

Western Equine Encephalitis

Western equine encephalitis is a disease that is spread to horses and humans by infected mosquitoes. Western equine encephalitis is one of a group of mosquito-borne virus diseases that can affect the central nervous system and cause severe complications and even death. Other similar diseases are eastern equine encephalitis, St. Louis encephalitis, and LaCrosse encephalitis. Western equine encephalitis is found in the plains regions of the western and central United States. While there is no specific treatment for western equine encephalitis, prevention involves controlling mosquitoes and avoiding mosquito bites.

What Causes Western Equine Encephalitis?

Western equine encephalitis is caused by the western equine encephalitis virus, an arbovirus. Arbovirus is short for arthropod-borne virus. Arboviruses are a large group of viruses that are spread by certain invertebrate animal, mainly blood-sucking insects. In the United States, arboviruses are usually spread by infected mosquitoes. Birds are often the source of infection for mosquitoes, animals, and, in rare cases, people.



Transmitting Western Equine Encephalitis

The virus that causes western equine encephalitis has a complex life cycle involving birds and a specific type of mosquito, *Culex tarsalis*, that is common in farming areas and around irrigated fields. Humans, horses, and other mammals are not an important part of the life cycle of the western equine encephalitis virus. In rare cases, however, people who live in or visit an area where the western equine encephalitis virus lives can be infected by the bite of an infected mosquito. Horses are common in these regions and can also be infected. After infection, the western equine encephalitis virus invades the central nervous system, including the spinal cord and brain. Diagnosis of western equine encephalitis is based on tests of blood or spinal fluid.

Who's at increased Risk for Western Equine Encephalitis?

While anyone can get western equine encephalitis, some people are at increased risk, including those who:

- Live in or visit areas where the disease is common
- Work outside in areas where the disease is common
- Participate in outdoor recreational activities in areas where the disease is common

Western equine encephalitis occurs in all age groups. Major complications, including brain damage, are reported in about 13 percent of infected people overall and in about a third of infants diagnosed with western equine encephalitis. Western equine encephalitis is fatal to about 3 percent of those who develop severe symptoms. There is no specific treatment for western equine encephalitis. Antibiotics are not effective against viruses, and no effective antiviral drugs have been discovered. Caring for patients with western equine encephalitis involves treating the symptoms and complications.

Western Equine Encephalitis Statistics

Western equine encephalitis is a relatively rare disease in humans that can occur in isolated cases or in epidemics. Since 1964, 639 human cases of western equine encephalitis have been confirmed in the United States. Fewer than five western equine encephalitis cases are reported each year. In the United States, western equine encephalitis cases in humans are usually first seen in June or July. The risk of exposure to

western equine encephalitis has been increasing in recent years as people move into previously undeveloped areas where the western equine encephalitis virus lives.

Geographic Distribution and Distribution History

1. First isolated in the Joaquin Valley of California in 1938
2. Found only in the Western Hemisphere
3. Distribution reaches from Argentina to northern and western Canada

Host Range

1. Natural Vertebrate Hosts
 - a. Humans
 - i. Develop infection
 - ii. Dead-end host only
 - b. Domestic Animals
 - i. Equids develop infection but are dead-end hosts
 - ii. Other domestic ungulates are susceptible to infection
 - iii. Domestic birds may serve in a limited reservoir host capacity
 - c. Wild Animals
 - i. Birds, mammals, reptiles and amphibians
 1. passerine birds (particularly finches and sparrows) serve as the primary amplifying hosts
 2. wild mammals become infected but do not contribute to amplification
 - a. evidence strongly suggests a transmission cycle involving blacktail jackrabbits

Disease Manifestation

1. Humans
 - a. Mild febrile illness, aseptic meningitis, encephalitis, chills, nausea, vomiting, occasional respiratory symptoms
 - b. Case fatality rate: 10%
 - c. Young children and older adults at higher risk of developing serious disease
 - d. Human fetus can be infected in utero sometimes resulting in severe neurologic sequelae
 - e. Incubation period of 5 to 10 days
 - a. Death usually occurs within 1 week after onset of symptoms
2. Domestic Animals
 - a. Equid infection characterized by fever, incoordination, drowsiness, prostration, coma, and death
 - i. Case fatality rate in horses: approx. 40%
 - ii. Other ungulates do not usually develop symptomatic infection
 - b. Domestic birds such as chickens develop asymptomatic infection
 - i. Emus develop symptomatic, often fatal, disease
3. Wildlife
 - a. Passerine birds serve as hosts in the enzootic cycle; virus can cause fatal disease in sparrows
 - b. Bats, gray squirrels and ground squirrels become infected
 - i. Blacktail jackrabbits develop infection and viremia capable of infecting mosquitoes; serves as a host in a subsequent transmission cycle
4. Incidence
 - a. 639 confirmed cases in the U.S. since 1964

Ecology

1. Natural Vectors
 - a. The primary vector is *Cx. Tarsalis*
 - b. Isolations have been from *Ae. melanimon* and *Ae. dorsalis*
2. Reservoir Hosts
 - a. Passerine birds serve as the primary amplifying hosts
 - b. The blacktail jackrabbit has been found to be an amplifying host and the vector is *Ae. melanimon*
1. Basic Transmission Cycle
 - a. WEE virus is amplified in the blood systems of wild passerine birds
 - b. Mosquito vectors become infected by feeding on birds that have viremia
 - c. *Cx. Tarsalis* is the amplifying vector as they transmit virus from one bird to another and also to tangential hosts such as humans and horses
 - d. Blacktail jackrabbits become infected and transmit WEE virus to *Ae. melanimon*

Problems

1. Maintenance/overwintering mechanisms unknown
2. No licensed vaccine for human use

Literature Cited

Calisher, C.H. 1994 Medically Important Arboviruses of the United States and Canada. Clin. Microbiol. Rev. 7(1):89-116.

[CDC] Centers for Diseases Control and Prevention. Factsheet: Western Equine Encephalitis. 2004 Dec 2. CDC homepage. <http://www.cdc.gov/ncidod/dvbid/arbtor/weefact.htm>.

Griffin, D.E. 2001. *Alphaviruses*. Fields Virology. 4th ed. pp. 935-937.

Monath, T.P. ed. The Arboviruses: Epidemiology and Ecology, vol. III. Florida: CRC Press. 1988.