



# Eastern Equine Encephalitis



Nike Shoyinka MD MPH Medical Director Ingham County Health Department

# Health department says threat of EEE still alive

Branch-Hillsdale-St. Joseph Community Health Agency Health Officer Rebecca Burns says some hard frosts are still needed to completely kill off mosquitoes

Thursday, October 24, 2019 9:09 a.m. EDT by Ken Delaney

# 5th person in Michigan dies of EEE mosquito virus. Risk still high despite frost advisory

 Kristen Jordan Shamus, Detroit Free Press
 Published 4:48 p.m. ET Oct. 14, 2019 | Updated 8:20 p.m. ET Oct. 14, 2019

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A fifth person has died in Michigan from the rare but dangerous mosquito-t Eastern equine encephalitis virus, state health officials said Monday. Horse euthanized after showing signs of EEE virus in Michigan's Thumb

Updated Oct 10, 2019;Posted Oct 10, 2019

## MDHHS reviews eastern equine encephalitis response, plans for years to come

by Callie Rainey | Newschannel 3 | Tuesday, October 8th 2019



# EEE threat grows in Michigan: 12 counties now considered high-risk

Kristen Jordan Shamus, Detroit Free Press Published 11:30 a.m. ET Sept. 25, 2019 | Updated 6:42 a.m. ET Sept. 26, 2019



### Worst Outbreak in 50 Years: EEE Virus Having Widespread Impact

10-11-2019 - Caitlin Burke

### EEE - History

- 1831 Encephalomyelitis virus affects horses in Massachusetts
- 1933 Virus isolated from horse
- 1937 Virus identified in ring necked pheasant
- 1938 Virus isolated in human brain
- 1942 1943 Michigan epidemic
- 1947 Louisiana and Texas
  - o 14000 cases 83% fatality rate
- 1951 Isolated from the Culiseta melanura
- 1959 Largest recorded EEV outbreak NJ, 32 lab confirmed human cases



### EEE - Virus

- Arbovirus Arthropod borne
- Mosquito borne alpha virus
- Most virulent variant is found in North America
- Causes one of the most severe encephalitides in North America



### **Clinical Features**

- Incubation period 4-10 days
- Asymptomatic
- Systemic disease
  - Headache
  - o Fever
  - Myalgia /arthralgia
  - Flu-like symptoms
- \*Infection confers life long immunity

- Neuroinvasive disease
  - o Fever
  - Headaches
  - Altered mental status
  - o Seizures
  - Permanent neurological sequlae - 50%
  - Mortality 30%
- \*4-5% of infections result in invasive disease

### EEE - Vector

- Main vector Culiseta Melanura
- Bridge Vector
  - o Coquillettidia sp
  - o Aedes spp
  - o Ochlerotatus spp
  - o Culex spp



### **EEE Transmission**



nemassmosquito.org

### EEE cases reported by month of illness onset



Lindsey, Nicole P., J. Erin Staples, and Marc Fischer. "Eastern equine encephalitis virus in the United States, 2003–2016." The American journal of tropical medicine and hygiene 98.5 (2018): 1472-1477.

# **EEE Transmission**

Outbreaks are hard to predict

Transmission heavily dependent on

- Temperature
- Precipitation
- Human activity
- Vector and Host spread



# EEE - Epidemiology



Counties reporting Eastern equine encephalitis virus activity to ArboNET, United States, 2003-2016. \*Human disease cases reported by state and county of residence.

