



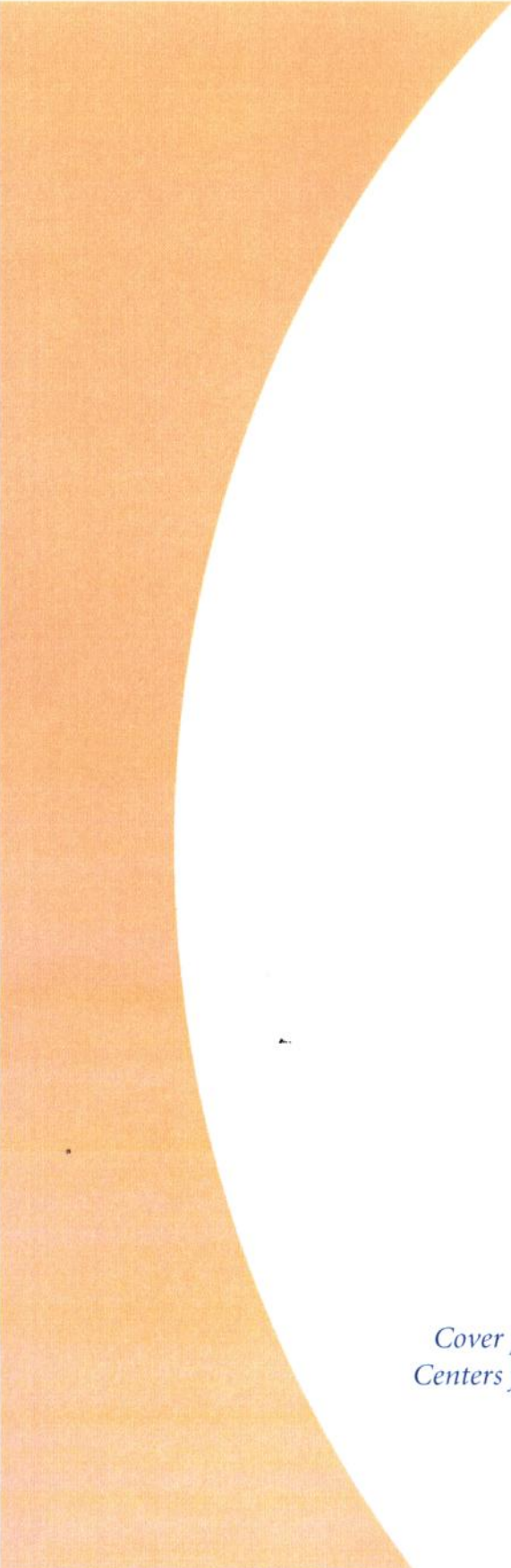
Recommendations for

# Protecting Outdoor Workers from West Nile Virus Exposure



DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Centers for Disease Control and Prevention  
National Institute for Occupational Safety and Health





*Cover photograph courtesy of William Brogdon,  
Centers for Disease Control and Prevention (CDC)*



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## Introduction

The West Nile virus (WNV) is most often spread to humans from the bite of an infected mosquito. The virus may also be transmitted in other ways—through organ transplants, blood transfusions, and breast milk, and from mother to fetus. But the risk of such transmission is very low. WNV was first reported in the United States in 1999, and occupational exposures have been documented. By 2004, the virus was reported throughout the continental United States.



**WNV is spread to humans from the bite of an infected mosquito.** Photograph courtesy of Jim Gathany, Centers for Disease Control and Prevention (CDC).

Most human infections with WNV (about 80%) cause no symptoms, and about 20% cause flu-like symptoms, including fever, fatigue, headache, and muscle or joint pain. Fewer than 1% of humans infected with WNV become severely ill. Severe symptoms include high fever, stiff neck, disorientation, tremors, muscle weakness, and paralysis. Severely affected persons may develop encephalitis (inflammation of the brain) or meningitis (inflammation of the membranes of the brain or spinal cord). Severe cases may be fatal. People of all ages and conditions may be affected. However, those who are above age 50 or who have had an organ transplant are at increased risk of severe illness.

## Frequently Asked Questions

### Which workers may be exposed to WNV?

Outdoor workers may be exposed to WNV whenever mosquitoes are biting. Outdoor workers at risk include farmers, foresters, landscapers,



**Outdoor workers are at risk of WNV infection.**



**Anyone who works where there are infected mosquitoes is at risk of WNV infection.** *Photograph courtesy of Ken Hammond, U.S. Department of Agriculture (USDA).*

groundskeepers and gardeners, painters, roofers, pavers, construction workers, laborers, mechanics, and other outdoor workers. Entomologists and other field workers are also at risk while conducting surveillance and other research outdoors. All outdoor workers should follow the recommendations in this brochure to reduce their potential for WNV exposure.

