, or vapor. Dusts and mists are easiest to filter from the air. Fumes and vapors are more difficult and require more specific protection.

Depending on the pesticide, there is a wide variety of filtering respirators available, ranging from simple dust masks to powered air protection respirators.

Dust Masks

The one-strap dust mask as shown in Figure 4 is not NIOSH approved. It is adequate only for nuisance-level dusts not exceeding the OSHA permissible exposure limit. These are not recommended for pesticide work because they do not provide enough protection.

Two-strap dust respirators provide much more protection than the one-strap dust mask. They seal better while maintaining their shape and integrity. There are models with exhale valves that make breathing easier, padding over the bridge of the nose for a better seal and comfort, and stronger straps. Some models have a plastic mesh outer shell that helps the respirator keep its shape. Figure 5 illustrates several models.

Two-strap respirators are limited in their ability to filter particles from the air, up to 0.05 milligrams of dust per cubic meter of air. Be sure the respirator meets your needs before purchase. The product label will list its capabilities. Generally, two-strap respirators are not recommended for pesticide spraying but are acceptable for application of pesticide dusts and granules. Always read the pesticide label for product-specific recommendations.

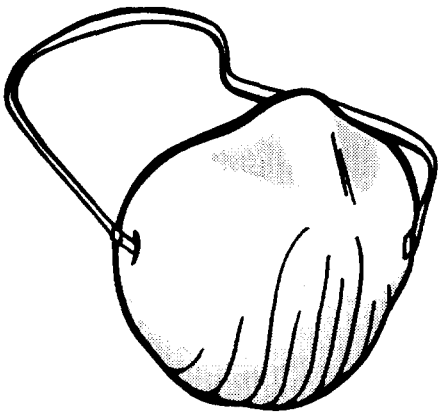

Figure 4. One-strap dust respirator.

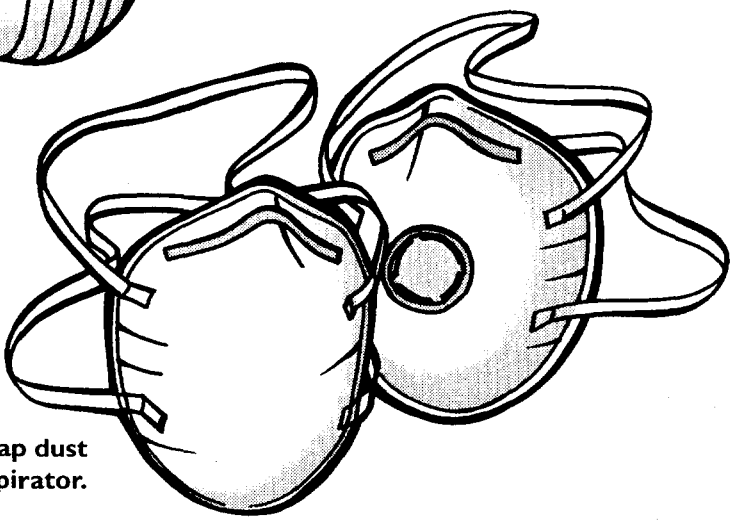

Figure 5. Two-strap dust respirator.

Cartridge and Canister Respirators

Cartridge or canister respirators are needed when pesticide vapors present a risk. Contents of the cartridge or canister absorb the vapors as the air passes through the respirator. The respirator must be equipped with an approved pre-filter to be approved for organic vapor removal. Since the air is cleaned by filtering and absorption, the respirator will not protect you when there isn't enough oxygen to maintain life.

A respirator cartridge is smaller than a canister and has a shorter service life. The service life is used up when the smell or taste of the pesticide is detectible. Otherwise, replace the cartridge or canister at least every eight hours or according to label instructions.

The cartridge type is typically used more often in agricultural applications. Both types are available with full-face protection, eliminating the need for goggles when eye protection is required (Figure 6).

Maintenance

Respirator cartridges have a limited service life. The service life is indicated on the package. The maximum service life can be obtained when exposure to pesticides is minimized. The cartridge continues to absorb pesticide vapors from the air, even when not being used. Store the cartridge in a zip-lock plastic bag between uses to limit the exposure.

Cartridges cannot be cleaned, but they should be disposed of when their service life is used up. Respirator bodies should be washed in warm, soapy water. A clean respirator is much more inviting to wear.

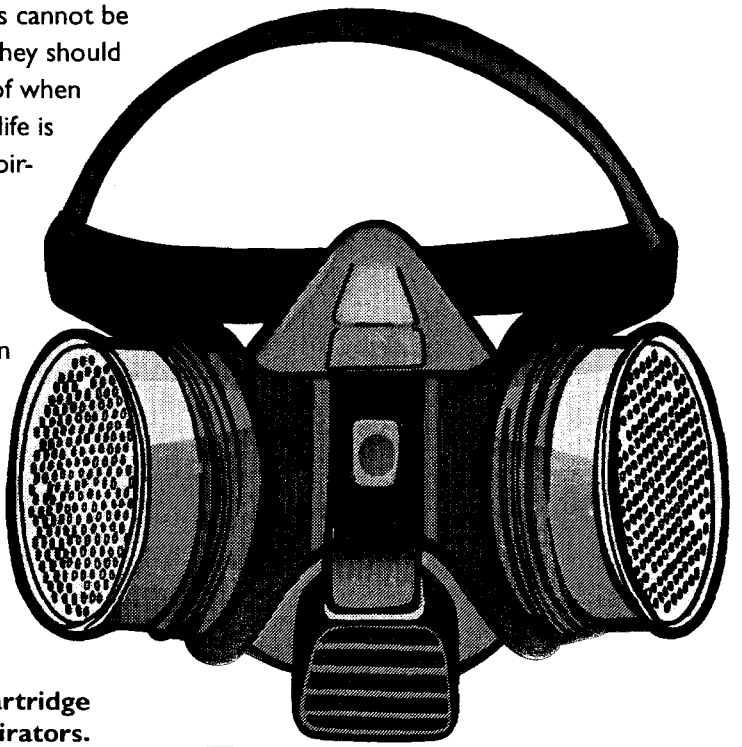

Figure 6. Cartridge type respirators.

