

# West Nile Encephalitis in Horses

## BACKGROUND

West Nile virus, a mosquito-borne virus, was detected for the first time in the United States in August 1999. The virus can cause encephalitis, which is characterized by inflammation of the brain and spinal cord. The first outbreak of West Nile encephalitis in the United States occurred in the New York City metropolitan area, where 62 people were diagnosed with the disease. Seven of those people died. The infection also was diagnosed initially in several breeds of horses, a variety of zoo birds, and various native bird species, especially crows.

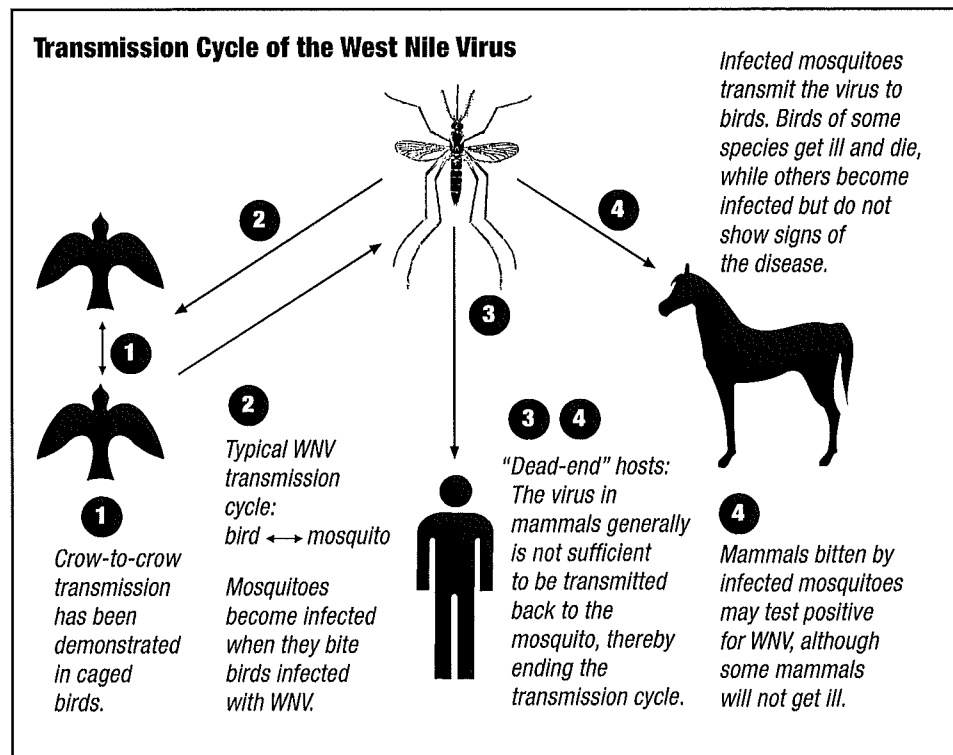
In October 1999, a total of 25 horses, all from Long Island, New York, had confirmed signs of

West Nile encephalitis, of which nine died or were euthanized. The first confirmed case of West Nile virus in a Pennsylvania horse was reported in October 2000. Since then, positive detections in horses have been made in most mainland states throughout the United States and provinces in Canada. Horses may be exposed to West Nile virus and not show signs, but of those that are infected and become ill about 35 percent die or are euthanized. With the continuing health threat of West Nile virus to horses, ongoing research to learn more about the disease and develop effective prevention and control measures, becomes even more important.

## TRANSMISSION OF WEST NILE VIRUS

Infected birds serve as the reservoir host of the West Nile virus. These birds develop viremia—a large number of virus particles in their circulatory system. Mosquitoes become infected after taking a blood meal from an infected bird. They in turn infect horses by biting them.

The incubation period—the time between exposure to the virus and appearance of the first signs of disease—is estimated to be between 3 and 15 days. Humans and horses are known as “dead-end” or “terminal” hosts. These hosts have so few virus particles in their bloodstream that a mosquito cannot accumulate enough of the virus while



<sup>1</sup> In current peer-reviewed journals, West Nile encephalitis in horses is more commonly referred to as West Nile encephalomyelitis, which is an inflammation of the brain and spinal cord.

taking a blood meal to subsequently transmit the infection.

No evidence suggests that horses can transmit West Nile virus to other horses, birds, or humans. In fact, evidence exists that the virus can be found in the horse's bloodstream for only a few days during the entire course of the infection. Despite this fact, one should use caution when handling blood, spinal fluid, or nervous tissue from suspect animals, since these may contain the virus.

### **SIGNS OF WEST NILE ENCEPHALITIS**

The West Nile virus can affect the central nervous system and cause encephalitis. Clinical signs may include one or more of the following: weakness (hind end, front end, or both, characterized by falling to their knees or difficulty in remaining standing), ataxia (incoordination), muscle twitching or tremors, altered mental state (somnolent or aggressive, circling, or stall-walking), hypersensitivity to touch or sound, cataplexy or narcolepsy, seizures, blindness, cranial nerve deficits (facial paralysis, tongue weakness, difficulty swallowing), recumbency, and fever.

