Michigan Emerging and Zoonotic Disease

SURVEILLANCE SUMMARY 2017

Michigan Department of Health & Human Services
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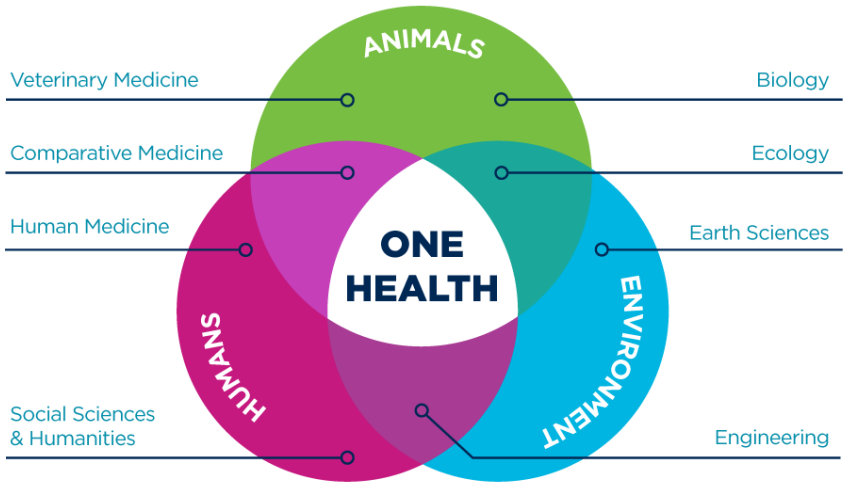
INTRODUCTION

Zoonotic diseases are diseases that can be transmitted between animals and humans directly or through a vector (mosquitos, ticks, etc.). They can be caused by viruses, bacteria, parasites, and fungi. About 60% of infectious diseases in humans are transmitted from animals and 75% of emerging infectious diseases are zoonotic.

From West Nile Virus (WNV) to Lyme disease (LD), emerging zoonotic diseases in Michigan develop and are spread within complex cycles involving people, animals, vectors, and the environment. Thus, it is essential for healthcare providers, veterinarians, public health officials, and environmental scientists to work together in the identification, prevention, treatment, and control of disease. This collaborative initiative is known as One Health.

The Michigan Department of Health and Human Services (MDHHS) partners with federal, state, and local agencies as well as public universities to identify and define the geographic, environmental, and exposure risk of emerging diseases. The MDHHS is also dedicated to providing stakeholders with information on emerging diseases and best practices for surveillance, prevention, and control, including the Emerging Diseases website (www.michigan.gov/emergingdiseases) and quarterly One Health webinars.

This report provides a summary of epidemiologic information for select zoonotic and vector-borne diseases in Michigan for 2017 and updates on special projects.



Zoonotic Diseases in Michigan – 5 Year Table

Reported Cases in People

Disease	2013	2014	2015	2016	2017
Bird-Associated					
Psittacosis	0	0	0	2	0
Livestock-Associated					
Anthrax	1	0	0	0	0
Q Fever, acute	1	2	2	1	3
Q Fever, chronic	0	2	2	3	1
Mosquito Borne					
Dengue Fever	16	6	23	16	11
Encephalitis, California (La Crosse)	0	0	1	0	0
Encephalitis, Eastern Equine	0	1	0	2	0
Encephalitis, St. Louis	0	0	0	0	0
Encephalitis, Western Equine	0	0	0	0	0
Malaria	23	19	21	43	45
West Nile Virus	37	1	18	42	40
Yellow Fever	0	0	0	0	0
Zika	0	0	0	69	9
Multi-Mode Zoonoses					
Brucellosis	0	2	2	2	1
Leptospirosis	1	1	0	5	4
Plague	0	0	1	0	0
Rickettsial disease - Typhus	0	0	0	1	0
Tularemia	0	2	0	1	0
Public Health Pest					
Head Lice (Aggregate School Reporting)	6123	5857	6415	7956	7389
Rabies and Animal Bites					
Rabies, Animal	41	41	37	42	39
Rabies, Human	0	0	0	0	0
Rodent Borne					
Hantavirus	0	0	0	1	0
Hantavirus, Other	0	0	0	0	0
Hantavirus, Pulmonary	0	0	0	0	0
Tick Borne					
Babesiosis, *Babesia microti*	3	2	2	2	3
Ehrlichiosis, *Anaplasma phagocytophilum*	4	4	7	7	15
Ehrlichiosis, *Ehrlichia chaffeensis*	1	3	5	8	4
Ehrlichiosis, *Ehrlichia ewingii*	0	0	0	0	0
Ehrlichiosis, human other/undetermined	0	0	0	0	0
Encephalitis, Powassan	0	0	0	0	0
Lyme Disease	176	129	152	228	291
Rickettsial Disease – Spotted Fever	3	1	2	12	13

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ARBOVIRUSES

Arboviruses: any group of viruses that are transmitted by mosquitos, ticks, or other arthropods.

(Arthropod-Borne viruses)

ZIKA VIRUS

Zika virus is an emerging arbovirus that is spread mostly by the bite of an infected *Aedes* species mosquito (*Ae. aegypti* and *Ae. albopictus*). Zika can also be spread by unprotected sex or from a pregnant woman to her fetus. Infection during pregnancy can cause certain birth defects. Local mosquito-borne Zika virus transmission has been reported in the continental United States (Florida and Texas), but Michigan's cases have all been in travelers who contracted the virus elsewhere.

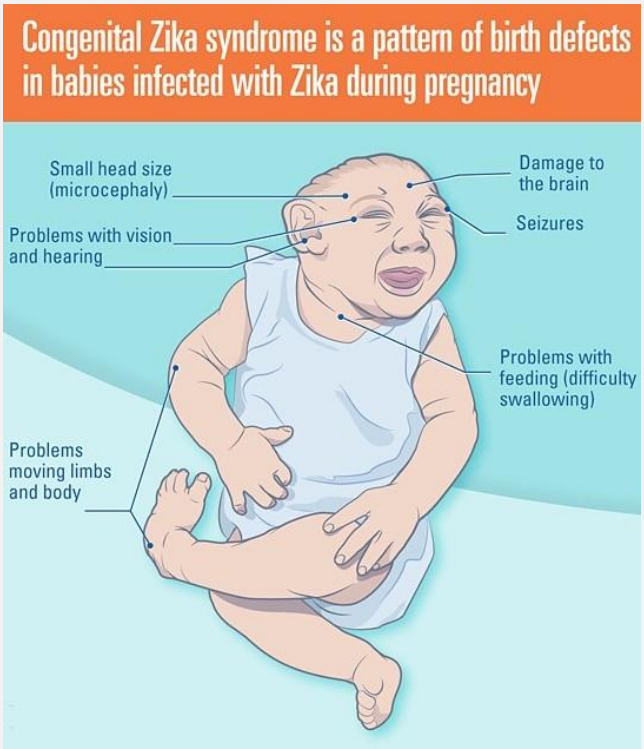
In 2017, MDHHS received CDC funding to provide grants to selected local health departments to facilitate Zika vector mosquito surveillance and additional community prevention and response efforts.

