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DIAGNOSTICS

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WEST NILE VIRUS

West Nile virus is an arthropod-borne virus (arbovirus) that was first identified in the West Nile district of Uganda in 1937, and has since been spreading worldwide. Currently, the virus has been found in Africa, Asia, Europe, the Middle East, and North America.

LIFE CYCLE

West Nile virus is transmitted by bloodfeeding insects such as mosquitoes, and perhaps by ticks. Avian species, especially wild birds, act as reservoir hosts, but the virus also can infect many other species as the end host. This includes humans, horses, dogs, cats, bats, chipmunks, skunks, squirrels, domestic rabbits, and domestic and exotic birds.

TRANSMISSION

Mosquitoes contract the virus by feeding on infected birds. The level of viremia is too low in species other than birds to infect mosquitoes. Infected mosquitoes transmit the virus to humans and animals via bites, causing West Nile viral encephalitis once the virus has multiplied and crosses the blood-brain barrier.

Many **avian species**, especially crows, harbor the virus with very high viral loads but without clinical signs of illness. Viremia usually occurs 1-4 days post-infection, but once recovered, immunity is life-long. An important early epidemiologic sign of the presence of West Nile virus in a region may be loss of birds (reduced numbers, ill or dying birds).

In **horses**, viremia occurs 5-7 days post-infection; and they are highly susceptible to clinical disease. Recovered cases are immune for life. Rabbits, rats, and guinea pigs are resistant to the virus, whereas the status of mice and hamsters is unclear. **Dogs** seroconvert upon exposure but are usually asymptomatic. **Cats** also seroconvert but rarely show clinical signs of illness. Humans and other primates can become infected and can develop encephalitis.

There is no documented evidence of animal-to-animal or animal-to-person transmission of West Nile virus. However, human-to-human transmission has been reported through organ transplantation or blood transfusion, and so this could be a means of transmission between animals. People, like veterinarians, who directly handle sick animals may be at risk and should take precautions to avoid contact with their saliva.

In areas where mosquitoes are known to carry the virus, less than 1% are actually infected. Even when people are bitten and infected by these mosquitoes, less than 1% become severely ill. Thus, the risk of becoming ill from a single mosquito bite is very low.

CLINICAL SIGNS

Horses: Infected horses most commonly show weakness, usually in the hindquarters. Widened stance, stumbling, leaning, toe dropping, and even paralysis can occur. Occasionally, they are febrile, depressed, or fearful. To date, more than 3,400 horses in 32 states have been infected throughout the United States. About 1 in 10 infected horses show symptoms of viral encephalitis, and about one-third of these die (mortality rate is about 35%).

Humans: Most human infections are relatively mild, with flu-like symptoms such as fever, headache, body aches, and sometimes skin rash and swollen lymph glands. In severe infections, signs include high fever, neck stiffness, muscle weakness, convulsions and paralysis. Death rates in such cases range from 3-15%, and are highest among the elderly. To date, more than 40 humans and countless wild birds have died of West Nile virus infection.

Other Animals: Most infected wild birds are found dead, and so descriptions of clinical signs in those birds are not readily available. Dogs and cats rarely show signs of illness, although there are recent reports of potentially infected dogs and

WEST NILE VIRUS (CONT'D)

cats. Affected animals are usually elderly and may be immunocompromised.

DIAGNOSIS (see Table)

Laboratory findings in infected **horses** may include lymphopenia and mild CPK or BUN elevations. CSF analysis reveals increased protein concentration and mononuclear pleocytosis. Differential diagnoses include rabies, Eastern and Western Equine Encephalitis, protozoal myeloencephalitis, bacteremia, and liver failure.

Horses: The test of choice is a serum IgM capture ELISA. A positive test result indicates recent infection. A PCR test for detection of West Nile virus is also available. Postmortem diagnostic specimens of choice include removal of the hindbrain and lumbar spinal cord, but precautions should be taken to avoid exposure to infected tissues.

TREATMENT

Horses are typically given anti-inflammatory agents (e.g. flunixin meglumine, DMSO, dexamethazone), mannitol, fluids, analgesics, sedation, slinging, and other supportive and nursing care.

PREVENTION

Equine Vaccination: A federally licensed West Nile virus vaccine is available for horses (Fort Dodge Animal Health, Overland Park, KS). The standard protocol is for a two-dose series followed by an annual booster, although in climates with year-round mosquito exposure, more frequent boosters may be given. The efficacy of the vaccine is uncertain.

VECTOR CONTROL

Reducing exposure to mosquitoes is the focus of preventative measures. Eliminating stagnant water and using screens on windows and doors will help control the mosquito population around homes and animal housing areas. Confining dogs and cats to areas where mosquito populations are lower should help. Avoid being outdoors at dusk and dawn during warm weather. If outdoor exposure is unavoidable, cover arms, legs and feet with clothing which should help reduce mosquito bites. For **humans**, use mosquito repellents on exposed skin and clothing (permethrin or 35% DEET). For **pet animals**, do **not** use human products that contain DEET (unsafe as they are too strong for dogs and cats). Use products labeled safe for dogs and/or cats.

WEST NILE VIRUS TESTS FOR HORSES

Test	Test code	Sample	Comments
West Nile Virus IgM Capture ELISA	85624	1 ml serum (spun SST or RTT).	Turn-around time is 7-10 days

WEST NILE VIRUS TESTS FOR AVIAN & OTHER SPECIES

West Nile Virus Titer	85448	1 spun GRT (with gel) or 1 spun SST. Minimum sample volume is 100 µl of plasma or serum.	This is a serum neutralization (SN) test and detects predominantly IgG. A positive SN titer may be due to current infection, previous infection, or vaccination. A negative SN titer may occur with acute infections, or failure of the bird to mount an appropriate IgG response. Turn-around time is 10-14 days.
West Nile Virus PCR Test	85449	1 unspun GRT (± gel) or LTT. Minimum sample volume is 200 µl of whole blood. Tissue samples – kidney (preferred), heart, or brain in a sterile RTT.	Turn-around time 5-7 days.
West Nile Virus Isolation	85450	Kidney, brain, or heart in a sterile RTT.	Turn-around time is 3-4 weeks.

KEY: **GRT** Green top Microtainer® tube (heparinized). Comes with or without separator gel
LTT Lavender top tube; Microtainer® LTT for avians

SST Serum separator tube; Microtainer® SST for avians
RTT Red top tube

References: www.avma.org (West Nile Virus, update Sept. 19, 2002); Vet Pract News 14(10):1 and 11, 2002.

LAB TIP

SAMPLES FOR VWD TESTING

Testing for von Willebrand disease is best performed on citrate anticoagulated plasma (BTT). If the sample is picked up and delivered by an Antech courier or the same day, submission of a full BTT of whole blood is acceptable. For longer transit times, the BTT should be spun at the clinic and plasma transferred to an empty RTT or plastic tube. To separate the plasma, use a plastic transfer pipet or small syringe and needle to aspirate the plasma down to just above the buffy coat layer. Do **not** attempt to decant (pour-off) the plasma. This is important because von Willebrand factor (VWF) is the largest plasma protein and tends to become layered at the bottom of the plasma compartment.

If all of the plasma is not harvested, the resultant VWF level could be lower than it is actually is *in vivo* as the largest multimeric forms of this protein have been left behind.