

# EEE, WEE & VEE



*Horse Care*

by **HEATHER SMITH THOMAS**

Eastern (EEE), Western (WEE) and Venezuelan (VEE) Equine Encephalomyelitis are arboviruses (arthropod-borne viruses) that can cause fatal neurologic disease in horses. These viruses are transmitted by blood-feeding insects, and mosquitoes are the primary vectors.

“The life-cycle of the viruses and their vectors can help you determine the geographic locations and seasons for risk for exposure,” says Dr. Kathy Seino (Washington State University). EEE, WEE and VEE are alphaviruses (part of the Togavirus family). West Nile Virus (WNV), another arbovirus that affects horses, is in the Flavivirus family.

EEE occurs primarily in the eastern part of the United States but has been seen as far west as Ohio. The first case was identified in Connecticut during 1937. It can affect horses and humans. “Horses don’t transmit EEE, as they are dead-end hosts, but they serve as a marker to show that it is in a certain area. EEE has come back into the picture a little more, now that West Nile has become endemic following its introduction in 1999. Last year, 185 cases of EEE were reported in horses, with 89 in Florida. There have been a number of human cases of well,” says Seino.

WEE occurs primarily in the western and Midwestern

U.S. “When it first was identified in outbreaks in the 1930s and 1940s that occurred primarily in California and surrounding western states, there were huge numbers of horses affected, and humans as well. Since that time, there have been very few cases. In the last eight or nine years, we have not seen any cases in humans and horses, probably due to the fact that there is an effective vaccine for horses,” she explains.

VEE is seen predominantly in South and Central America, with the first outbreak identified in 1935. There are still sporadic outbreaks. “This one is of great concern; it is a very important veterinary and public health problem in these regions because it can cause disease in humans and horses. In humans, it usually causes influenza-like symptoms, but in children and horses it can cause severe encephalitis,” she says.

Unlike with the other viruses, horses can actually develop a high enough level of virus or viremia to spread the disease. “Most mosquitoes—after biting an infected horse—can transmit VEE to people or to other horses,” she says.

Any suspected cases of VEE occurring in this country must be reported to the state veterinarian so that quarantine can be established. Fortunately for horsemen in the U.S., VEE has been seen very infrequently. “There was a huge outbreak in South America in 1969, that spread into Mexico and Texas in 1971, resulting in the deaths of an estimated 200,000 horses. There were several thousand human infections. By using an attenuated vaccine, health officials were able to shut down that outbreak. Since then, we carefully monitor for VEE and usually recommend—for horses who live on the bordering states next to Mexico—that owners may want to consider vaccinating their horses.”

The available VEE equine vaccines are inactivated or killed virus vaccines, but the vaccinated



*A horse with a high fever in a sling*

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horse will show a titer. "Some countries will not accept those horses, because they can't distinguish very easily between the vaccine titer and a true infectious titer. But if you have a horse at risk for being exposed, it may be worthwhile to vaccinate," she says.

"EEE, WEE and West Nile are three of the five core vaccines for horses recommend by the American Association of Equine Practitioners (AAEP). VEE is not considered a core vaccine, but should be considered in horses with potential risk of exposure," says Seino.

"For all of these vaccines, after the primary vaccine series you need to annually vaccinate one month before the mosquito season starts. It's important for owners to recognize when their mosquito season starts." This will vary from northern regions (May or June) to south (January or February). In an area with a long mosquito season you may need to revaccinate at least once, or maybe twice, before the season ends—when using an inactivated or killed virus product. In Florida, many horsemen vaccinate their animals every four months.

"There are many different equine vaccines available for these viruses. For prevention of EEE, WEE and VEE the inactivated or killed virus products are available as single formulation (monovalent) or as a combination (bi or trivalent). For West Nile Virus, there are three different vaccines commercially available. The earliest one that came on the market in 1999, is a killed virus vaccine (Innovator) which was followed by the recombinant canarypox vectored vaccine (Recombitek) in 2001, and then a chimera vaccine (PreveNile) in 2006. Your veterinarian can help you determine which vaccines to use, and the schedule best suited for your horse," she says.

Additional information for horse owners, and recommended vaccination schedules for adult horses and foals can be found online at the AAEP website of [www.aaep.org/vaccination\\_guidelines.htm](http://www.aaep.org/vaccination_guidelines.htm)

"Vaccines play a key role in prevention of disease. Maureen Long, DVM, PhD (Emerging Disease and Arbovirus Research and Test Lab, University of Florida), in a retrospective survey, looked at horses who were positive for EEE and succumbed to the disease. Most of them had an incomplete or no vaccination history," says Seino. Vaccination is reliable protection, as long as you make sure the horse is boosted at proper intervals, to keep immunity strong. Epidemiological studies of the outbreaks of West Nile Virus since 1999, have also supported the efficacy of the WNV vaccine in protection against this disease.

Controlling mosquitoes and reducing mosquito exposure are also a key part of prevention against arboviruses. Eliminate standing water, if possible. Some people use natural products (such as Mosquito Dunks) in ponds and tanks that will inhibit the mosquito larvae, or plant fish who will eat them. "Insect repellent such as DEET is also helpful, for both horses and humans, but you may need to reapply them

frequently, especially in a humid area or when you or your horse are sweating. You can also keep your horses indoors during the times mosquitoes are most active, such as dusk, and ride them during times of day when there's less mosquito emergence. Provide fans for air movement in stalls to prevent mosquitoes from feeding on horses," she says. Mosquitoes don't like to fly against a breeze.