Local health departments conducted outreach to at-risk populations, conducted scrap tire drives, and distributed Zika prevention kits.

Zika Pregnancy Registry

MDHHS and local health departments participated in the U.S. Zika Pregnancy and Infant Registry by:

- Identifying pregnant women and infants for Zika virus testing
- Coordinating Zika testing of laboratory samples
- Reporting information about pregnant women and infants with laboratory evidence of possible Zika infection
- Collecting medical information about eligible pregnant women and their infants
- Working with CDC to determine methods for collecting and sharing data



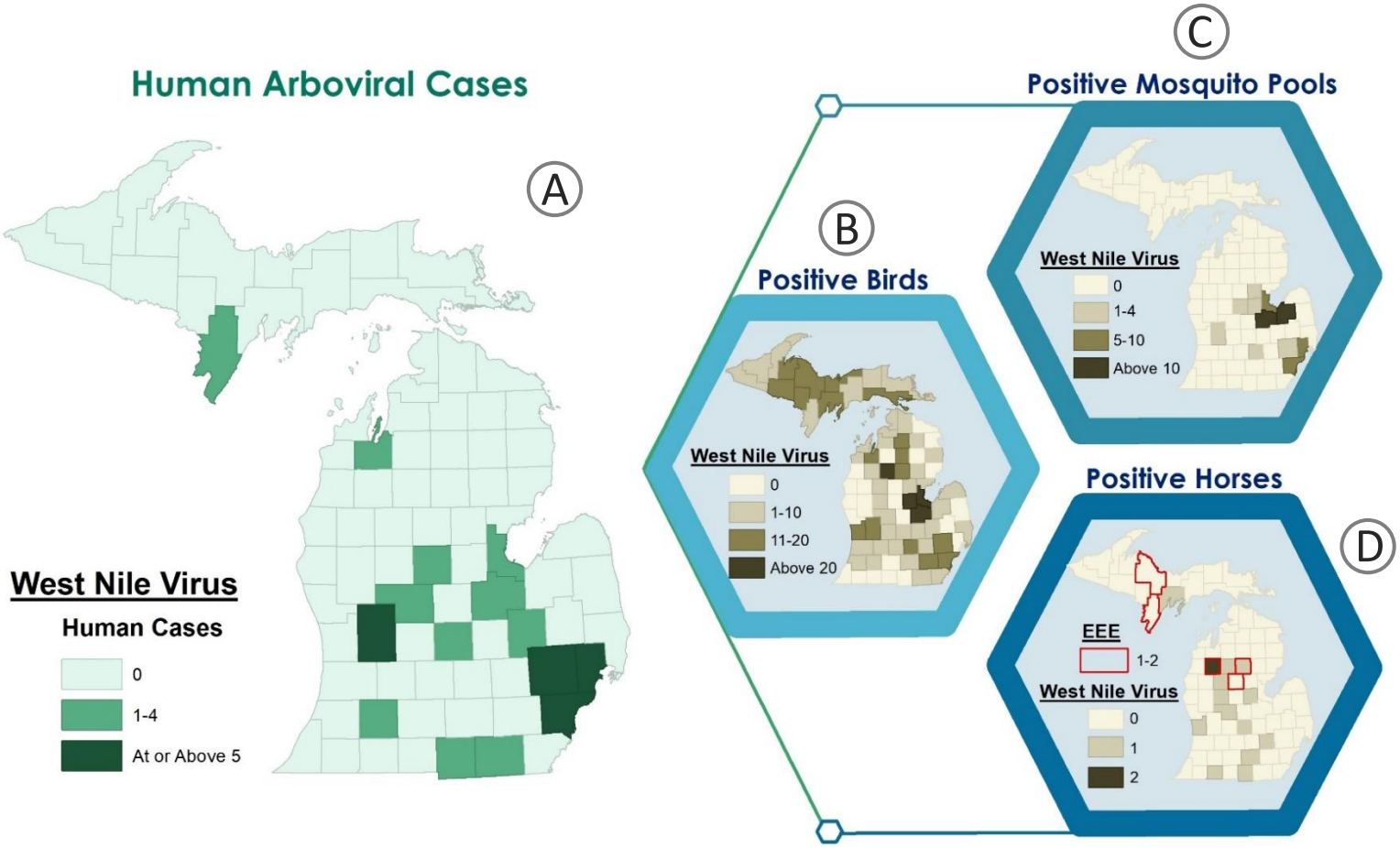
More information about the registry can be found at https://www.cdc.gov/pregnancy/zika/research/registry.html

WEST NILE VIRUS & EASTERN EQUINE ENCEPHALITIS

Similar to 2016, in 2017, human case counts of WNV were highest from August to September with the last case reporting symptom onset in October. There were 40 human cases of WNV, including seven presumptive viremic blood donors (PVDs), and one death. PVDs are people who had no symptoms at the time of donating blood but whose blood tested positive when screened for WNV. The majority of WNV cases in Michigan occur in the Metro Detroit and Grand Rapids areas.

There were no human cases of Eastern Equine Encephalitis (EEE) in 2017.

2017 Arboviral Activity



2017 Michigan Arboviral Map Key

- **A) Map of WNV Positive Human Cases:** Number of confirmed and probable human WNV cases by county of residence
- **B) Map of WNV Positive Birds:** Number of birds tested positive for WNV by county
- **C) Map of WNV Positive Mosquito Pools:** Number of mosquito pools tested positive for WNV by county
- **D) Map of WNV and EEE Positive Horses:** Number of horses tested positive for WNV and EEE by county

MOSQUITO SURVEILLANCE

MDHHS, in coordination with local health departments, conducts surveillance to assess the geographic distribution of various mosquito species to evaluate the risk of arboviral disease transmission in Michigan. Several types of traps are set throughout the state to collect mosquitos, which are identified and tested to determine if they are positive for any arboviral diseases (WNV and EEE mainly). Institutions such as the Michigan Mosquito Control Association, the Midwest Centers of Excellence, and Michigan State University also aid in mosquito surveillance.

