VTPP Quarterly

A Newsletter From Virginia Tech Pesticide Programs

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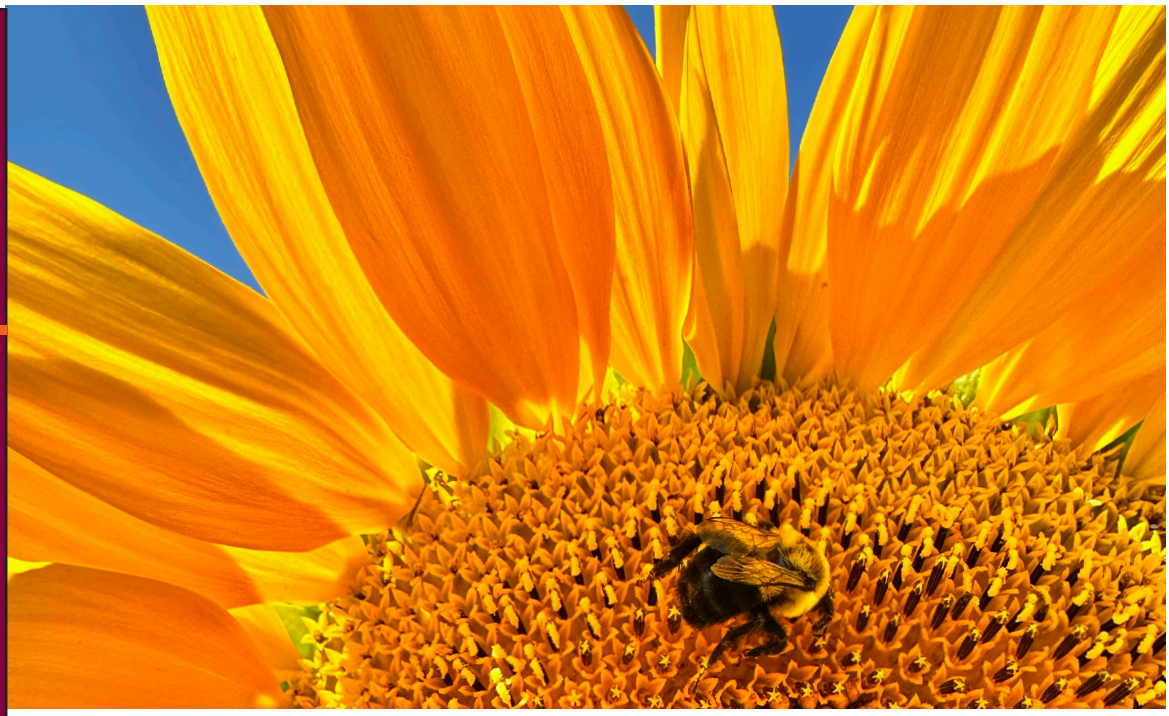

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Cleaning Spray Equipment

Stephanie Blevins Wycoff – Extension Associate

Maintaining spray equipment involves several tasks, including inspection, replacing parts, and regular cleaning. Cleaning may not be the most exciting task; however, it is a necessary step to keep spray equipment in good working order. When planning your pesticide application, allow time for proper clean up once the application is complete.

Cleaning Your Spray Tank

Immediately following your pesticide application, you must clean your spray tank. Never allow a spray tank to sit with leftover spray mix or pesticide residue, as this can damage sprayer parts and make cleaning much more difficult. Check the pesticide product label for any instructions on cleaning spray tanks (fig. 1). Continue wearing the PPE recommended on the pesticide label. Chemical-resistant gloves, protective eyewear, and a chemical-resistant apron are important additions even if they are not specifically listed on the label.

Clean Out Procedures for Spray Equipment

Drain any remaining spray mixture from the application equipment. Hose down the interior of the tank while filling the tank 1/2 full of water. Add recommended dose of tank cleaner and circulate through the system. Empty the tank. Remove all spray nozzles and screens and clean separately. Thoroughly clean exterior surfaces of spray equipment.

