EASTERN EQUINE ENCEPHALITIS

MICHIGAN 2019 OVERVIEW

Coquillettidia perturbans





EASTERN EQUINE ENCEPHALITIS (EEE)

- EEE is an **arboviral illness** a virus that is carried and spread by mosquitoes.
- In nature, EEE is carried by birds and mosquitos that like to bite birds. When a
 mosquito bites a bird with EEE, the mosquito becomes infected and can
 pass the virus on to the next animal it bites. Mammals and people can get
 EEE if they are bitten by an infected mosquito.
- You can't get EEE from a sick person or animal; only from the bite of an infected mosquito.
- Michigan usually has 0-3 human cases of EEE per year.
- 2019 was an unusual year for EEE in Michigan.





EASTERN EQUINE ENCEPHALITIS VIRUS CYCLE







EEE IN HUMANS



Illness begins 4-10 days after a bite from an infected mosquito

Abrupt onset of fever, chills, achiness and/or joint and muscle pain

When the brain is infected, onset can be swift and include fever, headache, and confusion – this is referred to as "neuroinvasive" disease

 1/3 of cases result in death, typically within 2-10 days of illness onset

Those who survive often have long-lasting brain damage; many become disabled and some require lifelong care





EEE IN ANIMALS



- Other mammals can become ill from EEE EEE is especially severe in horses
 - If a horse becomes ill with EEE, it means that there is also a risk to people in that area
 - MDHHS works with the Michigan Department of Agriculture to monitor for EEE in horses
 - There is a EEE vaccine available for horses
- MDHHS also works with the Michigan Department of Natural Resources to monitor EEE in wild animals, such as deer





DIAGNOSIS



When a doctor suspects that a patient might have EEE, they can order testing from the MDHHS Bureau of Laboratories (free of charge), or from a commercial lab

- Testing is performed on blood (serum) and/or spinal fluid
- Testing should also be done for other similar arboviral diseases, like West Nile virus
- If testing is ordered from a commercial lab, additional testing at MDHHS may be needed for confirmation
- Animals that are suspected to have EEE can be tested at Michigan State University's Veterinary Diagnostic Lab

In some cases, laboratory confirmation can take **several weeks**

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EEE IN THE UNITED STATES: HUMAN NEUROINVASIVE* CASES 2009-2018

Eastern equine encephalitis virus neuroinvasive disease cases reported by state of residence, 2009–2018



Source: ArboNET, Arboviral Diseases Branch, Centers for Disease Control and Prevention

EEE human neuroinvasive cases, United States, 2009-2018



*Neuroinvasive means "affecting the brain or spinal cord"





2019 EEE OUTBREAK

In 2019, Michigan and several other states experienced an unusually high number of animal and human EEE cases



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INFECTIO



EEE IN THE U.S. HUMAN NEUROINVASIVE CASES, 2019





*EEEV veterinary disease cases, or infections in mosquitoes, birds, or sentinel animals



State	Neuroinvasive disease cases	Deaths
Alabama	1	1
Connecticut	4	3
Georgia	1	0
Indiana	1	1
Massachusetts	12	6
Michigan	10	6
New Jersey	4	1
North Carolina	1	0
Rhode Island	3	1
Tennessee	1	0
Total	38	19

BRIEF HISTORY OF EEE IN MICHIGAN

- 1942-43: Large horse outbreak in SW Michigan, 469 horse cases
 - EEE virus isolated from brain tissue of dead horses in 1942 and 1943
- 1973-75: Second outbreak of EEE in Michigan horses. Started in Oakland County, extended widely with scattered horse cases in SE Michigan. First mosquito and bird investigations.
- 1980: First human case of EEE in Michigan, in a 10 year old boy from St. Joseph county
- 1980-83: Third outbreak of EEE in Michigan. EEE virus isolated from mosquitoes in state for first time, second human case.
- 1989, 1991, other years: outbreaks among animals
- 1991: SE & SW Michigan horse outbreak with two human cases.
- 1990s-2000s: Several sporadic cases and outbreaks, 1995 in particular
- 2010: Outbreak with three human cases and 132 horse cases.
- 2019: Largest human outbreak ever: 10 human cases, 6 fatal.