In addition to outdoor workers, laboratory workers are at risk of WNV infection if their skin is penetrated or cut while performing necropsies or handling WNV-infected tissues or fluids.

### **Who is at risk of WNV infection?**

Anyone who lives or works in an area where there are WNV-infected mosquitoes is at risk of WNV infection. People of all ages are at risk of the flu-like symptoms of this infection. Although people usually recover, the symptoms may be severe enough to result in lost workdays for extended periods.

People above age 50 and those who have had organ transplants are known to have the highest risk of severe illness from WNV infection. Others with compromised immune systems are also likely to be at high risk. However, people of all ages and conditions can become severely ill. Therefore, ALL workers should be careful to follow the recommendations listed in this brochure to reduce their potential for exposure to WNV.

## Have any outdoor workers been infected with WNV on the job?

Workers were infected with WNV at a turkey breeder farm in 2002 and an alligator farm in 2004. Although it is uncertain how these workers were infected, it may have been through mosquito bites, contact of cut or scraped skin with infected feces, swallowing or being splashed in the eyes or mouth with contaminated material, or inhaling airborne virus from infected feces.

It is likely that more outdoor workers have been infected with WNV when bitten by infected mosquitoes, but information about workers' occupations may not be collected when cases are reported. Many cases have occurred in rural areas where people work in farming and other outdoor occupations.

## When are outdoor workers at greatest risk of WNV exposure?

Outdoor workers are at risk of WNV exposure any time infected mosquitoes are biting. Most WNV infections occur from July through September. Many mosquitoes are most active from dusk to dawn. However, some are active during the day. If possible, avoid working outdoors during peak activity times for mosquitoes. When you must work at such times, pay special attention to the use of personal protection such as protective clothing and insect repellent to reduce the potential for exposure.



**Outdoor workers should be trained about the risks of WNV exposure and infection.**



**Many mosquitoes are most active from dusk to dawn.** *Photograph courtesy of USDA.*



**Tires provide breeding sites for mosquitoes.** *Photograph courtesy of Graham Heid and Harry D. Pratt, CDC.*



**When pregnant workers are outside, they should avoid mosquitoes, wear protective clothing, and use an effective repellent.** *Photograph courtesy of CDC.*

## **Where are mosquitoes most commonly found?**

Mosquitoes develop in any standing body of water that persists for more than 4 days. Stagnant pools, ponds, watering troughs, irrigation ditches, rain barrels, manure lagoons, and other stagnant bodies of water increase mosquito populations. Weedy, bushy, and wooded work environments may also have mosquito populations. Emptying containers of stagnant water every 4 to 5 days or treating these breeding sites with larvicides can help to reduce mosquito populations.

## **How does WNV affect a woman's pregnancy?**

The Centers for Disease Control and Prevention (CDC) has followed a number of women who became ill with WNV during pregnancy. Most of these women delivered apparently healthy babies with no evidence of WNV infection. Although some of the babies born to WNV-infected mothers did have health problems, it is unknown whether the WNV infection caused these problems. Because of the limited number of cases studied so far, it is not yet possible to determine what percentage of WNV infections during pregnancy result in infection of the fetus or medical problems in newborns. More research is needed to understand the possible effects of WNV on pregnancy.

When pregnant workers are outside, they should follow the recommendations at the end of this brochure



to reduce their risk for WNV infection. These recommendations include avoiding mosquitoes; wearing protective clothing; using repellents containing DEET (N,N-diethyl-m-toluamide), picaridin, or oil of lemon eucalyptus on the skin; and spraying clothes with one of these repellents or permethrin. Always follow label instructions for repellents. Pregnant women who become ill should see their health care providers.

### **What should I do if I must handle dead animals?**

Avoid handling dead animals when possible. If you must handle them, avoid direct contact and wear gloves that provide a protective barrier. See additional recommendations at the end of this brochure.

### **What should I do if I develop symptoms of WNV infection?**

Tell your supervisor about any symptoms that might be caused by WNV infection. If you develop severe symptoms such as high fever, stiff neck, disorientation, tremors, muscle weakness, or paralysis, seek medical attention immediately. Be sure to tell your health care provider that you work outdoors. The period between receiving the infected bite and having symptoms is 3 to 14 days.

Testing for WNV infection is available. No vaccine is currently available to prevent WNV infection in humans.