Horses with severe clinical signs can die as a result of the infection or are euthanized due to secondary complications. Current data indicates that the mortality rate in clinically affected horses is about 35 percent and even higher in recumbent horses. The West Nile virus has been confirmed in foals as young as three weeks. However, the risk of infection and death seem to increase with age. Research indicates that elderly horses have decreased antibody titers because horses greater than ten years of age tend to have an age dependent decrease in neutralizing antibody response after vaccination.

It is important not to presume that horses with clinical signs of encephalitis have West Nile encephalitis. A definitive diagnosis requires ruling out other diseases with similar neurological signs. Rabies, botulism, equine protozoal myeloencephalitis (EPM), and Eastern (EEE), Western (WEE), and Venezuelan (VEE) equine encephalitis are examples of other diseases with neurological signs that may be confused with West Nile encephalitis. A positive diagnosis of West Nile encephalitis can be made by testing blood from an infected horse. Determining the actual number of horses exposed to the West Nile virus is difficult as some horses exposed to the virus may not show any clinical signs or perhaps may exhibit only vague signs of the disease.

Even when clinically ill horses recover from West Nile encephalitis, some horses may have residual effects, such as gait abnormalities and a change in their usual temperament or behavior. These effects may be significant and affect the owner's use or enjoyment of the horse. Keep the veterinarian involved in reassessing the horse's neurological condition beyond the apparent resolution of the initial signs. Continued veterinary involvement is very important since some of these effects may impact a person's safety when handling affected horses and impact their future use and management.

### **TREATMENT FOR WEST NILE ENCEPHALITIS**

Consult with your veterinarian for recommendations for current treatment methods. Affected horses should be treated based on the presenting signs with emphasis on reducing the severity of the disease. Weakened and impaired animals should be protected from injuring themselves. Fluid and nutritional supportive therapy also may be required, either by intravenous methods or by stomach tube.

### **WEST NILE VIRUS VACCINE INFORMATION**

Several vaccines are available that have met the USDA requirements for safety. When using most current vaccines, the first time the horse receives the vaccine, it is very important that a series of two doses be given about 3 to 6 weeks apart. It appears that horses will not develop high, presumably protective, antibody levels until they receive the "booster," or second vaccination in the series. Optimal protection occurs 2 weeks after this second dose. In addition, this second dose should be given at least 4 weeks *before* mosquitoes are likely to bite and infect the horse. These vaccines require an annual booster. Depending on the time of year the horse is vaccinated and the regional presence of the disease, veterinarians might recommend boosters be given twice yearly. Horses vaccinated against Eastern, Western, and/or Venezuelan equine encephalitis *will not* be protected against West Nile virus.

Vaccines are generally effective and recommended to prevent West Nile encephalitis. Some research has shown that some horses do not respond well to vaccinations. Be sure to consult with your veterinarian for current vaccination recommendations, schedules, and management practices to prevent West Nile encephalitis.

*At the current time, none of the vaccines are labeled for use in pregnant mares in the United States.* However, a vaccine has been licensed in Europe for use in pregnant mares. Furthermore, a *Journal of the American Veterinary Medical Association* article by Vest, et al. concluded that "Vaccination of pregnant mares during any period of gestation was not associated with increased incidence of pregnancy loss." Again, consult with your veterinarian for the most up-to-date information and research on available vaccines and recommendations for use. In addition, discuss vaccination schedules for mares and foals with your veterinarian, as the schedules may be different for various vaccines.

Owners should keep records of all vaccinations or treatments which may affect international shipment of horses. Owners are advised to contact the U.S. Department of Agriculture or their state Department of Agriculture for current regulations involving interstate and international travel of horses.

#### **PREVENTION AND CONTROL**

Horse owners can reduce the likelihood of exposure to mosquitoes by implementing the following pest management practices:

- Keep horses stabled during peak periods of mosquito activity (dusk and dawn).
- Fans may reduce the ability of mosquitoes to feed on horses.
- Avoid turning on lights inside the stable during the evening and overnight. Mosquitoes are attracted to incandescent bulbs. Fluorescent lights neither attract nor repel mosquitoes.
- Place incandescent bulbs about 50 yards from the stable to attract mosquitoes away from the horses. Black lights are of little value as attractants for mosquitoes.
- Prohibit pigeons and other birds from roosting and living in or near the stables.
- Periodically examine the property for dead birds, particularly crows, blue jays, and raptors (hawks and owls). Report any suspicious deaths to the Pennsylvania Department of Health at 1-877-PA-HEALTH. Handle dead birds only if wearing protective gloves, and place birds in tied plastic bags.
- Carefully examine your property and eliminate locations that could serve as breeding grounds for mosquitoes. Shallow stagnant or standing water,

used tires, clogged roof gutters, and manure storage pits are ideal places for mosquitoes to breed.

