Pennsylvania Game Commission Wildlife Disease Reference Library

Eastern Equine Encephalitis (EEE)

Cause

Eastern Equine Encephalitis (EEE) is an infectious viral disease that is maintained in bird reservoirs, transmitted by mosquitoes, and sometimes causes fatal neurological disease in mammals. The first reports of EEE in horses in the eastern United States probably date back to the 1800's, but the virus was not isolated until 1993.

Significance

EEE infects humans rarely, and only a few cases a year are reported in the United States. Most people infected with this virus will show no clinical signs of illness; however, some will exhibit headache and fever followed by severe neurological disease. Overall, EEE has a 33% mortality rate in humans, and those who survive often suffer significant brain damage.

EEE has recently been reported in white-tailed deer, but it does not seem to be a significant cause of mortality in deer populations.

Species Affected

EEE causes subclinical infection in a wide variety of wild birds. The virus has been known to cause mortality in the glossy ibis and several species of birds that are not native to the United States, including pigeons, house sparrows, pheasants, chukar partridges, white Peking ducklings, and emus. The virus has been known to cause disease in horses, humans, and pigs, but more recently EEE has been found to cause disease in white-tailed deer. EEE also infects rodents.

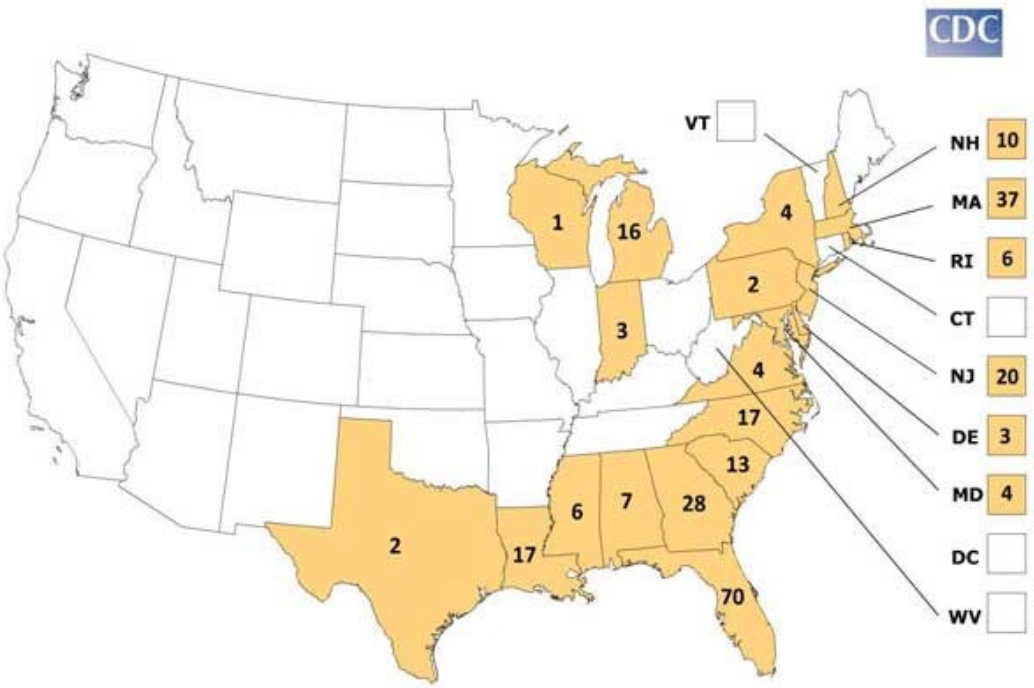
Distribution

EEE occurs throughout Eastern North America, primarily on the Atlantic and Gulf coasts. The virus's distribution extends down into Central and South America as far south as Argentina. EEE has been isolated in white-tailed deer in Michigan, Georgia, and Wisconsin.

Transmission

The EEE virus is transmitted by mosquito vectors. The type of mosquito primarily responsible for transmission is the *Culiseta* genus, which feeds on birds. These

mosquitoes pick up the virus when taking a blood meal from infected birds and then transmit the virus to uninfected birds in a similar way. Mammals can become infected by mosquito species that feed on both birds and mammals, mainly the *Aedes* group and the *Coquillettidia* group. Virus transmission occurs primarily in the summer and fall when mosquito populations are largest.



Total human cases of Eastern Equine Encephalitis reported by state from 1964 through 2010; map courtesy of cdc. gov

Mammals are generally considered dead-end hosts because they do not produce enough virus particles in their blood to infect a new mosquito. Only birds produce enough virus, which is why birds are a natural reservoir for EEE. Occasionally infected horses may produce large enough amounts of virus to infect a mosquito, but this is only for a short period of time. The potential of deer to be a host for this virus is being investigated.

Humans may potentially be exposed if brain or spinal cord tissue of an infected animal comes into contact with the eyes or an open wound. Infectious material may also become aerosolized and be inhaled when hunters saw through brain tissue to remove the antlers. These modes of transmission of EEE virus to humans are probably unlikely, but it is important to be cautious.

Clinical Signs

White-tailed deer and horses may exhibit clinical signs of neurological disease 1-3 weeks following infection. Clinical signs include lethargy, confusion, loss of coordination, head tilt, circling, blindness, muscle paralysis, loss of fear, difficulty breathing, emaciation, and death. Most birds do not show clinical signs of disease.

Diagnosis

Virus isolation or other laboratory tests are needed to confirm a diagnosis of EEE. Clinical signs of EEE in white-tailed deer can be similar to those of chronic wasting disease (CWD) and other neurological conditions, so it is important to run the appropriate tests to find the cause of clinical illness.

Treatment

There is no specific treatment for EEE. Horses may be treated with symptomatic supportive care, but treatment of wild, free-ranging animals is typically impractical.

Management/Prevention

There is currently no vaccine approved for use in deer as there is for horses . Mosquito control is the primary method of control and prevention of EEE. People should protect themselves by using insect repellants and wearing protective clothing while outside during mosquito season. It is also important to eliminate mosquito breeding sites (standing water) and make sure that all house screens are in tact to keep mosquitoes out. Hunters are also reminded not to shoot or consume sick animals. Horse and white -tailed deer cases may be useful as sentinels for increased risk of human exposure to EEE virus.

Suggested Reading

Centers for Disease Control and Prevention (CDC). 2011. Eastern Equine Encephalitis. <http://www.cdc.gov/EasternEquineEncephalitis/>.

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