**Wear gloves if you must handle dead animals.**



**Visit your health care provider if you develop WNV symptoms.**

## Recommendations for Employers of Outdoor Workers

Employers should protect their workers from WNV exposure by taking the following steps:

- Provide training that describes how WNV is transmitted and reinforces knowledge about the risks of WNV exposure and infection.
- Stress to workers the importance of reporting all work-related injuries and illnesses in a timely manner.
- Provide a medical surveillance system that monitors, records, and assesses the symptoms and absenteeism associated with WNV infection.
- Provide workers with protective clothing (long-sleeved shirts, long pants, and socks) and repellents to use on skin and clothing:
  - Use repellents containing DEET (more than 20% DEET for longer protection), picaridin, or oil of lemon eucalyptus on both skin and clothing.
  - Use permethrin on clothing only.
- Reduce worker exposure to mosquitoes by taking the following steps:
  - Avoid having workers outdoors when mosquitoes are most active and biting (most often from dusk to dawn).



Removing tires from worksites helps to reduce mosquito populations. Photograph courtesy of CDC.

- Recommend that outdoor workers wear long-sleeved shirts, long pants, and socks when possible.
- If worker uniforms are provided, include long-sleeved shirts and long pants as options.
- Eliminate as many sources of standing water from the worksite as possible to decrease mosquito populations:
  - Change the water every 4 to 5 days in animal drinking troughs, birdbaths, and other water containers.
  - Scrub the sides of water containers to dislodge eggs.
  - Add an aerator to ponds and water gardens to keep the water circulating, or add fish that will eat the mosquito larvae or adults.
  - Remove discarded tires or keep them dry and under cover.
  - Turn over, cover, store, or remove equipment such as tarps, buckets, barrels, wheelbarrows, and containers to prevent standing water.
  - Place drain holes in containers that collect water and cannot be discarded.
  - Clean out rain gutters.



**Preventing standing water helps to reduce mosquito populations.**

*Photograph courtesy of Graham Heid and Harry D. Pratt, CDC.*



**Using an effective insect repellent helps prevent mosquito bites.**

*Photograph courtesy of CDC/PHPPPO/DPDE/CAB/PhotoServices.*



**Long-sleeved shirts, long pants, and socks will help prevent mosquito bites.** *Photograph courtesy of Joe Larson, USDA.*

- Remove debris (leaves, twigs, trash) from ditches.
- Fill in ruts and other areas that collect standing water.

## Recommendations for Workers

Outdoor workers can reduce their risk of WNV exposure by taking the following steps:

- Use insect repellent if you work outdoors when mosquitoes are biting:
  - Apply insect repellent containing DEET (more than 20% DEET for longer protection), picaridin, or oil of lemon eucalyptus to exposed skin and to clothing.
  - Use permethrin on clothing only.
  - Carefully follow label directions for repellent use.
  - Do not apply pump or aerosol products directly to the face. Instead, spray these products onto the hands and carefully rub them over the face, avoiding the eyes and mouth.
  - Use a repellent that provides protection for the amount of time that you will be outdoors and reapply it as needed. The percentage of active ingredient in the repellent determines the length of protection.

- Wash skin treated with insect repellent with soap and water after returning indoors.
- Use protective clothing if you work outdoors when mosquitoes are biting:
  - Wear long-sleeved shirts, long pants, and socks.
  - Spray clothing with products containing DEET, picaridin, oil of lemon eucalyptus, or permethrin, as mosquitoes may penetrate thin clothing.
  - Use permethrin repellents on clothing as directed; do not apply them directly to skin.
  - Wash clothing treated with insect repellent before wearing it again.
  - Do not apply repellent to skin that is covered by clothing.
- Avoid handling dead animals when possible. If you must handle them, take the following precautions:
  - Use tools such as shovels to avoid direct contact with the animals.
  - Wear medical examination gloves that provide a protective barrier between your skin and blood or other body fluids:
    - Wear two pairs of gloves if one pair alone might tear.

- Wear the medical examination gloves as the inner pair.
  - Make sure that any latex gloves used are reduced-protein, powder-free gloves to reduce workers' exposure to allergy-causing proteins.
  - Wear cotton or leather work gloves as the outer pair when heavy work gloves are needed.
  - Discard both inner and outer gloves immediately after use.
  - Remember that cotton, leather, and other absorbent gloves are not protective when worn alone.
- If gloves are not available, use a plastic bag, which may act as a protective barrier between the animal and your skin.

## Additional Resources

For more comprehensive information about WNV, contact the Division of Vector-Borne Infectious Diseases, National Center for Infectious Diseases, Centers for Disease Control and Prevention at

**[www.cdc.gov/westnile](http://www.cdc.gov/westnile)**

For further information about other occupational safety and health topics, contact the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention at

**[www.cdc.gov/niosh](http://www.cdc.gov/niosh)**

## **Acknowledgments**

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