Note: **Rinsate may be disposed of on site according to label use directions or at an approved waste disposal facility.**

Figure 1. An example of directions for sprayer cleanout that may be found on a pesticide label.

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IMPORTANT – NEVER mix ammonia and bleach together to clean a spray tank! When combined, they react chemically to create chloramine gas, which is toxic and can be deadly. Always keep these household cleaners separate! Also, NEVER use bleach to clean out a tank that has contained fertilizer, as bleach and fertilizer can also create harmful gases if mixed.

Steps for Cleaning
Before cleaning, make sure the spray tank is emptied of all pesticide solution. If a small amount of mixture remains, apply it to the same field where the pesticide was used. Once your tank is empty, follow these steps to properly clean your equipment:

1. Rinse with clean water.
2. Rinse with a cleaning solution.
3. Rinse with clean water again.
4. Drain as much water from the system as possible and allow it to dry.

Let's take a closer look at each step.

Step 1. Initial Rinse With Clean Water
Add clean water to the tank for the initial rinse. For larger tanks, fill the tank to at least 10% of its capacity. If the tank has an agitator, turn it on to help remove residues. Allow water to run through all hoses, nozzles, and spray wands. Empty the rinse water in the same field where the pesticide was applied. If your system has a boom, don't forget to clean out the end caps. Nozzles, screens, and strainers should be removed and cleaned separately.

Step 2. Second Rinse With a Cleaning Solution
If using a tank cleaner, check the pesticide label for product recommendations and dosage instructions. When using ammonia or bleach for cleaning, fill the tank halfway with clean water and make a 1–2% cleaning solution. Agitate the tank and pump the solution through all hoses, nozzles, and spray wands. Tank cleaning products will specify how long the solution should remain in the system to neutralize residues. Follow these instructions carefully before emptying the sprayer.

Step 3. Final Rinse With Clean Water
Add clean water to the tank once more for a final rinse. Use clean water to wash off the outside of the tank as well. Empty the final rinse water in the same field where the pesticide was applied. NEVER dump rinsate into storm drains or near surface water, wells, or sensitive areas!

Step 4. Drain as Much Water From the System as Possible and Allow to Dry
Once the system is clean, remove as much water as possible, especially if you plan to store your sprayer for an extended period. Water left in the spray system can damage parts over time (fig. 2). Allow the pump to run to push water out of the tank, then open all valves to let any remaining water drain. Ensure the sprayer is completely dry before storing.

Figure 2. A nozzle strainer that has been damaged over time from constant contact with water.

Conclusion
Regular cleaning of pesticide application equipment ensures optimal performance and helps preserve critical components over time. For additional information, please consult the following source:

- Cleaning Pesticide Application Equipment: https://extensionpubs.unl.edu/publication/g1770/na/html/view.

Glove Selection and Maintenance for Pesticide Handlers

Kathleen Miller – Extension Associate

Importance of Wearing Gloves
When handling pesticides, be aware of the potential for exposure and take precautions to minimize

hazards. For most handlers, the main route of pesticide exposure is through the skin, known as "dermal exposure." The skin is not impenetrable, and some areas of the body — particularly the hands — are more vulnerable to dermal exposure than others. During mixing and loading, 85% of pesticide exposure occurs through the hands and lower arms. However, wearing chemical-resistant gloves and a long-sleeve shirt can significantly reduce this exposure.

Glove Selection

Before handling any pesticides, read the product label to ensure safe and proper use. Typically, the pesticide label lists the necessary personal protective equipment (PPE), including the required type of gloves, for each handling situation (e.g., mixing, loading, application). Even when the label does not explicitly state gloves are required, it is still advantageous to wear them. At a minimum, gloves, a long-sleeve shirt, long pants, shoes, and socks should be worn when handling pesticides.