EEE - Epidemiology



https://www.cdc.gov/easternequineencephalitis/tech/epi.html

### EEE - Michigan



### Arbovirus\* Activity, Including EEE and West Nile Virus:

### Weekly Summary, Michigan 2019

\*Arboviruses are viruses transmitted by mosquitoes or other insects





Animals testing positive for EEE infection





Human cases of EEE and other arboviruses reported

| 2019 Michigan Arbovirus Surveillance<br>(click links below to see cases by county)  |             |
|---|-------------|
| Human Eastern Equine Encephalitis cases<br>reported   | 10          |
| Animal Eastern Equine Encephalitis cases<br>reported  | 46          |
| West Nile virus Positive Mosquito Pools   | 54          |
| Total Number of Mosquito Pools Tested   | 1,532       |
| Total Number of Mosquitoes Tested   | 31,606      |
| Human WNV cases   | 9           |
|   |             |
| Human California Group virus cases  | 2           |
| Human California Group virus cases WNV asymptomatic, viremic blood donor  | 2<br>5      |
| Human California Group virus cases         WNV asymptomatic, viremic blood donor         Equine/Other Animal WNV cases reported | 2<br>5<br>1 |

### Highlights

- This year, Eastern Equine encephalitis virus (EEE) infected 10 Michigan residents (1 Barry, 2 Berrien, 1 Calhoun, 2 Cass, 3 Kalamazoo, and 1 Van Buren) with 5 fatalities.
- EEE has also infected 46 animals (2 Allegan, 5 Barry, 1 Berrien, 3 Calhoun, 3 Cass, 1 Genesee, 1 Eaton,5 Jackson, 9 Kalamazoo, 2 Kent, 1 Lapeer, 1 Livingston, 1 Montcalm, 1 Newaygo, 7 St. Joseph, 1 Tuscola and 2 Van Buren).
- West Nile virus (WNV) has sickened 9 Michigan residents (1 Bay, 2 City of Detroit, 1 Genesee, 1 Macomb, 1 Marquette, 1 Oakland, and 2 Wayne) and routine testing of the blood supply identified WNV in 5 Michigan blood donors.
- Additionally, 2 Michigan residents (1 Genesee and 1 Washtenaw) were infected with a California group virus.



### **EEE-** Public Health Response

- Source reduction
- Surveillance
- Control
- Communication

# EEE - Public Health Response -Communication

- Timely collection/dissemination of information about disease distribution
- Effective communication and support about disease reduction and prevention

### Healthcare providers

- Reporting
- Increased clinical suspicion
- Testing



LANSING, Mich. – Michigan residents are being reminded by the Michigan Department of Health and Human Services (MDHHS) to protect themselves from mosquito bites following the confirmation of one case of a mosquito-borne disease in a resident and three other possible cases in the state.

Three cases of Eastern Equine Encephalitis (EEE) are now suspected in residents from Kalamazoo and Berrien counties. In addition, a case of California encephalitis virus has been confirmed in a Genesee County resident.

As of Aug. 23, six cases of EEE have been confirmed in horses in Barry, Kalamazoo and St. Joseph counties. None of the horses were vaccinated against EEE and all animals have died. There is an EEE vaccine available for horses, but not for people. In addition, two deer in Barry and Cass counties have been diagnosed with EEE.



Michigan Health Alert Network

### MDHHS BUREAU OF LABORATORIES MOSQUITO-BORNE AND TICK-BORNE DISEASE TESTING

### MOSQUITO-BORNE DISEASES

The Michigan Department of Health and Human Services Bureau of Laboratories (MDHHS BOL) offers comprehensive testing on clinical specimens for the following viral mosquito-borne diseases (also known as arborivuses) of concern in Michigan: **California Group encephalitis** 



virus (CGV), Eastern Equine encephalitis virus (EEE), St. Louis encephalitis virus (SLE), and West Nile virus (WNV). Testing is available free of charge through Michigan healthcare providers for their patents. Testing for mosquito-bome viruses should be considered in patients presenting with meningitis, encephalitis, or other acute neurologic illness in which an infectious etiology is suspected during the summer months in Michigan. Methodologies include:

- IgM detection for all four arboviruses (CGV, EEE, SLE, WNV)
- Molecular detection (PCR) for WNV only
- Plaque Reduction Neutralization Test (PRNT) is also available and may be performed on select samples when indicated

### REPORTABLE DISEASES IN MICHIGAN – BY PATHOGEN 2019 A Guide for Physicians, Health Care Providers and Laboratories

Report the following conditions to the Michigan Disease Surveillance System (MDSS) or local health department (see reverse) within 24 hours (unless otherwise noted) if the agent is identified by clinical or laboratory diagnosis.