GEOGRAPHY OF EEE IN MICHIGAN

- Historically, southwestern Michigan has been the area with the highest number of human and animal cases
- This is likely related to the area having lots of swamps and bogs, which provide habitat for the mosquitos that carry EEE







HUMAN CASES OF EEE IN MICHIGAN, 2003-2019







2019 EEE ACTIVITY IN MICHIGAN

- 10 human cases
- 50 animals tested positive, across 20 counties
- Positive animals included horses, deer, and wolves.
- Onset dates: July 22– Oct 11

EEE Activity in Michigan, 2019 No EEE cases reported County with animal EEE case(s) County with human EEE case(s)





2019 HUMAN EEE CASES IN MICHIGAN

- 10 Cases including 6 fatalities
- This is the most human cases Michigan has ever recorded in a single year
- Age range: 14-78 years
- Median age: 63 years
- Onset dates: Aug 9 Sept 20







2019 EPIDEMIC CURVE



DECISION TO INITIATE AERIAL TREATMENTS

- As of late September, human and animal cases were continuing to be identified
- Weather for Sept/Oct was predicted to be mild, allowing mosquitos to remain alive and active
- The species of mosquito that transmits EEE was still being caught in traps
- Determined that a public health emergency existed
- Identified a contractor to perform treatments, obtained needed permits and waivers for pesticide application
- Notified the public
- Residents of treatment areas given the chance to opt-out with at least 48 hours notice
- Accepted opt-out requests online as well by email and phone







AERIAL TREATMENT, 9/28-10/10/2019

- Opt outs gathered 24 hours a day
- Phone answered at state health department 8 am to 8 pm, 7 days/week
- Updated treatment maps daily based on opt outs received
- Daily calls with internal and external response partners
- Monitor weather for potential flight plan each day
- Alert local health of proposed treatment areas; put out daily press releases, updated website
- Monitored poison control, hospital data each day
- 557,000 acres treated





AERIAL TREATMENT DETAILS

- Aerial treatment involves the use of specially equipped airplanes, which spray a very fine mist of
 product as they fly. The tiny droplets drift through the air and kill adult mosquitos that are flying
 around.
- In an outbreak, aerial treatment is the most effective control method when large areas must be treated quickly.
- Spraying from an aircraft allows treatment to be applied in places where trucks can't go (like swamps and wooded areas).
- Aerial treatment has been used in many other states.
- Monitoring of poison control and hospitals found no human illness associated with the treatment.
- No large-scale pollinator deaths were reported.





Perspective Eastern Equine Encephalitis Virus — Another Emergent Arbovirus in the United States

David M. Morens, M.D., Gregory K. Folkers, M.S., M.P.H., and Anthony S. Fauci, M.D.

November 21, 2019 N Engl J Med 2019; 381:1989-1992 DOI: 10.1056/NEJMp1914328

"In the absence of vaccines or specific treatments, state and local health departments can provide early warning of imminent human infections by surveilling equids, birds, and mosquitoes; however, even these blunt prevention tools are continuously threatened by underfunding of public health efforts."

"Arbovirus threats are not easily thwarted by piecemeal efforts."

"Although EEE is not yet a disease of major national importance, this year's spike in cases exposed our inadequate preparation for emergent disease threats. Though the best way to respond to these threats is not entirely clear, to ignore them completely and do nothing would be irresponsible."

TAKE-HOME MESSAGES

- 2019 marked the most human cases Michigan has ever recorded in a single year
- Arboviral illnesses are reported every year in Michigan
- Outbreaks of EEE can occur in large areas of the state
 - Risk varies each year
 - Weather and geography influence both historical and regional risk
- To better anticipate disease risk, more mosquito surveillance is needed
- Controlling mosquitoes & arboviral diseases is complicated work that requires community support and sustained funding
- Preventing human disease requires a coordinated approach