Gloves used for pesticide application are made of four main types of materials. These materials vary in their protective abilities and are used in different circumstances depending on the level of protection required by the pesticide's formulation type.

- Non-chemical resistant (e.g., cotton, canvas) – Provides minimal protection from liquids and powders, which can easily penetrate the material. Do not use non-chemical-resistant gloves when handling liquid or dry pesticide formulations. (NOTE: Fabric gloves are required for some fumigant formulations.)
- Water resistant (e.g., tightly woven fabric with a water-repellent coating) – Prevents small amounts of liquid or dry particles from penetrating the material, but offers only limited protection.
- Waterproof (e.g. rubber, PVC-coated) – Prevents water-soluble formulations from penetrating the material, but will not protect against oil-based solvents.
- Chemical resistant (e.g., nitrile, barrier laminate, butyl rubber, nonwoven fabric coated with a plastic polymer, neoprene, viton; fig. 3) – Prevents most chemicals from penetrating and provides the highest level of protection.

If handling water-based or dry pesticide formulations, a waterproof glove — such as rubber — often provides sufficient protection. However, when handling liquid pesticides formulated with organic solvents (such as emulsifiable concentrates), gloves listed as chemical-resistant must be worn. Always read the label to be sure the gloves you choose will provide adequate protection.

Figure 3. Types of chemical-resistant gloves. Displayed from left to right are natural rubber, neoprene, fabric-lined (not safe for pesticide use), butyl, barrier laminate, and nitrile.

Occasionally, the pesticide label will refer to the *EPA Chemical Resistance Category Chart* (Table 1). This chart lists several glove materials and the level of protection each provides against various solvent categories. Care information for each material is also described.

When selecting the proper glove, you must consider more than just the material's compatibility with the pesticide formulation. Other important factors include glove length, grip requirements, lining type, and glove size.

- Glove length – Gloves come in different lengths, depending on how much of the hand and arm needs protection:
  - 9–12-inch gloves provide complete hand protection.
  - 12–18-inch gloves protect hands and forearms up to the elbow, ideal for immersion or splash protection.
  - 24–31-inch gloves offer full arm immersion protection.

Table 1. EPA Glove Chemical Resistance Category

Category	Barrier laminate	Butyl rubber	Nitrile rubber	Neoprene rubber	Natural rubber	Polyethylene	Polyvinyl chloride	Viton > 14 mils
A	High	High	High	High	High	High	High	High
B	High	High	Slight	Slight		Slight	Slight	Slight
C	High	High	High	High	Moderate	Moderate	None	High
D	High	High	Moderate	Moderate	None	None	None	Slight
E	High	Slight	High	High	Slight	None	Moderate	High
F	High	High	High		Slight	None	Slight	High
G	High	Slight	Slight	Slight	None	None	None	High
H	High	Slight	Slight	Slight	None	None	None	High

A: Dry and water based formulations	E: Aliphatic petroleum distillates
B: Ketones	F: Aromatic petroleum distillates < 40 %
C: Alcohol	G: Aromatic petroleum distillates > 40%
D: Acetates	H: Halogenated hydrocarbons

HIGH: Highly chemical resistant. Clean or replace PPE at end of each day's work period. Rinse off pesticide at rest breaks.

MODERATE: Moderately chemical resistant. Clean or replace within an hour or two of contact with chemicals.

SLIGHT: Slightly chemical resistant. Clean or replace within 10 minutes of contact with chemicals.

NONE: No chemical resistance.

- Grip requirements – Gloves made from thicker materials, such as natural rubber, are typically less flexible and may cause dexterity issues. If a better grip is required for the task, choose a more flexible glove material without compromising safety.
- Lining type – Lined gloves are absorbent and should NEVER be worn when handling pesticides. Pesticides can soak into the glove lining, keeping the chemical in constant contact with the skin, which can significantly increase exposure.
- Sizing – Protective gloves are available in sizes ranging from small to XX-large. A proper fit is essential to ensure the gloves provide effective protection and do not allow exposure due to stretching of the material. Conversely, gloves that are too large may impede dexterity during handling.