### Report the unusual occurrence, outbreak or epidemic of any disease or condition, including healthcare-associated infections.

### Acute flaccid myelitis (1)

Anaplasma phagocytophilum (Anaplasmosis) Arboviral encephalitides, neuro- and non-neuroinvasive:

Chikungunya, Eastern Equine, Jamestown Canyon, La Crosse, Powassan, St. Louis, West Nile, Western Equine, Zika (6) Babesia microti (Babesiosis)

### Bacillus anthracis and B. cereus serovar anthracis (Anthrax) (4)

Blastomyces dermatitidis (Blastomycosis) Bordetella pertussis (Pertussis) Borrelia burgdorferi (Lyme Disease)

### Brucella species (Brucellosis) (4)

Burkholderia mallei (Glanders) (4)

### Burkholderia pseudomallei (Melioidosis) (4)

Campylobacter species (Campylobacteriosis) Candida auris (Candidiasis) (4) Chlamydia trachomatis (Trachoma, genital infections, LGV) (3, 6) Chlamydophila psittaci (Psittacosis) Clostridium botulinum (Botulism) (4)

Clostridium tetani (Tetanus) Coccidioides immitis (Coccidioidomycosis) Coronaviruses (SARS, MERS-CoV) (5) Corynebacterium diphtheriae (Diphtheria) (5) Coxiella burnetii (Q Fever) (4)

Cryptosporidium species (Cryptosporidiosis) Cyclospora species (Cyclosporiasis) (5) Dengue virus (Dengue Fever) Ehrlichia species (Ehrlichiosis) Encephalitis, viral or unspecified Enterobacter spp., Carbapenemase Producing-Carbapenem Resistant (5) Streptococcus pneumoniae, sterile sites Escherichia coli, Carbapenemase Producing-Carbapenem Resistant (5)

Escherichia coli, O157:H7 and all other Shiga toxin positive serotypes (including HUS) (5)

### Francisella tularensis (Tularemia) (4)

Giardia species (Giardiasis) Guillain-Barre Syndrome (1) Haemophilus ducrevi (Chancroid) Haemophilus influenzae, sterile sites only-submit isolates for serotyping for patients <15 years of age (5) Hantavirus

### Hemorrhagic Fever Viruses (4)

- Hepatitis A virus (Anti-HAV IgM, HAV genotype) Hepatitis B virus (HBsAg, HBeAg, anti-HBc IgM, HBV NAAT, HBV genotype; report all H8sAg and anti-H8s (positive, negative, indeterminate) for children < 5 years of age) (6)
- Hepatitis C virus (all HCV test results including positive and negative antibody, RNA, and genotype tests) (6)
- Histoplasma capsulatum (Histoplasmosis)
- HIV (tests including: reactive immunoassays (e.g., Ab/Ag, TD1/TD2, WB, EIA, IA), detection tests (e.g., VL, NAAT, p24, genotypes), CD4 counts/percents; and all tests related to perinatal exposures) (2,6)
- Influenza virus (weekly aggregate counts) Pediatric influenza mortality, report individual cases (5) Novel influenza viruses, report individual cases (5, 6)
- Kawasaki Disease (1)

Legionella species (Legionellosis) (5) Leptospira species (Leptospirosis) Listeria monocytogenes (Listeriosis) (5, 6) Measles virus (Measles/Rubeola) Meningitis: bacterial, viral, fungal, parasitic, and amebic Mumps virus Mycobacterium leprae (Leprosy or Hansen's Disease) Mycobacterium tuberculosis complex (Tuberculosis); report preliminary and final rapid test and culture results (4) Neisseria gonorrhoeae (Gonorrhea) (3, 6) Neisseria meningitidis, sterile sites (Meningococcal Disease) (5) Orthopox viruses, including: Smallpox, Monkeypox (4) Plasmodium species (Malaria)