Local health departments participating in mosquito surveillance training

MDHHS Annually Hosts Mosquito Training that Provides:

Training on Mosquito Biology & Identification

Data Management Through MosquitoNet

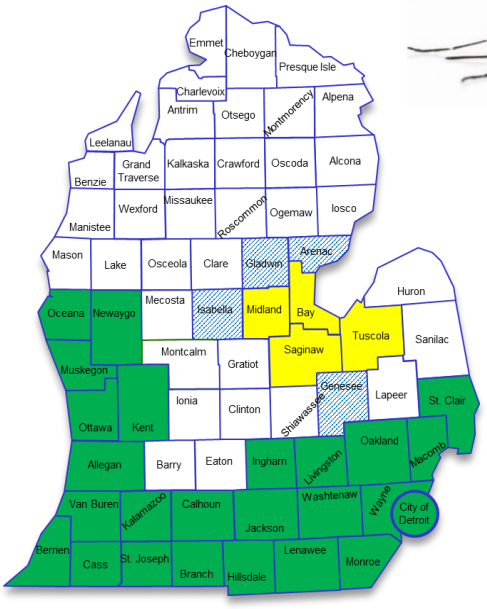
Mosquito Traps & Other Supplies

Mosquitos Tested for Arboviruses in 2017

Arbovirus	Pools Tested	Total Mosquitoes
Eastern Equine Encephalitis	394	12,998
LaCrosse Encephalitis	287	587
St. Louis Encephalitis	1,599	18,704
West Nile Virus	2,828	39,059
Total	**5,108**	**71,348**

184
Mosquito Pools Tested Positive for WNV

Aedes albopictus



County Mosquito District does surveillance
Limited township/city surveillance
2017 ELC-funded LHD mosquito surveillance

Zika Vector Surveillance

In addition to Michigan's arbovirus surveillance in mosquitos, MDHHS received a one-time funding opportunity from the Epidemiology and Laboratory Cooperative (ELC) Agreement to conduct enhanced Zika vector (*Aedes albopictus)* surveillance.

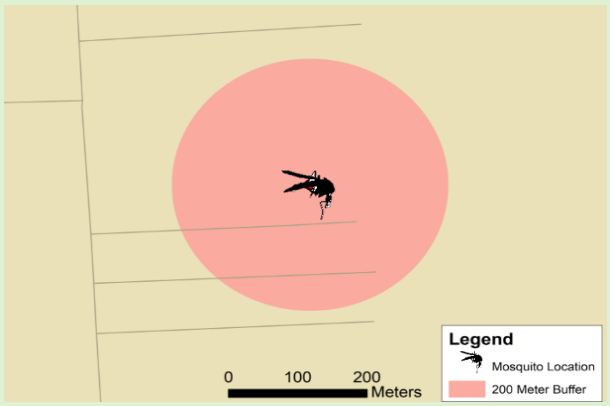
- **This enhanced surveillance prioritized:**
  - Southern border counties
  - Areas with high migrant populations
  - Ports (Monroe, Detroit)
- **Surveillance from May-Aug 2017 resulted In:**
  - **24 additional counties** conducted surveillance resulting in **over 3,500 trap nights**
  - More than **44,000 mosquitos** collected

Mosquito Surveillance Update: *Aedes albopictus* Found in Michigan

In August 2017, the *Ae. albopictus* mosquito was found for the first time in Michigan at an industrial area in Wayne county. These mosquitos were likely introduced to this area by traveling within commercial goods sent from another state where the *Ae. albopictus* is endemic. Once this vector was found, prompt response efforts coordinated by MDHHS, Wayne County Health Department, City of Livonia, and the Department of Environmental Quality (DEQ) took place to survey and control this mosquito population.

Surveillance Efforts

The flight radius of the *Ae. albopictus* is generally <200 meters. When this mosquito was found in Wayne county, mosquito traps and larval collections were conducted within a 200-meter radius of where the mosquitos were found.



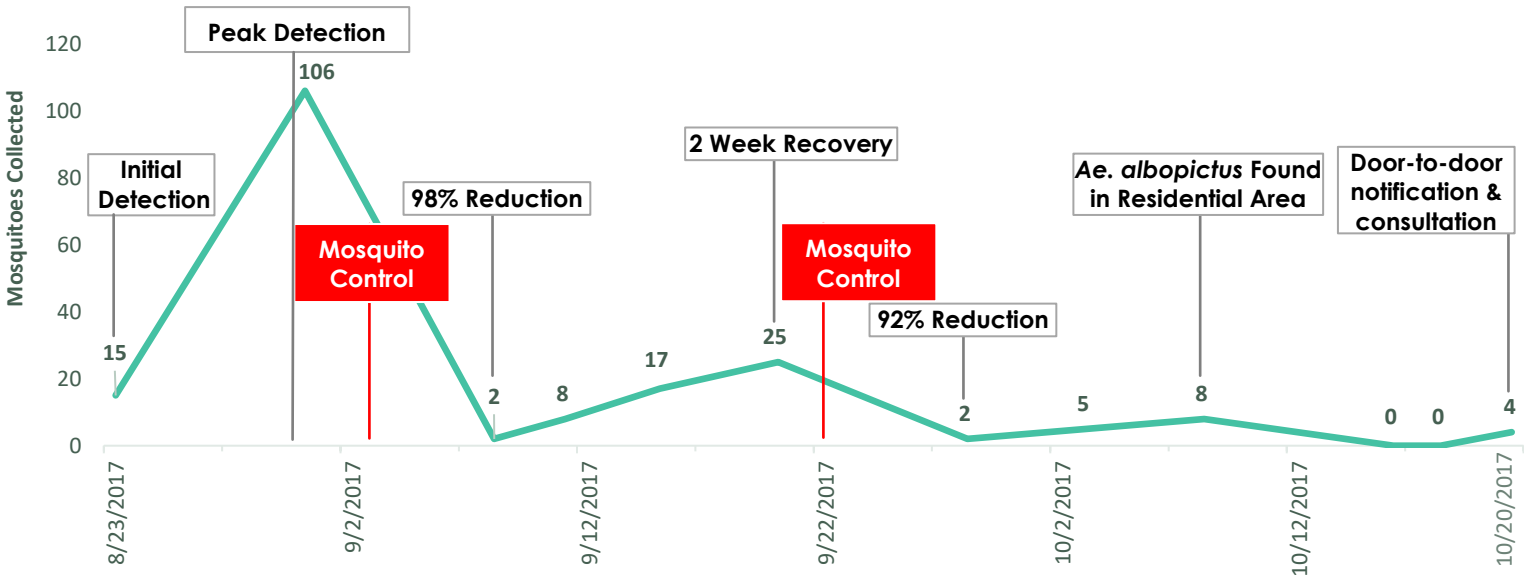
Example map of invasive species surveillance areas

Water samples were collected from tires and other containers for mosquito larvae.