When chosen and used properly, gloves provide an essential barrier against pesticide exposure. However, improper selection and use can greatly reduce their effectiveness. For example, using the wrong glove material for the specific pesticide being handled can lead to permeation of the pesticide through micropores in the glove. There is also potential for permeation through micropores if the gloves are too tight and the material is stretched, putting the handler at risk.

Glove Maintenance

Chemical-resistant gloves must be properly maintained to ensure they provide their intended protection. Before use, check the general condition of the gloves and inspect them for any leaks. Gloves can become brittle with repeated use or fluctuating temperatures during storage. Additionally, the corrosive properties of pesticides can contribute to glove deterioration. Always wash gloves properly after each use to prevent degradation. Keeping track of the age of gloves can help determine when they need to be replaced. Reusable gloves are not meant to last indefinitely and should be replaced periodically.

Blast From the Past

Stephanie Blevins Wycoff – Extension Associate

Hudson Rotary Duster

This antique rotary duster was used to spread dust formulations of insecticides and fungicides (fig. 4). It was manufactured by the H.D. Hudson Manufacturing Company of Chicago, Illinois in the late 1950s and early 1960s. The Hudson Rotary Duster was

advertised as “powerful, easy turning, and light,” and could be purchased for $10.95. This type of duster was commonly used for pesticide applications in ornamentals and gardens. Interestingly, the H.D. Hudson Manufacturing Company is still in business today, producing a variety of sprayers for the lawn and garden market.

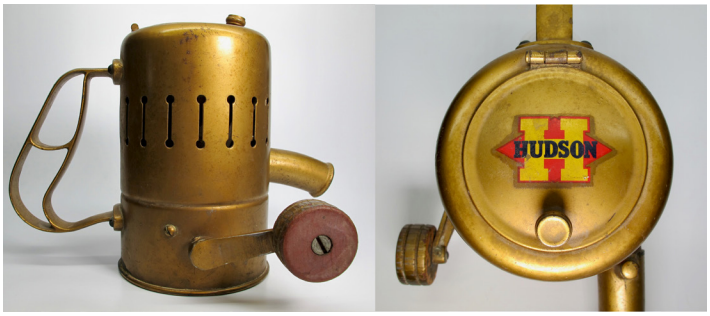


Figure 4. Side view (left) and top view (right) of Hudson Rotary Duster, circa late 1950s to early 1960s.

Program Updates

VTPP Updates

2025-26 Online Course for Private Applicator Recertification

For the 2025-26 private applicator recertification (PAR) season, VTPP will be managing a PAR online course for interested Virginia private pesticide applicators. The 2025-26 PAR online course will give applicators full credit in Categories 90 and 91 if completed. Each user enrolling in the course must have their own unique email address. Recertification credits can only be provided to a single individual registered under that email address (only one registrant per email address). Access to the course will be given through an emailed VCE Canvas guest account invitation following registration and confirmation of enrollment. The PAR online course enrollment information is as follows:

- Link: tinyurl.com/VCE-VTPP-PAR-90-91 (same as last year).
- Email Dana Watson at danaew@vt.edu if you would like a QR code for the enrollment link.
- Title: VTPP-PAR-01-2025/2026 Online Private Pesticide Applicator Recertification.
- Cost: $30.
- Enrollment period: Oct. 1, 2025 - Feb. 25, 2026.
- Deadline to complete the course: Feb. 28, 2026.

Applicators with certificates that expire on Dec. 31, 2025, must retest if they do not complete a recertification course before March 1, 2026. No extensions will be given. The public can find the registration information at register.ext.vt.edu/ by searching under “Programs,” and then under “Agriculture” or “Natural Resources” or by using specific keywords (e.g., pesticide, applicator, private, recertification, PAR, private applicator, VTPP, Category 90, or Category 91). For guest account issues, please contact the VCE helpline (vceprograms@mail.ext.vt.edu). For questions about course content, please contact Rachel Parson at rparson@vt.edu or Dana Watson.

