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## WNV: An Evolving Epizootic

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"West Nile virus (WNV) is coming to a state near you if it hasn't already arrived," said Eileen Ostlund, DVM, PhD, head of the equine and ovine viruses section at the Diagnostic Virology Laboratory, National Veterinary Services Laboratory in Ames, Iowa, during the Western Veterinary Conference held February 15-19 in Las Vegas, Nev. In a comprehensive overview of WNV's activity in the United States since its arrival in 1999, she discussed its transmission methods, hosts, U.S. history, clinical signs, diagnosis, vaccination options, impact on the U.S. horse population, duration of immunity, and supportive care.

### Birds and Mosquitoes

Ostlund noted that WNV has been found in more than 130 bird species to date. "It's not a picky virus in terms of its hosts," she said. "No state lacks birds that can harbor WNV."

Corvids (birds, including crows, bluejays, and magpies) have a high mortality rate when infected with WNV, she said, which has led to the recommendation that dead crows be tested for WNV in order to monitor the disease. However, she added that sparrows, finches, grackles, and some other species have a low mortality rate, but high viremia (a high level of virus in the bloodstream). Thus, even though you don't see them dropping dead everywhere, they are significant reservoirs of the virus.

The mosquitoes that pick up the virus from birds fall into two categories, she explained--amplification cycle vectors and bridge vectors. The former spread the virus between birds and mosquitoes (mosquitoes bite infected birds, then transmit the virus to non-infected birds). These include many species of the *Culex* genus. The bridge vectors bite more than one host, "bridging" the infection between species (they bite infected birds, then humans, horses, etc.). Candidate (possible) bridge vectors include some species from the *Culex*, *Aedes*, and *Ochlerotatus* genuses.

### WNV in the United States

"Many other countries had seen a case or two of WNV, but then it disappears. We were hoping that would be the case here," said Ostlund of the 1999 arrival of WNV in the United States. Unfortunately, that wasn't the case. In 2000, the disease spread to seven states. In 2001, there were more than 700 equine cases, and in 2002, that number skyrocketed to more than 15,000. In 2003, the virus made it all the way to California, and it infected 4,636 horses nationwide (according to the USDA web site). The decrease has been attributed to vaccination and fewer horses in the naïve population.

"Now it's pretty much coast to coast and obviously not going away," she said. "The greatest number of cases tend to occur in September and October, she said.

### Detection and Prevention

She discussed the intricacies of various laboratory tests for the virus in detail, noting that horses are much less viremic than birds, and viremia occurs well in advance of clinical signs. "Tests designed for birds can miss half of the equine cases," she cautioned. "Check with the lab--if they're only adapting bird tests, they may not be sensitive enough for testing horse tissues."

### Vaccine

"The killed WNV vaccine (Fort Dodge's West Nile-Innovator) was conditionally licensed on Aug. 1, 2001, and it received full licensure in February of 2003," Ostlund said. "Over 13 million doses of it have been distributed; it is labeled for a two-dose initial series followed by an annual booster. There is no cross-protection between Eastern, Western, and Venezuelan equine encephalitis vaccines and the WNV vaccines

(vaccinating for one form of encephalitis doesn't protect the horse against the others)."

After vaccination, the horse has no WNV-specific IgM (a type of antibody) response (as detected under the conditions used to test suspect clinical cases), so increased WNV-specific IgM levels indicate exposure, she said. Neutralizing antibody is low or undetectable after the first vaccine dose, but measurable after the second.

The concerns with this vaccine include efficacy--no vaccine is 100% effective, she said. However, she added, most cases have been in unvaccinated horses. Another question mark is frequency of boosting--some state veterinarians recommend more frequent boosters than once a year, although the Fort Dodge vaccine is labeled for an annual booster. A third, although it is entirely unproven, is safety. Concerns about fetal malformations and abortions claimed by the Lost Foals Group have not been substantiated by any lab evidence, she stated. "Also, the claims didn't often make sense in terms of timing, etc.," she added.

The second vaccine, a recombinant canarypox vectored vaccine produced by Merial, received its full license in December of 2003. "Once a product is fully licensed, there can never be another conditional license for that disease again, for any other vaccine," Ostlund explained.

The canarypox vector expresses the desired antigens (to stimulate the animal's targeted immune response), but doesn't multiply in the horse, she said. She added that the vaccine's efficacy has been proven by mosquito challenge, and like the killed vaccine, it offers no cross protection against other encephalitis viruses. It is also labeled for a two-dose initial series and a single-dose annual booster.

"We're still awaiting data on IgM response so we'll know how to use tests to confirm vaccination vs. exposure (when using the Merial vaccine)," she said. The neutralizing antibody response is low or undetectable after first dose, she commented, and measurable after the second--the same as with the killed vaccine.

### **Additional Notes**

"We're still learning about WNV in the United States," Ostlund stated. "We have history with it for about five years, but that's a much shorter experience than we have with many other diseases."

In that time, she said, researchers and practitioners have found out several additional facts about the disease and how it spreads. For one, she said that there is vertical transmission (from parent to offspring) in some mosquito species. "We don't know yet how important that is," she said. "The virus has been found in some (mosquito) egg floats." She also opined that for every horse which expresses clinical signs of WNV, 10 others are exposed and develop antibodies with no clinical signs. "Over a two-year period, 100% of our lab horses (which were housed outdoors in Iowa) seroconverted (began producing antibodies to the virus, indicating exposure to the disease) without ever having been vaccinated, and they didn't get sick," she said.

For horses which did get sick, she noted that head protectors were helpful, since ataxia and weakness are common to nearly every WNV case. "Slings are helpful for really severe cases," she said. "Many horses harm themselves in thrashing around, so nursing care is extremely critical.

"It seemed like horses that recovered did so fully," she went on. "But as we see more cases, we realize that not all recover fully quickly; recovery may take many months."

She added that mules and donkeys are not precluded from WNV infection.

### **WNV in 2004**

Ostlund listed the following lessons that researchers and practitioners have learned from the United States' WNV experience to date:

- Areas with WNV in horses will have it again (although probably in different horses);

- Additional areas/states will have WNV in horses (in the West);
- Detecting equine cases will help define WNV-active areas; and
- Equine infection areas define bridge areas (where mosquitoes are actively transmitting virus between birds and other species).

She also described the following expectations regarding future WNV activity and horse owner response:

- An increased number of horses will be vaccinated and/or have natural exposure;
- More facilities for WNV testing will influence the number of horses (and other species) tested;
- Testing facilities will expand and data collection will decrease (handled differently by different states); and
- More animal species will be identified as susceptible to rare clinical illness.

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