



THE NORTHEAST WILDLIFE DISEASE COOPERATIVE

<http://sites.tufts.edu/nwdc>

Epizootic Hemorrhagic Disease

Other Names: Hemorrhagic disease

Cause

Hemorrhagic Disease (HD) is caused by either Epizootic Hemorrhagic Disease Virus (EHD) or Bluetongue Virus (BT), which are closely related viruses. Outbreaks of disease similar to HD have been described since 1890, but the virus was not isolated until an outbreak in New Jersey white-tailed deer in 1955. The BT virus was isolated from white-tailed deer and bighorn sheep with HD in Texas in 1966. There is recent evidence that new variants of the EHD virus are now present in North America and that the virus, and presumably its vector, are expanding their ranges.

Significance

Hemorrhagic disease is one of the most common infectious diseases of white-tailed deer in the eastern United States and can cause a significant number of deaths during an outbreak. It is considered an emerging disease in other parts of North America.

Species Affected

White-tailed deer and mule deer are the primary wildlife species affected by EHD. It has caused severe mortality in at least one outbreak of the disease in bighorn sheep. Elk can become infected with this disease, but they do not seem to be as susceptible as white-tailed deer. EHD rarely causes disease in domestic animals. While BT is a well-known disease of sheep, cattle, goats, and can infect domestic dogs, it is also occasionally associated with the deaths of pronghorn antelope. The viruses are not known to cause disease in humans.

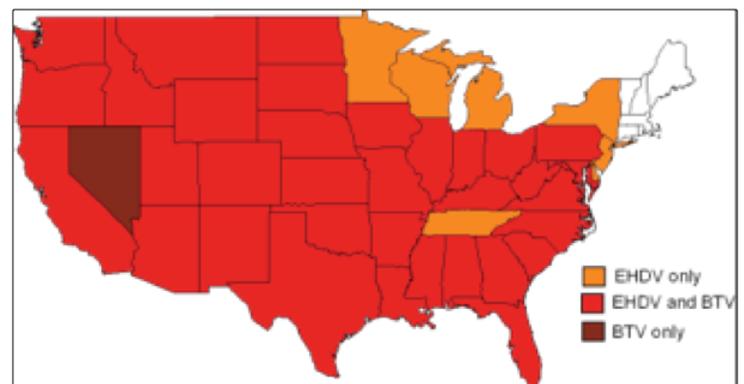
Distribution

EHD and BT viruses are found worldwide in temperate

and tropical climates, but they have only been reported in free-ranging wildlife in North America. In the United States, HD has been confirmed in most eastern and southeastern states as well as several states in the Midwest, the plains states, and northwest. There have also been sporadic cases reported in British Columbia, Alberta, and Saskatchewan in Canada.

Transmission

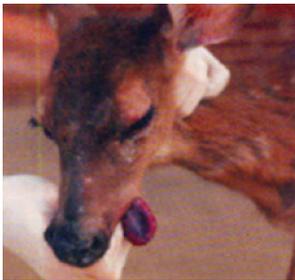
The EHD and BT viruses are both transmitted by biting flies or midges from the *Culicoides* group. Female midges take up the viruses by ingesting the blood of an infected animal and then transmit the viruses when they feed on an uninfected animal. Midges preferentially breed in mud; therefore outbreaks usually occur when deer congregate at water sources during the driest part of late summer and early fall when seasonal midge activity is at its peak and water levels are at or near their lowest points. Outbreaks end when the first hard frosts kill the midges, causing the virus to die along with the insects.



Known distribution of EHD and BT in the United States, 2014. Data for this map was compiled from virus isolation results from the National Veterinary Services Laboratories, Veterinary Services, Animal and Plant Health Inspection Service, United States Department of Agriculture, Ames, IA, and the Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, The University of Georgia, Athens, GA.

Epizootic Hemorrhagic Disease

Though *Culicoides* does not occur naturally in all parts of the United States, the insect is known for its ability to be transported to new areas on wind currents. Animals that live in areas where this primary vector is usually absent do not have any built-up immunity to the virus. As a result, when outbreaks of HD do occur, there are high mortality rates among white-tailed deer populations in these areas. In areas where the vector is found normally, immunity is more prevalent and mortality rates are lower.



Swollen tongue



Ulcers on tongue



Interrupted hoof growth

Photos courtesy of the Southeastern Cooperative Wildlife Disease Study

Clinical Signs

Clinical signs of hemorrhagic disease are all a result of the damage that the virus does to the walls of the blood vessels. They can range from sudden death to chronic disease. White-tailed deer usually develop clinical signs about 7 days following infection with the EHD or BT virus, but some animals may remain asymptomatic. Clinical signs include swelling of the face or neck, loss of appetite, lethargy, weakness, lameness, respiratory distress, fever, and excessive salivation. Deer with EHD will often have ulcers in the mouth and may bleed from the nose and/or mouth. Infected animals may develop swollen, bluish tongues. Frequently, infected deer will go into shock and die within 8 to 36 hours of the onset of clinical signs. Necropsy of animals that die of HD will often reveal extensive hemorrhage from the internal organs, including the heart, liver, kidneys, lungs, spleen, and intestines. Those that survive may exhibit hoof overgrowth and have indentations or cracks in the walls of their hooves (see photos).

Diagnosis

Laboratory tests are used to isolate the EHD or BT virus from infected tissues. Blood, spleen, and lung are preferred for virus isolation.

Treatment

There is currently no treatment for hemorrhagic disease in wildlife populations.

Management/Prevention

Hemorrhagic disease can cause very high mortality rates and is considered the most important viral disease of white-tailed deer in the United States. Both free-ranging and captive deer and elk are at risk of contracting HD, and transporting infected animals to areas where HD is not yet present has spread the disease. The impact of this disease on local deer populations is not thought to be long lasting, but it is important to test suspect cases in order to identify outbreaks of HD. Insect control could theoretically decrease transmission of EHD and BT viruses in captive herds, but it has not proven to be feasible or effective in the past. A vaccine has been developed for use in captive white-tailed deer populations, though it is not approved for wild populations.

Suggested Reading

- Bluetongue. General Disease Information Sheets. OIE: World Organisation for Animal Health. www.oie.int/en/animal-health-in-the-world/disease-information-summaries
- Howerth, E. W., D. E. Stallknecht, and P. D. Kirkland. 2001. Bluetongue, epizootic hemorrhagic disease, and other orbivirus-related diseases. Pages 77-97 in E. S. Williams and I. K. Barker, editors. Infectious diseases of wild mammals. Iowa State University Press, Ames, Iowa, USA.
- Michigan Department of Natural Resources. Wildlife Disease. Epizootic hemorrhagic disease (EHD) in white-tailed deer. www.michigan.gov/dnr/0,1607,7-153-10370_12150_12220-26647--,00.html
- Sleeman, J. M., J. E. Howell, W. M. Knox, and P. J. Stenger. 2009. Incidence of hemorrhagic disease in white-tailed deer is associated with winter and summer climatic conditions. *EcoHealth* 6: 11-15.