Note for Spanish speakers: The 2025-26 Online Private Applicator Recertification Course provides the option for Spanish language “General Safety” and “Pest Management & Application Technology” content.

New Resources

Manual: *2025 Aerial Pesticide Application*

The 2025 edition of *Aerial Pesticide Application* is now available (fig. 5)! This updated manual introduces new content on applying pesticides with drones, features the new manual design, and includes updated certification and training information for aerial applicators in Virginia.

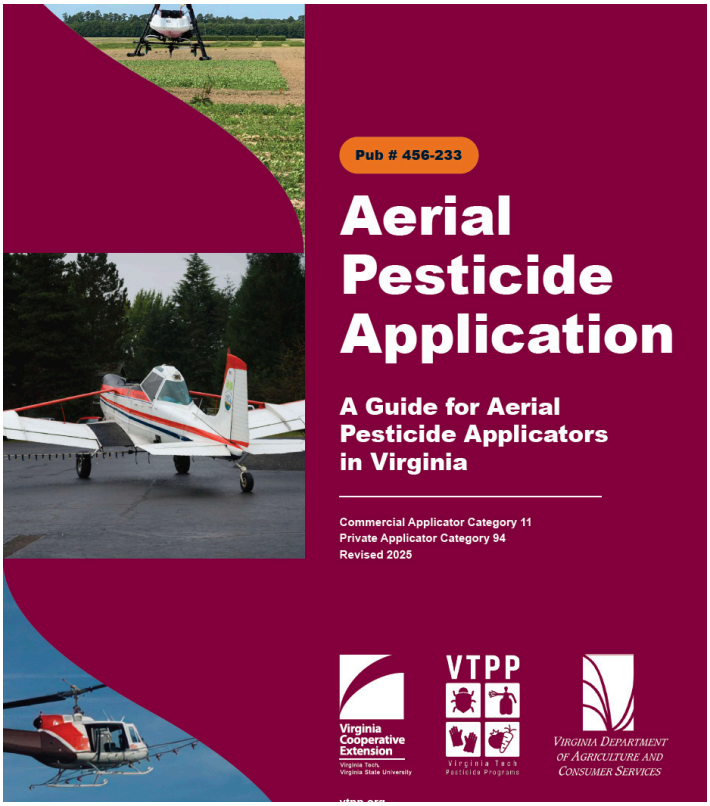


Figure 5. The cover of Aerial Pesticide Application, revised 2025.

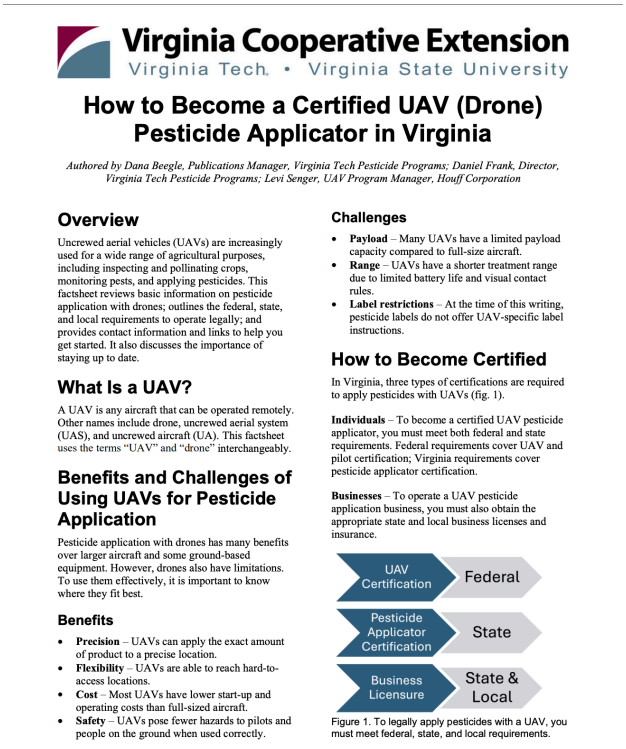
The manual serves both commercial aerial applicators (Category 11) and private aerial applicators (Category 94). Please note that Category 94 certification is not yet required for private applicators but will be in the near future. We will notify you once the new law takes effect.

