

West Nile Virus

What You Need to Know...

West Nile virus, which can cause encephalitis, is transmitted by mosquitoes. The virus was first detected in the United States in August 1999. Prior to 1999, the West Nile virus had only been found in Africa, Eastern Europe, West Asia, and the Middle East. The virus was most likely introduced from an infected mosquito or bird that was imported from a country where the virus is common.

Transmitting West Nile Virus

West Nile Virus is transmitted from the bite of an infected mosquito, primarily the *Culex* species. Data indicated that 55% of the WNV-positive mosquito pools collected in 2002 were *Culex* species.

Culex pipiens

(Northern House Mosquito)

- Common domestic pest
- Reaches greatest numbers in urban areas
- Thrives in polluted water habitats

Culex pipiens

(Larval Habitat)

- Lays its eggs on standing water
- Oviposits in containers & polluted groundwater
- Does not fly far from its breeding habitat

In the U.S., 36 different mosquito species have been reported WNV-positive since 1999. Of greatest concern in terms of risk to human health (and horses) are vector species that feed readily on large mammals (*e.g.*, *Culex* spp. and *Aedes vexans*).

Aedes vexans

(Common Floodwater Mosquito)

- Occurs in much larger numbers
- Avid human biter
- The ideal bridge vector for WNV in suburban areas

Floodwater Mosquito

(Larval Habitat)

- Any body of transient water
- Number of summer broods dependent on rainfall
- Eggs Remain Dormant until Flooded
- Large Numbers of Larvae Appear after each Rain

Birds are the primary reservoir for the West Nile virus. Mosquitoes get the virus from taking a blood meal from an infected bird.

Health Information About West Nile Encephalitis

Encephalitis -- inflammation of the brain -- can be caused by head injury, bacterial infections, or most commonly, viral infections.

- Although there is no human vaccine against West Nile encephalitis, research is currently being done to develop one.
- There is no specific treatment, medication, or cure, but the symptoms and complications of the disease can be treated.
- All residents of areas where virus activity has been identified are at risk of getting West Nile encephalitis.
- People over 50 years of age have the highest risk of severe disease.
- It is now unknown if immuno-compromised persons are at increased risk for WNV disease.
- Most people who are infected have no symptoms or experience mild illness such as fever, headache, and body aches. Some people may develop a skin rash or swollen lymph glands.
- In rare cases, severe illness may occur. Some symptoms include: headache, high fever, a stiff neck, disorientation, coma, convulsions, and muscle weakness.
- In 2002, CDC reported 3,873 human cases of WNV, of which 246 people died.
- West Nile virus can be transmitted through blood transfusions and organ transplants.
- This new method of transmission was determined when four organ recipients tested positive for WNV after receiving organs from the same donor.
- The CDC is investigating other cases.
- Although persons needing blood transfusions or organ transplants need to be aware of the risk for WNV infection, the benefits of receiving needed transfusions or transplants outweigh the potential risk for WNV infection.
- There is no risk of getting WNV by donating blood.
- The Food and Drug Administration (FDA) is facilitating the development of commercial tests for detection of acute infection with WNV in blood and plasma donors and potentially for tissue and organ donors.
- West Nile virus is NOT transmitted from person-to-person. You cannot get WNV from touching or kissing a person who has the disease, or from a health care worker who has treated someone with the disease.
- WNV transmission has now been documented from mother to fetus. While pregnant, a female became infected with WNV; her baby was born with the virus. Although the baby's life is not in danger, the viral infection may have caused health problems affecting the infant's central nervous system.
- Other suspected modes of transmission include:
 - - Breast milk from nursing mothers, infected with WNV, to their infants
 - - Infection from handling infected animals in a lab (skin was cut while handling infected animals)

Effects of the West Nile Virus on Animals

West Nile virus has been responsible for many bird and horse deaths.

American Crows are highly sensitive to the West Nile Virus and have a greater than 90% mortality rate.