Photograph of an adult *Ae. albopictus* found in Michigan.

A stack of tires that was treated with insecticide to control mosquito larvae.

Timeline of *Ae. albopictus* Surveillance & Control in Wayne County



WHAT CAN BE DONE?

Public Health Agencies can…

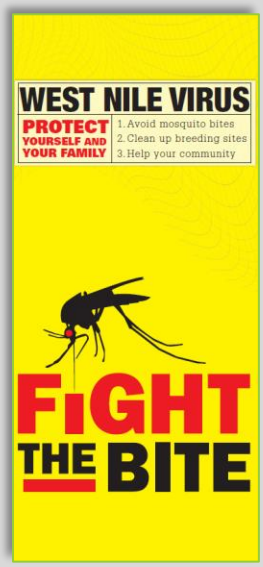
- Monitor Michigan's mosquito populations
- Maintain a surveillance system for arboviral diseases
- Make Michigan data publicly available
- Promote arbovirus disease prevention guidance

Health Providers can…

- Review public health data regarding the risk of arboviruses in Michigan
- Diagnose and treat infections using best practices
- Report cases promptly to your local health department
- Remind patients about the risk of arbovirus infection in your area and ways to prevent infections

Everyone can…

- **Inform** yourself about where risk for contracting arboviruses is greatest (lack of reported activity ≠ lack of risk)
- **Inform** yourself about when the risk for contracting arboviruses is greatest:
  - Summer
  - At dusk and dawn, mosquitoes are most active
  - Adults > 50 years of age are more susceptible to serious illness from WNV
  - Children < 15 years of age are more susceptible to serious illness from EEE and La Crosse encephalitis virus
- **Eliminate** standing water where mosquitos can lay eggs
- **Report** dead birds to your local authorities
- **Protect.** Take precautions to prevent mosquito bites when engaging in outdoor activities



Posters, pamphlets, and guides are available to download, print and order at:
http://www.michigan.gov/documents/emergingdiseases/Publication_Order_Form_357623_7.pdf

MDHHS West Nile Virus Website:
www.michigan.gov/westnile

Centers for Disease Control and Prevention West Nile Virus Website:
www.cdc.gov/westnile

Michigan Emerging and Zoonotic Disease

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TICKBORNE DISEASES

LYME DISEASE

291

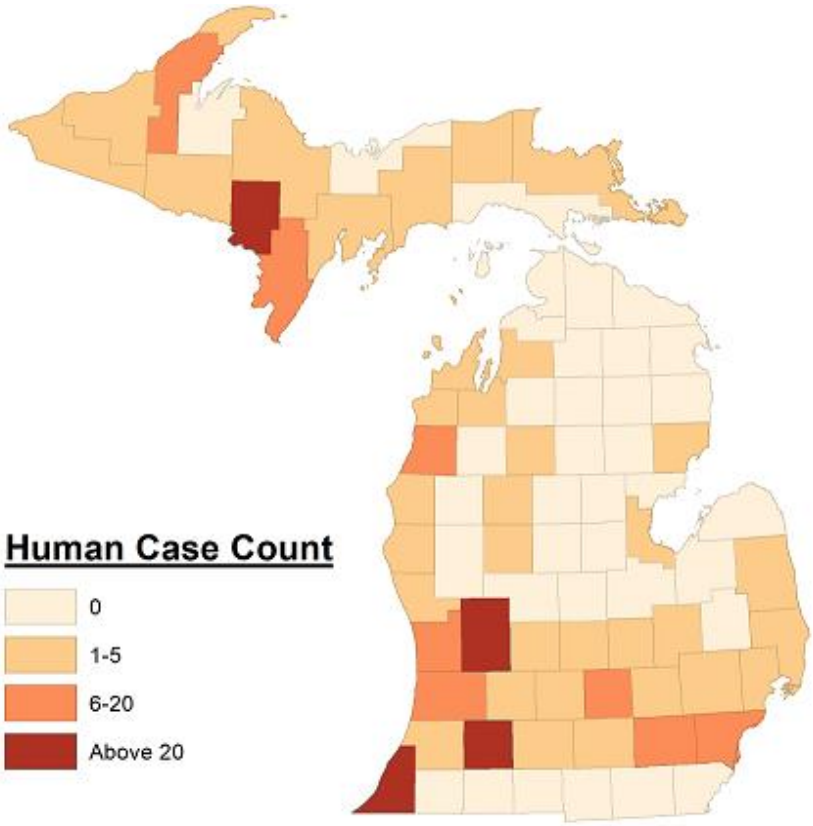
In 2017, 291 human cases were reported with most Michigan exposures occurring in the Upper Peninsula and western Lower Peninsula.

Lyme disease (LD) is the most commonly reported vector-borne disease in the United States; over 26,000 confirmed cases were reported nationally in 2016. In the U.S., cases tend to be geographically focused in the northeastern and north-central United States, but LD is also endemic and expanding in Michigan. In 2017, 291 human cases were reported with most Michigan exposures occurring in the Upper Peninsula and western Lower Peninsula.

The tick vector, *Ixodes scapularis* (blacklegged tick), is endemic in portions of the UP and along the coast of the western Lower Peninsula. In addition, the blacklegged tick is emerging into new areas across the state.

In 2017, MDHHS conducted human case surveillance and field ecologic surveillance for blacklegged ticks throughout the state with the help of its partners, including Michigan State University and sister state agencies. Educational materials will continue to be updated and made available to the public via the MDHHS Emerging Diseases website (www.michigan.gov/emergingdiseases).

