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

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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).

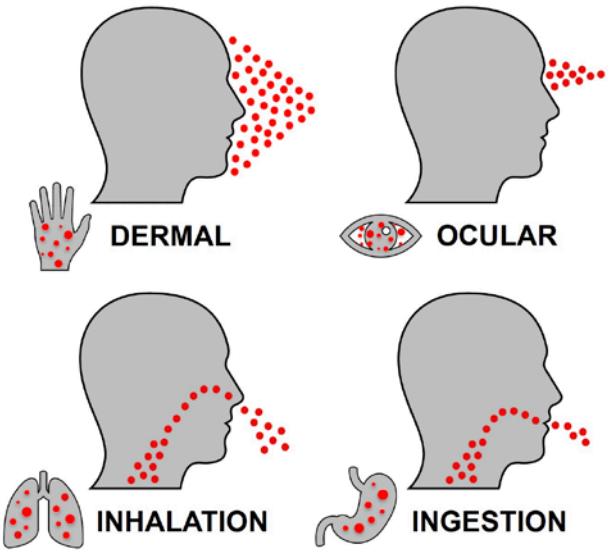

Figure 1. The four routes of exposure to pesticides.

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

to life-threatening heat stroke. Pesticide handlers and applicators use PPE to protect against pesticide exposure, but these non-breathable materials can increase the risk of heat-related illnesses. For this reason, it is essential to recognize the signs and symptoms of both heat stress and pesticide exposure.

Recognizing Signs and Symptoms

When a pesticide exposure occurs, it may or may not result in injury or poisoning. If it does, recognizing the early signs and symptoms is crucial. Signs such as vomiting or fainting are visible to others, while symptoms like muscle cramps or headaches are things only the person experiencing them can feel. Pesticide exposure and heat stress share some signs and symptoms, but they also have key differences (fig. 2). If either condition is suspected, immediately stop work, remove the victim from the situation, and seek medical attention.

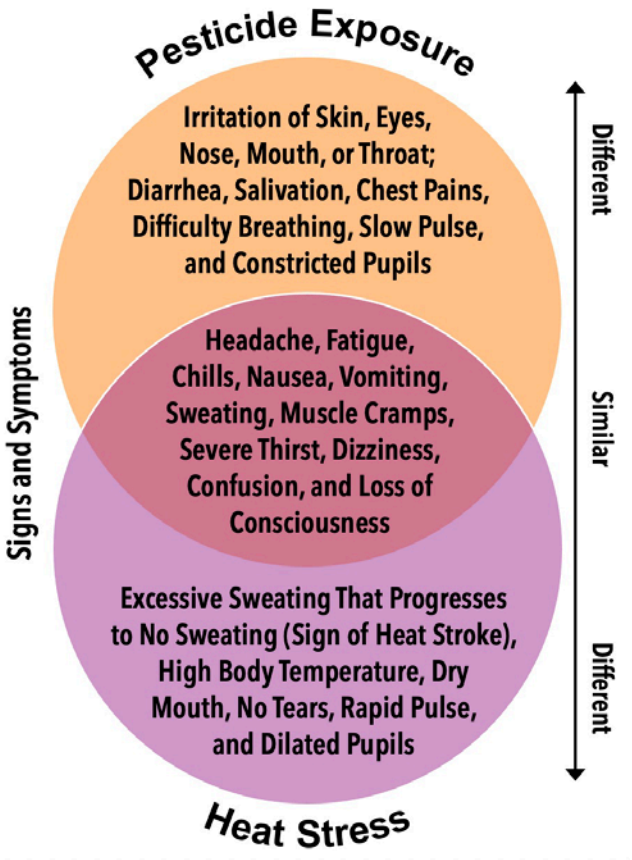

Figure 2. This diagram shows the similarities and differences between the signs and symptoms of pesticide exposure and heat stress.