Prevention is very important because there is no effective (anti-viral) treatment for encephalitis. Once a horse is bitten by an infected mosquito, the incubation period for EEE, WEE and VEE varies from two to three days and up to three weeks. Most horses develop inapparent infections. "Young and immunocompromised animals are most likely to develop clinical signs. These may manifest as moderate to high fever (102.5 to 104.5 degrees Fahrenheit), depression, inappetance, cranial nerve deficits (facial nerve paralysis, weakness of the tongue, difficulty swallowing), behavior changes (aggression, self-mutilation, drowsiness), gait abnormalities (ataxia, paresis), to more severe central nervous system signs (head pressing, circling, blindness, seizures)," she says.

"Treatment consists of good intensive nursing care and making sure the horse is well hydrated and has adequate nutrition, along with use of anti-inflammatories (NSAIDs, DMSO) to keep the fever down, and medication to control seizures," says Seino. The horse also needs good bedding to prevent bed sores, and a sling if he is down and unable to get up.

Mortality rate in horses infected with EEE is high (75 to 95 percent). The course of the disease with EEE may be very swift, and fatal, with death in two to three days after onset of clinical signs—despite intensive care. Horses with VEE and WEE are more likely to survive (with mortality rates 40 to 90 percent for VEE and 20 to 40 percent for WEE). Horses who do survive may have long lasting deficits, however," she says.

Duration of natural immunity (after a horse recovers from the disease itself) may be variable for the Alphaviruses such as EEE, WEE and VEE, but for the Flaviviruses like West Nile, natural infection seems to induce lifelong immunity. When West Nile first came to this country in 1999, there were hundreds of cases because the horse population was very susceptible. But now, after vaccination and many instances of natural exposure, the case numbers have dropped dramatically. Young horses, however, or horses that have never been exposed or vaccinated, are very vulnerable. Vaccination plays a key role in maintaining the low number of cases.

### Transmission From Primary Hosts

All of these viruses rely on mosquitoes for spread. The reservoir hosts for WNV, EEE, WEE and VEE are birds. Mosquitoes pick up the virus when biting the birds. For all but VEE, horses and humans are considered dead-end hosts.

"For West Nile, a number of other species may be involved as reservoirs, including reptiles such as alligators. It becomes more complicated for VEE. This virus has different sub-types. Some of these cause disease with lower pathogenicity

and are maintained between some of the mosquito species, such as *Culex*, and a type of rat. But when it becomes a more epizootic disease—affecting horses and humans and other species like dogs—it becomes a more pathogenic subtype. It seems to be maintained in certain regions by an endemic, low pathogenicity subtype, transmitted between the rats and the mosquitoes. When it makes the change, where it can affect horses and humans and causing more disease, it comes more directly from the mosquito,” she explains.

Most of the reservoir species, such as the rats or birds, live with the disease and pass it on, without becoming sick enough to die. With WNV, some birds develop titers and are not severely affected, but certain types of birds such as magpies and crows become sick—with a high viremia—and die. “This is one way we can tell that West Nile is in an area—when we see a die-off of these types of birds,” says Seino.

With EEE, there are actually two mosquitoes involved. The *Culex melanura* species maintains the life cycle of the virus between the reservoir avian bird host and the mosquito. But there are also some “bridge” vectors that can spread the disease to other animals. The *Aedes*, *Coquilletidia*, *Ochlerotatus* and *Culex* mosquitoes can take a blood meal from an infected bird and then bite a horse or human, transmitting EEE to these dead-end hosts. By contrast, with WNV, VEE and WEE, the virus cycles between certain birds and mosquitoes, with the horse and human as incidental hosts. 🐾

### The Importance Of Diagnosis

It is crucial to have an accurate diagnosis when dealing with nervous system disorders and diseases. A horse who shows clinical signs of encephalitis may be suffering from EEE, WEE, VEE, WNV or a number of other infectious diseases such as rabies, Equine Herpes Virus-1 or EPM. It’s important to establish a definitive diagnosis so that control measures can be taken, if needed, to protect other horses and humans.

The veterinarian can do a thorough physical exam and take a blood sample for testing. “A variety of diagnostic tests can be performed to determine the inciting agent, and this may involve testing blood and cerebral-spinal fluid

samples. The lab can do a MAC-ELISA test, looking for titers against some of these diseases. A positive IgM antibody titer greater than 1:400 (for EEE, WEE or WNV) on a MAC-ELISA test is considered diagnostic for these diseases. In horses that have a history of vaccination, a four-fold rise in neutralizing antibody titer from acute and convalescent blood samples (taken two to four weeks apart) is diagnostic. PCR tests for EHV-1, WNV and EEE are also available,” she says. Horses that show signs can also have a CSF tap to check the cerebral/spinal fluid. Handling of blood, CSF and tissue samples post-mortem should be done with care, to avoid human exposure to the disease. 🐾