### Poliovirus (Polio) Prion disease, including CID Rabies virus (4) Rabies: potential exposure and post exposure prophylaxis (PEP) Rickettsia species (Spotted Fever) Rubella virus (6) Salmonella species (Salmonellosis) (5) Salmonella Paratyphi (Paratyphoid Fever): serotypes Paratyphi A, Paratyphi B (tartrate negative), and Paratyphi C (5) Salmonella typhi (Typhoid Fever) (5) Shigella species (Shigellosis) (5) Staphylococcus aureus Toxic Shock Syndrome (1) Staphylococcus aureus, vancomycin intermediate/ resistant (VISA (5)/VRSA (4)) Streptococcus pyogenes, group A, sterile sites, including Streptococcal Toxic Shock Syndrome (STSS) Treponema pallidum (Syphilis) (6) Trichinella spiralis (Trichinellosis) Varicella-zoster virus (Chickenpox) (6) Vibrio cholera (Cholera) (4) Vibrio species (Vibriosis: non-cholera species) (5)

Yellow fever virus Yersinia enterocolitica (Yersiniosis) Yersinia pestis (Plague) (4)

### LEGEND

(1) Reporting within 3 days is required

- (2) Reporting within 7 days is required. (3) Sexually transmitted infection for which expedited partner therapy is authorized. See www.michigan.gov/hivstd for details.
- (4) A laboratory shall immediately submit suspect or confirmed isolates, subcultures, or specimens from the patient being tested to the MDHHS Lansing laboratory.
- (5) isolate requested. Enteric: if an isolate is not available from nonculture based testing, the positive broth and/or stool in transport medium must be submitted to the MDHHS Lansing laboratory. Respiratory: Submit specimens, if available.
- (6) Report pregnancy status, if available.
- Blue Bold Text = Category A bioterrorism or select agent, notify the MDHH5 Laboratory immediately: (517) 335-8063

This reporting is expressly allowed under HIPAA and required by Michigan Public Act 368 of 1978, 333.5111 MDHHS maintains, reviews, and revises this list at least annually, for the most recent version please refer to: www.michigan.gov/cdinfo REV. 12/2018 Michigan Department of Health and Human Services . Bureau of Laboratories . Bureau of Epidemiology and Population Health





### Surveillance

- Passive Surveillance -
- Targeted surveillance



Michigan Disease Surveillance System LOGIN HERE for Non-State of Michigan Employees LOGIN HERE for State of Michigan Employees

General Information Background News and Notes User Guides and References FAQ Contact Support Services



### Vector-borne disease (WNV) surveillance data flow in Michigan



Courtesy of Emerging and Zoonotic Infectious Disease Section, MDHHS

### Michigan Mosquito Surveillance

- Commercial city and township mosquito control programs
- Federally funded local health department surveillance for WNV in high incidence jurisdictions



### EEE - Public Health Response - Control

### Eliminate breeding grounds

- Remove old plastics tires
- Empty bird baths
- Clear gutters
- Fill or drain puddles, swampy areas (wikipedia)

### Protection

- Mosquito repellant
- Avoid dusk to dawn outings

### EEE - PH response - Control

- Aerial spraying Low Flying Aircraft
- Pyrethrin 5% EPA approved organic
- 0.87 ounce per acre/1 tablespoon per football field
- Adulticide
- Weather dependent
- No health effects to general public
- Opt out
- No reported cases after aerial spraying







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# Freezing temps reduce EEE risk 'close to zero,' official says



### Acknowledgements

- 1. Kimberly Signs, DVM, Emerging and Zoonotic Infectious Disease Section, Bureau of Epidemiology and Population Health, MDHHS
- 2. William Nettleton MD Medical Director, Kalamazoo and Calhoun County Health Department
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### Thank You