- Crows exhibit symptoms including rapid weight loss and an inability to perch. They usually die within 4-6 days after being infected.
- Monitoring American crow deaths is especially important since they are sentinels for local transmission of the disease.
- Crow to crow transmission of the West Nile virus was documented by placing diseased and healthy crows in a common flight cage.
- All healthy crows eventually died from being exposed to diseased birds.
- This research study was done by USGS personnel in Madison, WI.
- Many other species of birds have been found infected with the virus. The following is a partial list of birds that have tested positive:
 - American Goldfinch
 - American Kestrel
 - American Robin
 - Belted Kingfisher
 - Black Skimmer
 - Bluejay
 - Canada Goose
 - Canada Warbler
 - Captive birds
 - Cardinal
 - Cedar Wax Wing
 - Chicken
 - Cockatoo
 - Common Grackle
 - Common Nighthawk
 - Cooper's Hawk
 - Cormorant spp.
 - Eastern Bluebird
 - Eastern Wild Turkey
 - European Starling
 - Fish Crow
 - Gray Catbird
 - Great Black-backed Gull
 - Great Blue Heron
 - Great Horned Owl
 - Green Heron
 - Herring Gull
 - House Finch
 - House Sparrow

- Killdeer
- Macaw
- Merlin
- Mourning Dove
- Mute Swan
- Northern Mockingbird
- Ovenbird
- Red-tailed Hawk
- Red-winged Blackbird
- Ring-billed Gull
- Ring-necked Pheasant
- Rock Dove
- Ruffed Grouse
- Sharp-shinned Hawk
- Song Sparrow
- Wood Thrush
- Yellow-rumped Warbler
- In addition, suspected WNV infections have been detected in other animals including the following:
 - Wolf
 - Dog
 - Reindeer
 - Sheep
 - Black Bear
 - Squirrel
 - Mountain Goat
 - Alligator
 - Barbary Macaque (primate)
 - Harbor Seal

Monitoring for the West Nile Virus

Mosquito Pest Management and Control

The number of mosquitoes around your home and neighborhood can be reduced by eliminating sources of standing water in which mosquitoes lay their eggs.

- Turn over wheelbarrows and do not allow water to stagnate in birdbaths.
- Turn over plastic wading pools when not in use.
- Empty urns and vases in cemeteries.
- Dispose of tin cans, plastic containers, ceramic pots, or similar water-holding containers that have collected on your property.
 - Do not overlook containers that have become overgrown with vegetation.
- Pay particular attention to discarded tires. Used tires are the most important breeding sites for mosquitoes in the country.
- Clean and chlorinate swimming pools that are not being used.
 - Mosquitoes may breed even in water that collects on swimming pool covers.

- Drill holes in the bottom of all containers that are left outside. Containers with drainage holes on their sides can still collect enough water for mosquitoes to breed.
- Clean clogged roof gutters every year, particularly if leaves tend to plug the drains.
- Roof gutters can produce millions of mosquitoes each year.
- Aerate ornamental pools or stock them with fish. Water gardens are fashionable but become major mosquito breeding sites if allowed to stagnate.
- Modify the landscape to eliminate standing water that collects on your property.
- During warm weather, mosquitoes will breed in any puddle of water.
- In urban settings, catch basins are a major mosquito producer.

Reducing the Risk of a Mosquito Bite

- Stay indoors at dawn, dusk, and in the early evening. If you do go outdoors at these times, wear long-sleeved shirts and long pants.
- Make sure window and door screens are “bug tight.”
- Apply insect repellent sparingly to exposed skin and thin clothing. **Read and follow the product label.**
- Use the proper type of lighting outside: incandescent lights attract mosquitoes while fluorescent lights neither attract nor repel them.
- Note that Vitamin B and “ultrasonic” devices have not been proven effective in preventing mosquito bites.

Using Insect Repellents Properly

Products containing 10-35% DEET will provide adequate protection under most conditions. The American Academy of Pediatrics recommends that repellents used on children contain no more than 10% DEET.

- Alternatives to DEET:
 - Avon’s Skin-So-Soft Bath Oil
 - Avon’s Skin-So-Soft Bug Guard plus IR3535 Insect Repellent lotion with sunblock
 - Bite Blocker (plant based repellent)
 - Citronella oil
 - Plant-derived repellents (citronella, geranium, lavender, etc.)
 - Permethrin (apply to clothes only)
- Before using, read and understand the directions on its label.
- Use just enough repellent to lightly cover exposed skin and clothing. Do not saturate the skin or apply beneath clothing.
- To apply to face, first spray or dispense on your palms and rub your hands together. Then apply a thin layer to your skin.
- Do not apply a repellent directly to a child’s skin. First apply it to the palms of your hands and then apply it to the child.
- After applying a repellent, wipe or wash it from your hands.
- Once indoors, wash all treated skin and clothing with soap and water.
- If you suspect that you or your child is reacting negatively to a repellent, discontinue its use, wash treated skin, and call the new National Poison Center hotline (1-800-222-1222). You will then be transferred to a regional poison center.