First Aid for Pesticide Injury or Poisoning

Always familiarize yourself with the "First Aid" section on the product label of each pesticide you use. It provides specific safety instructions based on different routes of exposure (fig. 3). Some labels include guidance for all exposure routes, while others cover only a few. The figure below illustrates a sample pesticide label, but keep in mind that each label is unique. Every situation and pesticide product requires a tailored response. In all cases of pesticide injury or poisoning, seek medical treatment as soon as possible. Be sure to give the pesticide product label to a medical professional to ensure proper treatment.

FIRST AID

If Swallowed: Immediately call a Poison Control Center or doctor. Do not induce vomiting unless told to by a Poison Control Center or doctor. Do not give any liquid to the person. Do not give anything by mouth to an unconscious person.

If on Skin or Clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a Poison Control Center or doctor for treatment advice.

If in Eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a Poison Control Center or doctor for treatment advice.

NOTE TO PHYSICIAN: This product contains a cholinesterase inhibitor. Atropine is antidotal. 2-PAM may also be given in conjunction with Atropine. May pose an aspiration pneumonia hazard. Contains petroleum distillate.

Have the product container or label with you when calling a Poison Control Center or doctor, or going for treatment.

Figure 3. An example of the instructions you might find in the "First Aid" section of a pesticide product label.

First Aid for Heat Stress

Move the victim to shade as soon as possible. Splash the victim's skin with cool water, especially the face, neck, hands, and forearms. If feasible, a cool bath

can also help decrease body temperature. Remove any PPE or excess clothing that could be making the heat stress worse. Provide cool water for the victim to sip. Remain calm, keep the victim calm, and call for help.

Preventing Pesticide Exposure

Several tactics can help you minimize pesticide exposure:

- Plan pesticide applications ahead of time and work carefully to avoid accidents.
- Use safety systems, when possible, like closed mixing and loading systems and enclosed cabs.
- Choose products and packaging that make handling easier, like water-soluble packaging.
- Wear the PPE recommended on the pesticide product label.

PPE can greatly reduce pesticide exposure. Always follow the pesticide label directions for PPE. It is also important to keep PPE clean and replace reusable items regularly.

Preventing Heat Stress

To prevent heat stress, implement effective strategies to stay cool and hydrated:

- Take frequent breaks, and drink plenty of water and/or sports drinks to stay hydrated.
- Use fans and take advantage of shade whenever possible.
- Plan pesticide applications during cooler weather when possible. Hot temperatures, high humidity, and strong sunlight create unfavorable working conditions and can increase the risk of heat stress. If the weather is too hot, stop work and wait until it gets cooler to continue.
- Remember that PPE can increase the risk of heat stress. Adjust work schedules so tasks requiring PPE can be accomplished during the coolest part of the day.

Conclusion

Knowledge and awareness on the job site are key to managing both pesticide exposure and heat stress. Pay attention to yourself and others completing similar job tasks. Be sure everyone is taking the appropriate prevention steps. Watch for signs and symptoms of pesticide exposure or heat stress and be prepared to respond with first aid should either condition occur.

References

David D. Gummin, James B. Mowry, Michael C. Beuhler, Daniel A. Spyker, Laura J. Rivers, Ryan Feldman, Kaitlyn Brown, Nathaniel P.T. Pham, Alvin C. Bronstein & Carol DesLauriers (17 Dec 2024): 2023 Annual Report of the National Poison Data System® (NPDS) from America's Poison Centers®: 41st Annual Report, Clinical Toxicology, DOI: 10.1080/15563650.2024.2412423

"Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings Rulemaking." OSHA. Accessed March 17, 2025. https://www.osha.gov/heat-exposure/rulemaking

Additional Resources

For further information on pesticide exposure and heat stress, please refer to the following resources:

- Managing Pesticide Poisoning Risk and Understanding the Signs and Symptoms – Nebraska Extension Publications: https://extensionpubs.unl.edu/publication/ec2505/2018/pdf/view/ec2505-2018.pdf
- Heat Stress – Centers for Disease Control and Prevention and The National Institute for Occupational Health and Safety: https://www.cdc.gov/niosh/heat-stress/about/index.html

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2025 ENTO-611NP