SELECTED REFERENCES

- MDHHS. EEE and Aerial Spraying Frequently Asked Questions. https://www.michigan.gov/documents/mdhhs/FAQs_EEE_Response_v9.272_666971_7.pdf
- CDC. Eastern Equine Encephalitis: Frequently Asked Questions. https://www.cdc.gov/easternequineencephalitis/gen/qa.html
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- Lindsey NP, Martin SW, Staples JE, Fischer M. Notes from the Field: Multistate Outbreak of Eastern Equine Encephalitis Virus United States, 2019. MMWR Morb Mortal Wkly Rep 2020;69:50–51. <u>http://dx.doi.org/10.15585/mmwr.mm6902a4</u>
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- Clarke. Merus 3.0 Adulticide: Frequently Asked Questions. https://www.clarke.com/filebin/productpdf/Merus_3.0_FAQ_FINAL_9-27-19.pdf
- Boyce WM, Lawler SP, Schultz JM, McCauley SJ, Kimsey LS, Niemela MK, Nielsen CF, Reisen WK. 2007. Nontarget effects of the mosquito adulticide pyrethrin applied aerially during a West Nile virus outbreak in an urban California environment. *Journal of the American Mosquito Control Association* 23(3): 335-339.





www.michigan.gov/eee

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Michigan **Emerging Disease Issues**

Diseases that may affect humans or animals.

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Ficks and Your Health

Mosquitoes and Your

Health

Being Safe Around Animals

Bed Bugs, Head Lice, and Scabies

Diseases affecting vildlife

EMERGING DISEASE ISSUES Eastern Equine Encephalitis

2019 EEE Outbreak Response

EEE Press Releases

All areas planned for treatment have been completed. No further areas are currently slated for treatment.

Total treated acreage is more than 557,000 acres. Please refer to the Aerial Treatment Zones Map and County-level Aerial Treatment Maps for more details of the identified zones' locations.

Search

- EEE Response Frequently Asked Questions
- EEE Response Frequently Asked Questions (Spanish Translation)
- EEE Response Frequently Asked Questions (Arabic Translation)
- Aerial Treatment Zones
- County-level Aerial Treatment Maps
- Video of Aerial Treatment Planes Warming Up
- Video of Aerial Treatment Planes Taking Off

Eastern Equine Encephalitis (EEE) is carried by certain types of mosquitoes in Michigan. It is a potentially serious disease that can affect anyone, but children and people over age 60 are more likely to get the more severe form of EEE illness. EEE is found primarily in areas with swamps and bogs. The risk of bites from infected mosquitoes is highest for people who work or play outdoors in these areas. Wearing insect repellent when outdoors (especially at dawn and dusk) is important to prevent EEE.

EEE is also a serious disease in horses. Protecting horses with approved EEE vaccines is an important prevention measure.

Weekly Summary: Arbovirus activity, including Eastern Equine Encephalitis in Michigan

Arbovirus* Activity, Including EEE and West Nile Virus:

Year-End Summary, Michigan 2019

*Arboviruses are viruses transmitted by mosquitoes or other insects

Michigan counties with reported EEE activity



Highlights



Updated: April 19, 2020

2019 Michigan Arbovirus Surveillance (click links below to see cases by county)		
Human Eastern Equine Encephalitis cases reported	10	
Animal Eastern Equine Encephalitis cases reported	50	
West Nile virus Positive Mosquito Pools	57	
Total Number of Mosquito Pools Tested	1,540	
Total Number of Mosquitoes Tested	31,995	
Human WNV cases	12	
Human California Group virus cases	3	
WNV asymptomatic, viremic blood donor	5	
Equine/Other Animal WNV cases reported	1	
Avian WNV cases reported	19	

In 2019, Eastern Equine encephalitis virus (EEE) infected 10 Michigan residents (1 Barry, 2 Berrien, 1 Calhoun, 2 Cass, 3 Kalamazoo, and 1 Van Buren) with 6 fatalities.

EEE also infected 50 animals (2 Allegan, 5 Barry, 1 Berrien, 3 Calhoun, 4 Cass, 1 Genesee, 1 Eaton, 1 Houghton, 5 Jackson, 9 Kalamazoo, 2 Kent, 1 Lapeer, 1 Leelanau, 1 Livingston, 1 Montcalm, 1 Newaygo, 1 Ontonagon, 7 St. Joseph, 1 Tuscola, and 2 Van Buren). West Nile virus (WNV) sickened 12 Michigan residents (1 Bay, 2 City of Detroit, 1 Genesee, 1 Kent, 2 Macomb, 1 Marauette, 1 Oakland, 1 Presque Isle and 2 Wayne) and routine testing of the blood supply identified WNV in 5 Michigan blood donors

Additionally, 3 Michigan residents (1 Cass, 1 Genesee and 1 Washtenaw) were infected with a California group virus.

Animal Cases