- Clean water troughs once a week and pay attention to puddles that form around and under the troughs. Consider using stone or landscaping to reduce or eliminate hoof prints, where mosquitoes might breed.
- Topical preparations containing mosquito repellents are available for horses. Read the label before using the product, and follow all instructions.
- Stable premises can be fogged in the evening to reduce the number of mosquitoes.
- Do not allow water to stagnate in bird baths, wading pools, wheelbarrows, ornamental pools, water gardens, and swimming pools and their covers.

#### **SUMMARY**

Research continues to provide more information about West Nile encephalitis. Horse owners should stay informed of current information concerning this disease, especially if it is detected in their area. For more information on the most current recommendations regarding prevention and treatment, consult reliable sources, such as your veterinarian, and Web sites, such as the ones noted in this fact sheet.

The West Nile virus represents a real health threat to horses because they appear more susceptible to the disease than other livestock or companion animals. Vaccines are generally effective in preventing West Nile encephalitis when administered properly according to your veterinarian's recommendations and used in conjunction with preventative management practices. West Nile virus will be a threat to horses as long as a virus reservoir remains in the bird population, as is the case with Eastern, Western, and Venezuelan equine encephalitis.

Although many West Nile virus infections in horses last only a short time and result in no illness or mild signs with a complete recovery, the disease can be deadly. Thus, horse owners should take precautions to minimize exposure to mosquitoes and should monitor their animals for encephalitic signs. They should quickly contact their veterinarian to examine and test any horse that is showing any signs suggestive of this disease.

**FOR MORE INFORMATION**

For help in assessing mosquito exposure risks on your property and for suggested control practices, please contact your local Penn State Cooperative Extension office, county Department of Health, local veterinarian, or a mosquito pest control company. Additional information on West Nile virus, including *West Nile Encephalitis: What You Need to Know* and *Mosquito Biology and Control*, is available from Penn State's College of Agricultural Sciences. Contact the Publications Distribution Center, The Pennsylvania State University, 112 Agricultural Administration Building, University Park, PA 16802 or call 814-865-6713. Further information can be found at the following Web sites:

**Animal and Plant Health Inspection Service, Animal and Animal Product Export and Import Information**  
[www.aphis.usda.gov/import\\_export/animals/animal\\_exports.shtml](http://www.aphis.usda.gov/import_export/animals/animal_exports.shtml)

[www.aphis.usda.gov/import\\_export/animals/animal\\_import/animal\\_imports.shtml](http://www.aphis.usda.gov/import_export/animals/animal_import/animal_imports.shtml)

**Animal and Plant Health Inspection Service, Equine West Nile Virus Surveillance Data**  
[www.aphis.usda.gov/vs/nahss/equine/wnv](http://www.aphis.usda.gov/vs/nahss/equine/wnv)

**Centers for Disease Control and Prevention**  
[www.cdc.gov/ncidod/dvbid/westnile/index.htm](http://www.cdc.gov/ncidod/dvbid/westnile/index.htm)

**Cornell University, Environmental Risk Management Program**  
[environmentalrisk.cornell.edu/WNV](http://environmentalrisk.cornell.edu/WNV)

**Fort Dodge Animal Health, West Nile Virus**  
[www.equinewestnile.com/index.htm](http://www.equinewestnile.com/index.htm)

**Intervet, PreveNile**  
[www.prevenile.com](http://www.prevenile.com)

**Merial, Equine**  
[us.merial.com/equine/index.asp](http://us.merial.com/equine/index.asp)

**Pennsylvania's West Nile Virus Surveillance Program**  
[www.westnile.state.pa.us](http://www.westnile.state.pa.us)

**West Nile Virus Surveillance County Coordinators**  
[www.westnile.state.pa.us/CountyCoordinators](http://www.westnile.state.pa.us/CountyCoordinators)

**Penn State Pesticide Education Program**  
[www.pested.psu.edu/issues/wnv](http://www.pested.psu.edu/issues/wnv)

**U.S. Geological Survey**  
 Disease Maps: [diseasemaps.usgs.gov/](http://diseasemaps.usgs.gov/)  
 West Nile Virus Historical Maps: [diseasemaps.usgs.gov/wnv\\_historical.html](http://diseasemaps.usgs.gov/wnv_historical.html)

**REFERENCES**

Davidson A. H., J. L. Traub-Daragatz et al. "Immunologic Responses to West Nile Virus in Vaccinated and Clinically Affected Horses." *JAM Vet Med Assoc* 226 (2005): 240-45.

Vest, D. J., N. D. Cohen, C. J. Berezowski et al. "Evaluation of Administration of West Nile Virus Vaccine to Pregnant Broodmares." *JAM Vet Med Assoc* 225 (2004):1894-97.

Wilson, W. D. "Strategies for Vaccinating Mares, Foals, and Weanlings." *AAEP Proceedings* 51 (2005):421-38.

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