Pesticides Used for Mosquito Control

Insecticides used to control mosquitoes must meet EPA requirements that ensure no harm to human and animal health and the environment when used according to the label.

Mosquito Adulticides

Malathion & Naled (organophosphates)

Sumithrin & Resmethrin (synthetic pyrethroids)

Mosquito Larvicides

Temphos (organophosphate)

Methoprene (insect growth regulator)

Oils & Monomolecular films

Bacillus sphaericus & *Bacillus thuringiensis israelensis* (biological pesticides)

- **Malathion** – To protect the public and the environment, EPA requires that malathion be applied only by professionals as a fine spray at very low rates from trucks or aircraft. Malathion kills adult mosquitoes when they contact spray particles in the air.
- **Naled** – is an insecticide applied as an ultra-low volume spray from trucks or aircraft. It is primarily used on land to kill adult mosquitoes and blackflies.
- **Sumithrin** – is an insecticide used against mosquitoes in swamps, marshes, and recreational areas. It is similar in its action to natural pesticides found in chrysanthemums. Sumithrin degrades rapidly in the environment when used at low concentrations for mosquito control.
- **Resmethrin** – is an insecticide used to control flying and crawling insects in homes, lawns, gardens, and at industrial sites. It is registered only for outdoor use and is generally applied in small amounts. Resmethrin has low toxicity to humans, but is very toxic to fish and other aquatic organisms.
- **Temphos** – is an insecticide used to control mosquito larvae and is usually applied by helicopters. Temphos breaks down within a few days and does not pose unreasonable risks to human health. Temphos is applied directly to water so it is not expected to have a direct impact on land animals. It can be highly toxic to some birds and aquatic organisms; it is toxic to bees.
- **Methoprene** – is an insect growth regulator used to kill mosquito larvae. When used according to the label, it does not pose unreasonable risks to human health. The toxicity is low for birds and fish and it is nontoxic to bees. Methoprene breaks down quickly in water and soil, and will not leach into groundwater.
- **Oils and Monomolecular Films** – are used to form a coating or thin film on water surfaces, which drowns larvae, pupae, and emerging adult mosquitoes. Both oils and films, when used according to the label, do not pose a risk to human health. Oils that are misapplied may be toxic to fish and other aquatic organisms.
- **Bacillus sphaericus and Bacillus thuringiensis israelensis** – are biological pesticides used to control mosquito larvae in water. Larvae eat these bacteria, which in turn release proteins that disrupt the larval feeding process, causing them to starve and die. Both pose no hazards to humans and wildlife.
- Mosquito dunks, with the *Bacillus thuringiensis israelensis* active ingredient, can be thrown into standing water to control mosquito larvae.

To reduce exposure during mosquito control spraying, there are a number of common-sense steps you can take to help reduce possible exposure to pesticides.

- Look for notices about spraying in the newspapers and listen for radio and TV announcements.
- Whenever possible, remain indoors with the windows closed and air conditioning turned off when spraying is taking place.
- Bring your pets indoors and cover ornamental fish ponds.
- If you must be outdoors, avoid getting the spray in your eyes. If you do, immediately rinse your eyes with water.
- Wash exposed skin surfaces and clothing with soap and water if you contact pesticides.
- Bring laundry and toys indoors before spraying begins and wash, with soap and water, items that have been exposed to pesticides during spraying.
- Cover outdoor tables and play equipment or rinse them off with water after spraying is finished.
 - Cover swimming pool surfaces when feasible.
- Wash home-grown or store-bought fruits and vegetables with water before storing, cooking, or eating them.

If you have questions about pesticides, call the National Pesticide Information Center at (800) 858-7378.

Centers for Disease Control & Prevention (970) 221-6400

<http://www.cdc.gov/ncidod/dvbid/westnile/index.htm>