Powered Air Protection Respirators (PAPR)

This type of respirator supplies filtered air to the user, the air having been filtered before delivery to the face. Air is supplied under slight pressure to the user, making breathing much easier than with a cartridge respirator, which provides air at a negative pressure. PAPR units use a small battery-powered blower to push air through a cartridge and deliver it to the facial area for breathing (Figure 7). They usually provide up to eight hours of use with 16 hours needed for battery charging.

Powered air protection respirators have the same use/exposure limitations to air pollutants as the cartridge and canister respirators because they use similar cartridges to filter the air being breathed. Various models are available: helmet units, hood units, half-mask, full face masks, and impact resistant helmets for welding activity.

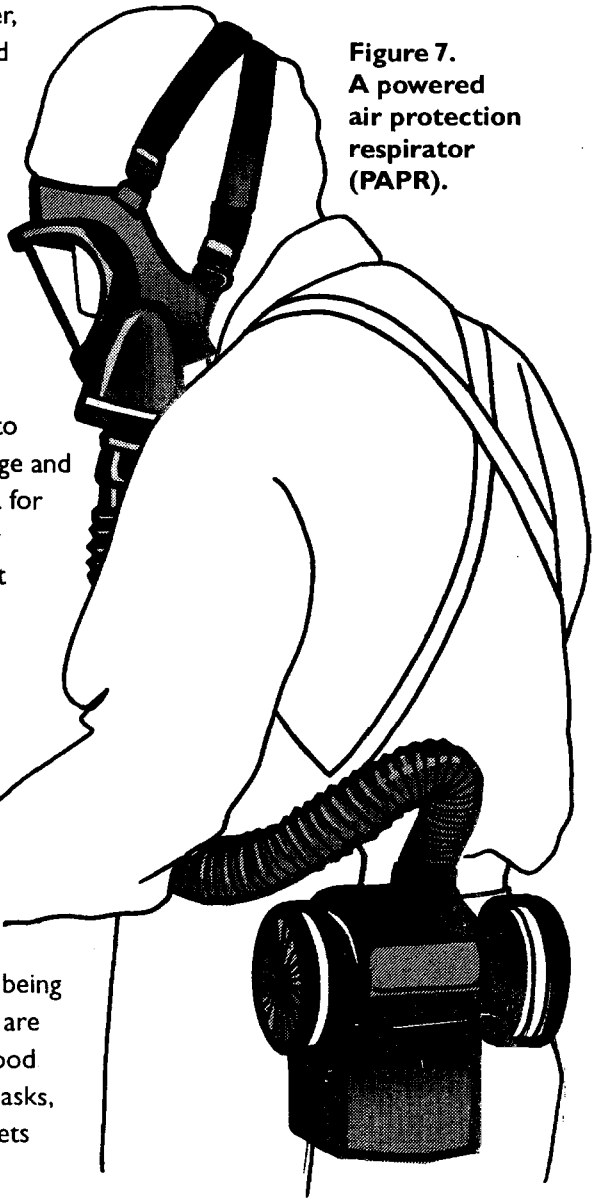

Figure 7. A powered air protection respirator (PAPR).

Air Supplying Equipment

This equipment does not filter the air to be breathed; it simply supplies it. Clean, oxygen-sufficient air is supplied from either a cylinder or an airline which brings it in from a safe source, as shown in Figure 8.

A self contained breathing apparatus (SCBA) is required when there is not enough oxygen present to support life (less than 19.5 percent oxygen) and/or when there are pollutants in the air that present an immediate danger to health and life. Examples are a manure pit with methane and hydrogen sulfide present, an uncontrolled release of anhydrous ammonia, grain fumigant in a bin, and smoke or combustion gases from a fire.

An SCBA consists of a full-face gas mask, an air delivery system (tubing and metering devices), and a cylinder for storage of compressed air. The safe use of an SCBA requires medical approval and training. Not just anyone can safely use an SCBA.

There are few agricultural situations that require the use of an SCBA, and generally pesticide application is not one. However, if a manure pit is part of the livestock facilities, or grain fumigation is a regular part of the grain handling program on the farm, then an SCBA should be immediately available.

Figure 8. Self contained breathing apparatus (SCBA) with a cylinder air supply (right) and with an airline that would connect to a safe air source (bottom).

Conclusion

Protective equipment is usually required by the pesticide label in one form or another and is integral to safe pesticide application.

There are many brands and models of protective equipment available for use in pesticide application. Price is not always an indicator of quality, so shop carefully. Select equipment that is NIOSH tested and approved.

Protective equipment should be selected by the person who is going to use it; comfort and proper fit must be considered. Unused protective equipment does not help anyone.

Protective equipment for agriculture is not usually marketed very aggressively in average retail outlets. Many agricultural supply centers, hardware stores, agricultural chemical retailers, and agricultural machinery dealers keep protective equipment in stock.

In some situations, it has to be asked for. The fact sheet Protective Equipment for Agriculture lists sources in North Dakota as well as many mail order sources.

General clothing may be considered as protective equipment, but it is not addressed as such in this circular. For information on clothing for pesticide application, refer to NDSU Extension Service Circular HE-454 (Revised), Buying and Wearing Protective Clothing for Applying Pesticides.