2017 Human Lyme Disease Cases by County of Residence

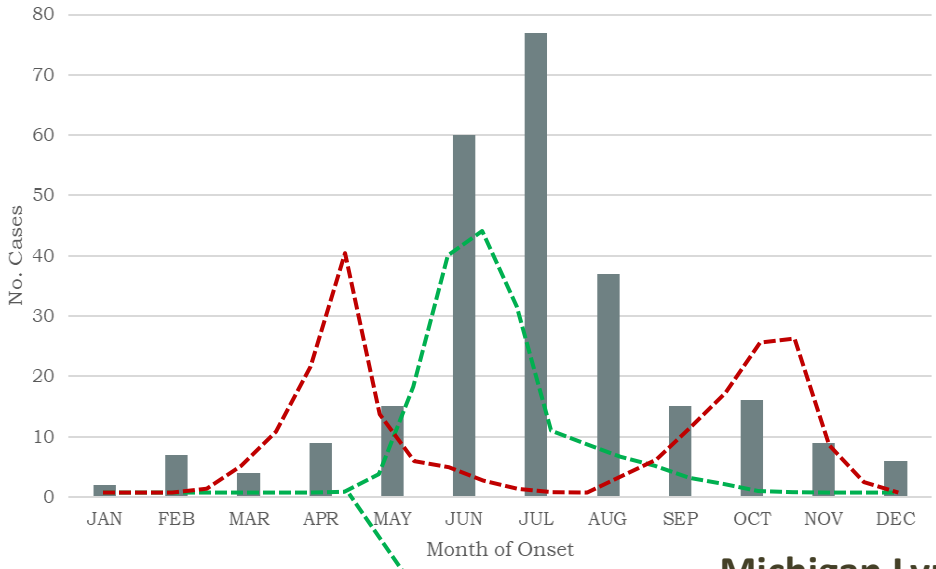


Map of the number of human Lyme disease cases (confirmed and probable) per county—291 cases total in Michigan

Counties with the highest number of cases of Lyme disease:

- Dickinson – 57 cases
- Berrien – 26 cases
- Kalamazoo – 21 cases
- Kent – 21 cases
- Menominee – 20 cases

Reported Lyme Disease Cases in Michigan: 2017

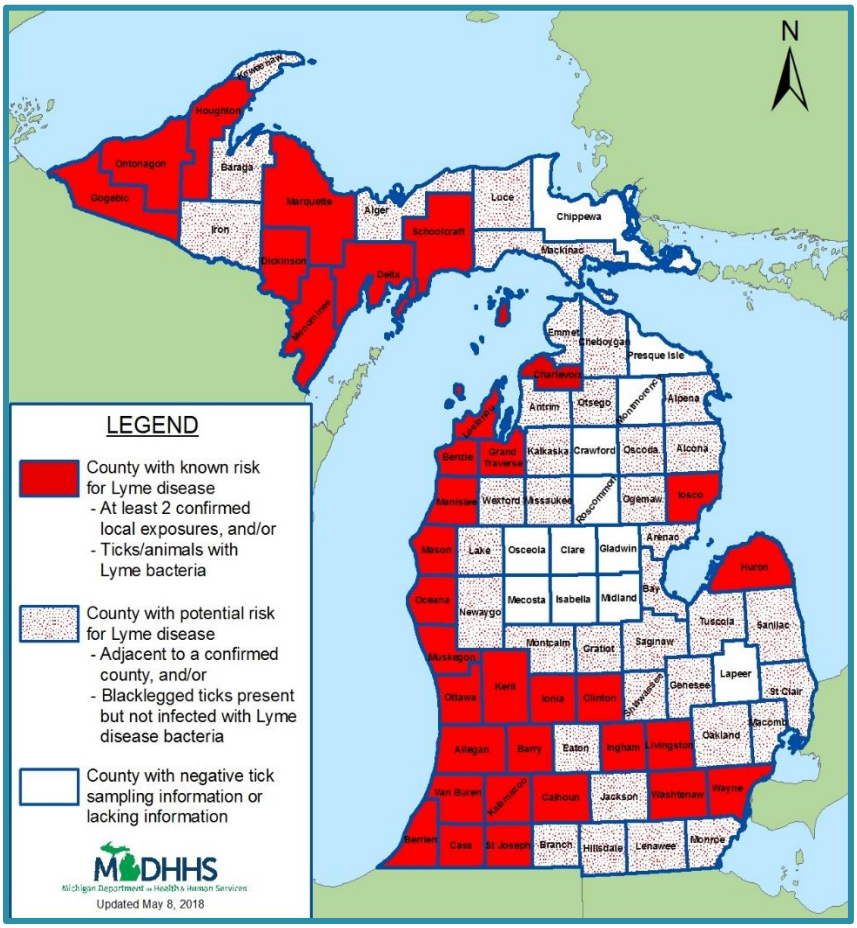


Generalized blacklegged tick activity periods in Michigan:

- Nymphs
- Adults

Peak transmission season for Lyme disease in Michigan is associated with nymphal stage blacklegged ticks. Approximately the size of a poppy seed, these ticks are active from May through August, and peak in June. Frequent tick checks are important during this time of year as prompt removal of ticks is preventive of Lyme disease.

Michigan Lyme Disease Risk Map: 2018



Map detailing the risk of Lyme disease in each county based on previously recorded presence of blacklegged ticks, presence of the Lyme disease bacterium, and confirmed local exposures

OTHER TICKBORNE DISEASES

Other tickborne diseases have been identified in Michigan, which include:

Tick-borne Disease	2017 Cases in Reported Michigan	Transmitted by (Species):
Anaplasmosis	15	Blacklegged Tick
Babesiosis	3	Blacklegged Tick
*Ehrlichia chaffeensis**	4	Lone Star Tick
Rocky Mountain spotted fever*	13	American Dog Tick

*In most cases, *Ehrlichia* and Rocky Mountain spotted fever were acquired while traveling out of state.

2017 Anaplasmosis Canine Case Investigation

This canine case was brought to the attention of the EZID Section by a local veterinarian due to the rarity of the condition and the potential for human disease.