Fact Sheet: *How to Become a Certified UAV (Drone) Pesticide Applicator*

This new fact sheet available on the VCE Publications website (https://www.pubs.ext.vt.edu/ENTO/ento-625/ento-625.html) outlines the essential federal, state, and local regulations for individuals seeking certification to apply pesticides via uncrewed aerial vehicles (i.e., drones). This resource provides a clear roadmap for navigating the legal and procedural steps required to operate drones for pesticide application legally in Virginia.

Fact Sheet: *Is It Pesticide Exposure or Heat Stress? How to Spot the Difference*

This new factsheet available on the VCE Publications website (https://www.pubs.ext.vt.edu/content/pubs_ext_vt_edu/en/ENTO/ento-611/ento-611.html) discusses pesticide exposure and heat stress. Anyone working with or near pesticides (e.g., pesticide handlers, pesticide applicators, and agricultural workers) should recognize the signs and symptoms of pesticide exposure. It is also essential for these workers to know the signs and symptoms of heat stress because it can closely resemble pesticide poisoning. This article discusses the similarities and differences between pesticide exposure and heat stress. It also outlines first aid measures and prevention strategies for each condition.



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How to Become a Certified UAV (Drone) Pesticide Applicator in Virginia

Authored by Dana Beegle, Publications Manager, Virginia Tech Pesticide Programs; Daniel Frank, Director, Virginia Tech Pesticide Programs; Levi Senger, UAV Program Manager, Houff Corporation

Overview

Uncrewed aerial vehicles (UAVs) are increasingly used for a wide range of agricultural purposes, including inspecting and pollinating crops, monitoring pests, and applying pesticides. This factsheet reviews basic information on pesticide application with drones; outlines the federal, state, and local requirements to operate legally; and provides contact information and links to help you get started. It also discusses the importance of staying up to date.

What Is a UAV?

A UAV is any aircraft that can be operated remotely. Other names include drone, uncrewed aerial system (UAS), and uncrewed aircraft (UA). This factsheet uses the terms "UAV" and "drone" interchangeably.

Benefits and Challenges of Using UAVs for Pesticide Application

Pesticide application with drones has many benefits over larger aircraft and some ground-based equipment. However, drones also have limitations. To use them effectively, it is important to know where they fit best.

Benefits

- **Precision** – UAVs can apply the exact amount of product to a precise location.
- **Flexibility** – UAVs are able to reach hard-to-access locations.
- **Cost** – Most UAVs have lower start-up and operating costs than full-sized aircraft.
- **Safety** – UAVs pose fewer hazards to pilots and people on the ground when used correctly.

Challenges

- **Payload** – Many UAVs have a limited payload capacity compared to full-size aircraft.
- **Range** – UAVs have a shorter treatment range due to limited battery life and visual contact rules.
- **Label restrictions** – At the time of this writing, pesticide labels do not offer UAV-specific label instructions.