Case Details

- 11-month old male Goldendoodle in Oakland County
  - Purchased from a Michigan breeder
  - No travel history
- First consultation on 6/15 at local veterinarian
  - Lethargy, abnormally calm
  - Fever
- Canine brought to emergency hospital on 6/17
  - Persistent fever and lethargy
  - Unresponsive to initial antibiotics
  - **Tested positive for *Anaplasma phagocytophilum***
- Successfully treated using doxycycline

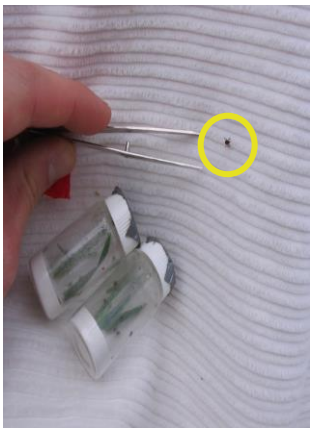
Fieldwork Follow-Up

- MDHHS and MSU CVM Veterinary Clerkship performed mammal trapping and tick sampling at patient's home and nearby park
- No ticks were found at patient's home
- 1 blacklegged nymph and 3 rabbit tick larvae were found at the state park
- 2 blacklegged larvae found on mammals
- All samples tested negative for the Lyme disease bacterium, *B. burgdorferi*
- 2/11 (18% prevalence) mice were infected with *A phagocytophilum* via blood and 1 of these mice had *A. phagocytophilum* infected ear biopsy

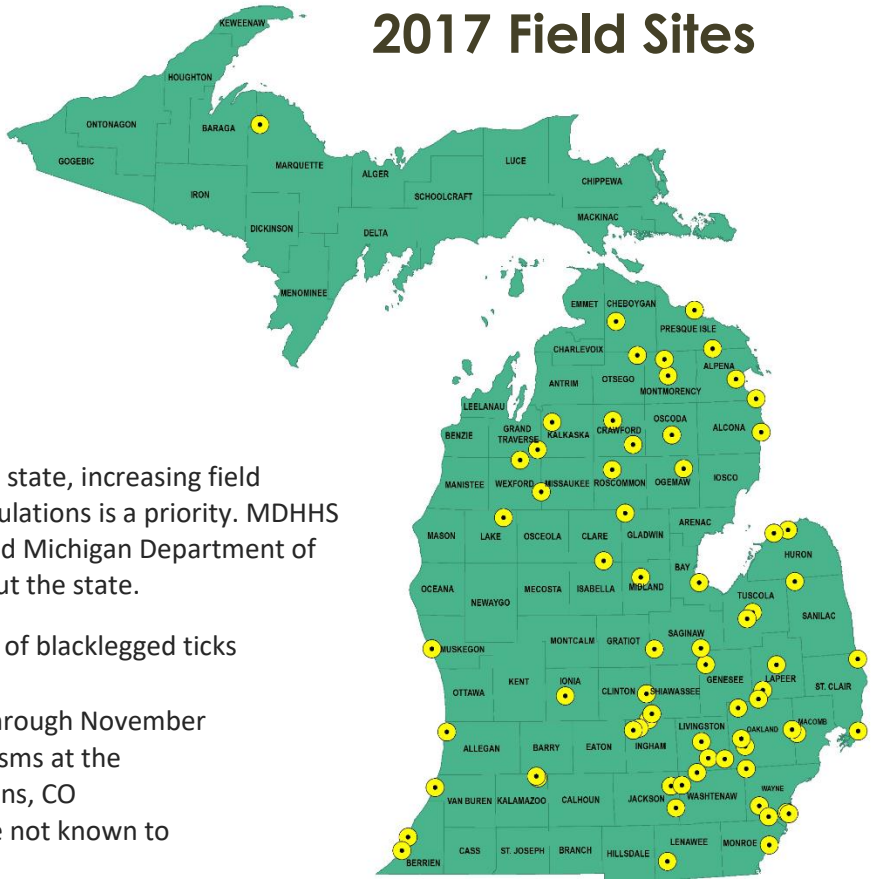
MDHHS and MSU CVM Veterinary Clerkship perform mammal trapping and tick sampling

STATEWIDE TICK SURVEILLANCE

Tick surveillance using a drag cloth



Tick found on drag cloth



Sites where tick field surveillance was conducted

Given that Michigan is a low-incidence, emerging LD state, increasing field detection of blacklegged tick and B. *burgdorferi* populations is a priority. MDHHS along with its partners, Michigan State University and Michigan Department of Natural Resources conducted surveillance throughout the state.

- 68 field sites were investigated for the presence of blacklegged ticks
- Over 179,000 m^2 sampled
- 592 blacklegged ticks collected from February through November
- 299 ticks were tested for disease-causing organisms at the CDC Vector-Borne Disease Laboratory in Ft. Collins, CO
- Citizens submitted ticks in 10 counties that were not known to have blacklegged ticks.
- In 2017, human LD cases were reported with potential exposure in 19 counties not previously known to have blacklegged ticks and/or infected blacklegged ticks

Citizen-Submitted Tick Program

In 2017, MDHHS took over the responsibility of receiving, identifying, and testing ticks sent in by Michigan citizens—a process previously performed by Michigan Department of Agriculture and Rural Development. Any ticks that are submitted by the public are identified, and the submitter receives information as to what species of tick it was. If a tick submitted is identified to be a blacklegged tick, *I. scapularis*, was removed from a person, and is still alive, the tick will then be submitted for testing to determine if it contains the Lyme disease bacterium.

Submitted Ticks by Number & Species

Tick Species	Number of Ticks Submitted in 2017
American Dog Tick (*Dermacentor variabilis*)	**786**
Blacklegged Tick (*Ixodes scapularis*)	**292**
Lonestar Tick (*Amblyomma americanum*)	**37**
Total	**1115**

WHAT CAN BE DONE?

Public Health Agencies can…..

- Monitor Michigan's tick populations
- Maintain Lyme disease surveillance system
- Offer tick identification and testing services to the public
- Make Michigan data publicly available
- Promote tick-borne disease prevention guidance

Health Providers can….

- Review public health data regarding the risk of Lyme disease in Michigan
- View the Michigan Lyme disease webinar at: www.michigan.gov/lymeinfo
- Diagnose and treat infections using best practices
- Report cases promptly to your local health department
- Remind patients about the risk of Lyme disease in your area, and ways to prevent infections

Everyone can….

- Inform yourself about where ticks can be encountered in Michigan
- Prevent tick bites by using EPA approved repellents on skin and clothing
- Check yourself and others for ticks regularly after spending time outdoors
- Remove ticks promptly and safely if you have been bitten
- Submit ticks you find on yourself or your pets for identification
- Recognize the symptoms of Lyme disease
- Seek prompt medical care if illness occurs after exposure to ticks

UPDATED GUIDES AND PRINTED RESOURCES

Tick ID Cards are now available for order. This pocket-sized resource provides information on how to identify common Michigan ticks, proper tick removal, and preventing tick bites.

The **Ticks and Your Health** brochure has been updated to include the most up-to-date information about Michigan ticks and tickborne diseases and is now available online and to order.

Posters, pamphlets, tick submission kits, and guides are available to download, print and order via the Communicable Disease Division's publication order form at: www.michigan.gov/cdinfo

Michigan Emerging and Zoonotic Disease

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RABIES

RABIES

Rabies is a deadly but preventable viral disease of mammals most often transmitted through a bite from an infected animal. The rabies virus is transmitted when saliva from an infected animal is exposed to broken skin or mucous membranes. Rabies infects the central nervous system, which causes disease in the brain and death in almost 100% of symptomatic cases.

In Michigan, most rabies cases occur in wild animals such as bats and skunks. In 2017, 3,229 animals were tested for rabies at the MDHHS Bureau of Laboratories (BOL). Thirty-eight animals tested positive, including 35 bats, 2 skunks, and 1 cat.

Between 2012-2017, 259 animals tested positive for rabies and about 92% of these animals were bats. (See map below).

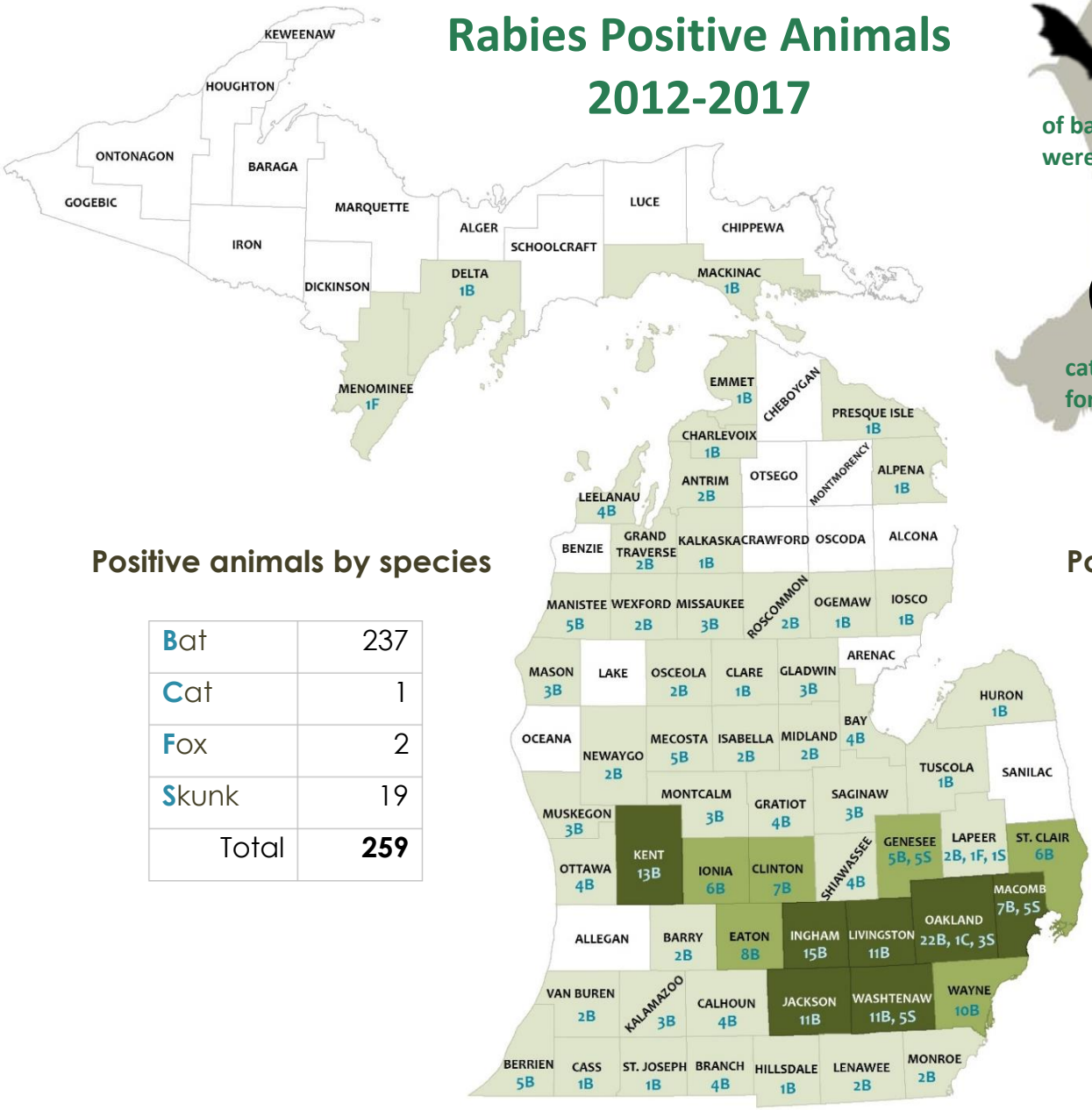
In 2017…

3,229
animals were submitted for rabies testing.

2.8%
of bats submitted for testing were infected with rabies.

1
cat tested positive for rabies.

Rabies Positive Animals 2012-2017



Positive animals by species

Bat	237
Cat	1
Fox	2
Skunk	19
Total	**259**

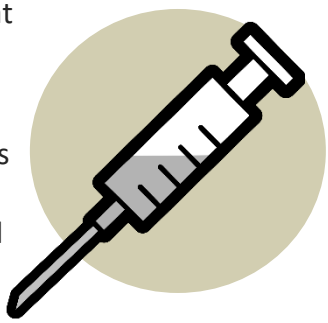
Positive animals per county

- 0
- 1-5
- 6-10
- 10-26

RABIES UPDATE

Rabies Post-Exposure Prophylaxis (PEP) Reporting Pilot

In 2017, the EZID section began exploring the idea of making rabies PEP a reportable condition statewide, to assess PEP use and to identify areas where additional education is needed. Before making this treatment a reportable condition, MDHHS wanted to conduct a PEP reporting pilot to assess the advantages of reporting and detect any challenges that may impede surveillance.