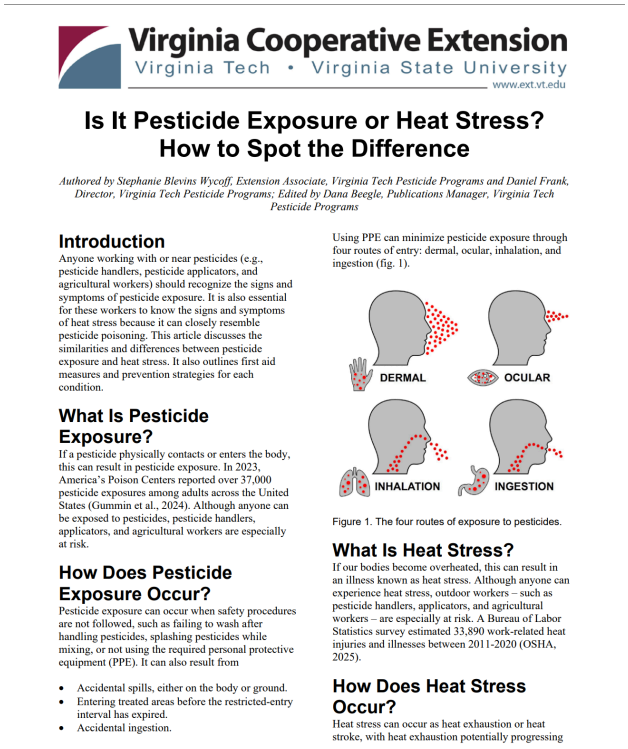
How to Become Certified

In Virginia, three types of certifications are required to apply pesticides with UAVs (fig. 1).

Individuals – To become a certified UAV pesticide applicator, you must meet both federal and state requirements. Federal requirements cover UAV and pilot certification; Virginia requirements cover pesticide applicator certification.

Businesses – To operate a UAV pesticide application business, you must also obtain the appropriate state and local business licenses and insurance.

Figure 1. To legally apply pesticides with a UAV, you must meet federal, state, and local requirements.



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Is It Pesticide Exposure or Heat Stress? How to Spot the Difference

Authored by Stephanie Blevins Wycoff, Extension Associate, Virginia Tech Pesticide Programs and Daniel Frank, Director, Virginia Tech Pesticide Programs; Edited by Dana Beegle, Publications Manager, Virginia Tech Pesticide Programs

Introduction

Anyone working with or near pesticides (e.g., pesticide handlers, pesticide applicators, and agricultural workers) should recognize the signs and symptoms of pesticide exposure. It is also essential for these workers to know the signs and symptoms of heat stress because it can closely resemble pesticide poisoning. This article discusses the similarities and differences between pesticide exposure and heat stress. It also outlines first aid measures and prevention strategies for each condition.

What Is Pesticide Exposure?

If a pesticide physically contacts or enters the body, this can result in pesticide exposure. In 2023, America's Poison Centers reported over 37,000 pesticide exposures among adults across the United States (Gummin et al., 2024). Although anyone can be exposed to pesticides, pesticide handlers, applicators, and agricultural workers are especially at risk.

How Does Pesticide Exposure Occur?

Pesticide exposure can occur when safety procedures are not followed, such as failing to wash after handling pesticides, splashing pesticides while mixing, or not using the required personal protective equipment (PPE). It can also result from

- Accidental spills, either on the body or ground.
- Entering treated areas before the restricted-entry interval has expired.
- Accidental ingestion.

Using PPE can minimize pesticide exposure through four routes of entry: dermal, ocular, inhalation, and ingestion (fig. 1).

Figure 1. The four routes of exposure to pesticides.

What Is Heat Stress?

If our bodies become overheated, this can result in an illness known as heat stress. Although anyone can experience heat stress, outdoor workers – such as pesticide handlers, applicators, and agricultural workers – are especially at risk. A Bureau of Labor Statistics survey estimated 33,890 work-related heat injuries and illnesses between 2011-2020 (OSHA, 2025).

How Does Heat Stress Occur?

Heat stress can occur as heat exhaustion or heat stroke, with heat exhaustion potentially progressing

Figure 6. Two new pesticide fact sheets released in 2025.

Editors: Dana Beegle and Daniel Frank • Layout and Design: Whitney Weaver Wright