In 2018, the EZID section and local health departments participating in the Rabies PEP Working Group worked together to plan and conduct the Rabies PEP Reporting Pilot. This project required healthcare facilities within participating jurisdictions to report all rabies PEP administrations to their local health departments. The jurisdictions who volunteered included Bay County, District Health Department #10, Central Michigan District Health Department, Ionia County, Jackson County, and Washtenaw County.

This reporting pilot was conducted from May 15 through September 30, 2018. MDHHS will make recommendations about statewide rabies PEP reporting based on the results of this project. More updates will be available soon.

WHAT CAN BE DONE?

Public Health Agencies can

- Maintain a rabies surveillance system
- Provide rabies testing services to the public
- Provide consultation to health care providers and the public
- Make Michigan data publicly available
- Maintain relationships with animal control and animal health organizations
- Promote rabies prevention

Veterinarians can

- Vaccinate pets and livestock against rabies
- Educate your clients and the public about rabies prevention
- Ensure your rabies titers remain at protective levels

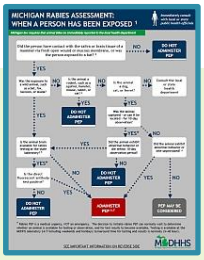
Health Care Providers can

- Report animal bites to your local health department, and consult with state or local public health concerning cases that are uncertain
- Treat potential exposures using best practices

Everyone can

- **Vaccinate** your pets against rabies and keep them up to date
- **Avoid** contact with wild or unfamiliar animals
- **Know** what to do if you find a bat in your home
- **Keep** a list of important phone numbers that includes animal control and your local health department
- **Seek** prompt medical care if you are bitten by an animal

GUIDES AND PRINTED RESOURCES



MDHHS has flow charts regarding rabies procedures/actions available at www.michigan.gov/rabies

Human rabies post-exposure prophylaxis protocols are available for order at www.michigan.gov/cdinfo

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UNUSUAL OCCURANCES

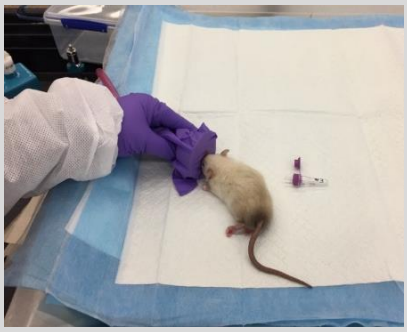
SEOUL VIRUS

Seoul virus is a type of hantavirus that is carried by Norway rats. Rats infected with Seoul virus are asymptomatic but can transmit the virus to humans through infectious saliva, urine, droppings, or aerosolization from contaminated bedding. Upon infection, humans are usually asymptomatic or show mild symptoms. However, in rare cases, infection can lead to Hemorrhagic Fever with Renal Syndrome (HFRS) and death. In 2017, MDHHS contributed to a national Seoul virus outbreak investigation of human cases in people having contact with pet rats.

National Outbreak Summary

- 17 confirmed acute human cases (IgM positive) in 7 states
- >100 facilities under investigation in 24 states
  - 31 confirmed facilities (either human or rodent positives)
  - All facilities linked by rat trade/sale
- 11 states reporting facilities with laboratory-confirmed Seoul virus positive results in either rats or humans
  - CO, GA, IA, IL, MN, MO, PA, SC, TN, UT, WI
- First time Seoul virus identified in pet rats in the US

Testing rats for Seoul virus:
Rats were anesthetized before taking retro-orbital or tail vein blood samples



Michigan Seoul Virus Investigation

MDHHS investigated four different potential links to the national Seoul virus outbreak.

These investigations identified eight potentially affected humans and one potentially exposed rattery with 52 rats. Humans with potential exposure were tested by their local health departments, and all tested negative for acute infection. Twenty-four rats from the exposed rattery were tested by a team of veterinarians from MDHHS and MSU. All rats tested negative for Seoul virus.

One Health in Action

This Seoul virus investigation employed a One Health approach, with human and animal health experts working together.

- CDC
- MDHHS (EZID section, BOL)
- MDARD
- Local Health Departments
- MSU, Campus Animal Resources
- MSU, Veterinary Diagnostic Laboratory

Michigan Emerging and Zoonotic Disease

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YOUTH IN AGRICULTURE

ONE HEALTH EDUCATION EFFORTS

In 2012, an outbreak of illness from a novel influenza A strain in people was linked to contact with pigs at agricultural fairs. As a result, the CDC partnered with CSTE to establish the Influenza Education Among Youth in Agriculture initiative. In 2017, seven states, including Michigan, received funding from the program.

These organizations work in coordination with state health departments, state departments of agriculture, land-grant universities, Future Farmers of America, and 4-H programs in a One Health effort to educate rural youth on zoonotic diseases and best practices for protecting animal and human health.

2017 Regional Fair Meetings

MDHHS partnered with the Michigan Association of Fairs and Exhibitions (MAFE) to bring information about zoonotic disease prevention, with a focus on swine influenza, to Michigan fair organizers and 4-H leaders. MAFE hosted a series of regional meetings in Alpena, Ann Arbor, Greenville, Kalkaska, Marquette, Marshall, and Midland. The events were held in the evening with dinner provided and consisted of two hours of presentations and discussion, led by animal health experts from the Michigan Department of Agriculture and Rural Development, MDHHS, MSU Extension, and MAFE.

Over 200 people attended and pre and post surveys were conducted to assess participant's knowledge, attitudes, and practices around zoonotic disease. Activities such as providing for handwashing and restrictions on eating and drinking in animal barns were favored by most overall. Other measures, such as limiting the time that pigs are at the fair and providing alternatives to live animals at auction were not popular with many before the meeting but saw nearly a 50% increase in support following the presentation. Overall, participants showed an increase in support for measures to reduce the risk of zoonotic disease, such as swine influenza at fairs.

RESOURCES:

4-H Animal Science Anywhere:
http://msue.anr.msu.edu/resources/4_h_animal_science_anywhere

CSTE Influenza Education among Youth in Agriculture Program:
https://www.cste.org/page/YIA

CDC Influenza and Zoonoses Education among Youth in Agriculture:
https://www.cdc.gov/onehealth/in-action/influenza-and-zoonoses-education.html

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