

Endemic and Emerging Vector-borne Disease in New Jersey

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Overview

- Define tick-borne and mosquito-borne disease
- Review vector-borne diseases of public health importance in New Jersey
- List personal and environmental prevention measures for vector-borne diseases



Vector-borne Diseases in New Jersey

Tick-borne

- Endemic
 - Anaplasmosis
 - Babesiosis
 - Ehrlichiosis
 - Lyme disease
 - Rocky mountain spotted fever
 - Tularemia
- Emerging
 - *Borrelia miyamotoi*
 - Bourbon virus
 - Heartland virus
 - Powassan virus

Mosquito-borne

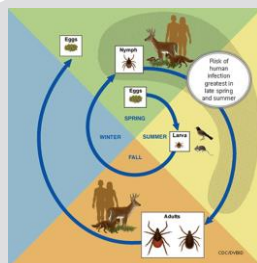
- Endemic
 - Eastern equine encephalitis
 - West Nile virus
- Imported/Emerging
 - Chikungunya
 - Dengue
 - LaCrosse virus
 - Malaria
 - St. Louis encephalitis
 - Yellow fever

Tick-borne Disease



Tick-borne Disease

- Transmission:
 - Ticks become infected by pathogens when feeding on small infected mammals (e.g. mice and voles)
 - Humans become infected by the bite of an infected tick



Life cycle of blacklegged ticks

Ticks in New Jersey



Blacklegged/Deer tick:

- Lyme disease, Anaplasmosis, Babesiosis and Powassan virus

Lone Star tick:

- Ehrlichiosis, Tularemia

American Dog tick:

- Rocky Mountain Spotted Fever, Tularemia

Lyme Disease



Transmission

- Agent: *Borrelia burgdorferi*
- Transmitted by infected blacklegged tick
- Must be attached for 36-48 hours for transmission



Early Signs and Symptoms

- 3-30 days after tick bite
- Fever, chills, headache, fatigue, muscle and joint aches, and swollen lymph nodes
- Erythema migrans (EM) rash
 - Bulls-eye appearance
 - Occurs in 70-80% of infected persons



Classic erythema migrans rash

Later Signs and Symptoms

- Days to months after tick bite
- Severe headaches and neck stiffness
- Additional EM rashes on other areas of the body
- Facial or Bell's palsy
- Heart palpitations or an irregular heart beat (Lyme carditis)
- Intermittent pain in tendons, muscles, joints, and bones
- Arthritis with severe joint pain and swelling



Facial palsy



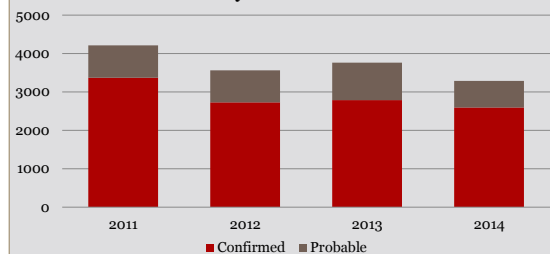
Swollen knee

Diagnosis & Treatment

- Lyme disease is diagnosed based on:
 - Physical exam
 - Risk factors: history of possible exposure to blacklegged ticks
 - Blood tests may be performed
- Treatment:
 - Antibiotics are effective
 - Early treatment can reduce time a person is ill and severity of disease

Statistics

Lyme Disease



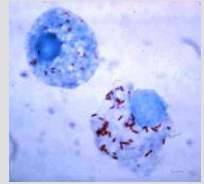
Source: NJDHSS CDERS, Historical Reports, New Jersey statewide totals, DHSS approved cases

Rocky Mountain Spotted Fever (RMSF)



RMSF: Transmission

- Agent: *Rickettsia rickettsii*
- Transmitted by the American dog tick
- The tick must be attached at least four hours to transmit bacterium



RMSF: Symptoms

- Incubation period: 2-14 days

Symptoms

- Fever
- Headache
- Nausea
- Vomiting
- Abdominal pain
- Muscle pain
- Lack of appetite
- Conjunctival injection (red eyes)

RMSF Rash

- Red, non-itchy
- Develops a few days after initial signs/symptoms
- Appears on wrists and ankles and spreads
- Rash not present in all cases

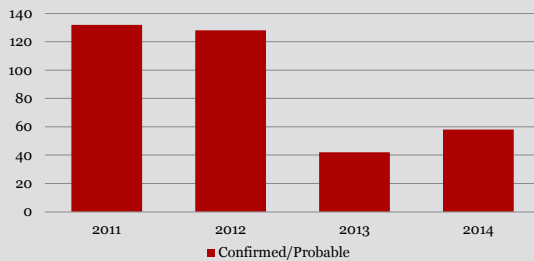


RMSF: Diagnosis & Treatment

- Prompt diagnosis is crucial
- Diagnosis made based on signs/symptoms and can later be confirmed using specialized confirmatory laboratory tests.
- **Antibiotic treatment is most effective if started before the fifth day of symptoms.**
- Treatment should not be delayed
 - pending test results; or
 - withheld on the basis of an initial negative result

Statistics

Rocky Mountain Spotted Fever



Source: NJDHSS CDERS, Historical Reports, New Jersey statewide totals, DHSS approved cases

Powassan virus



Powassan virus: Transmission

- **Agent:** Powassan virus
- **Vector:** Woodchuck tick and **Blacklegged tick**
- Transmission can occur within 15 minutes of attachment
- All tick stages (larva, nymph, and adult) can transmit, if infected

Powassan virus: Symptoms

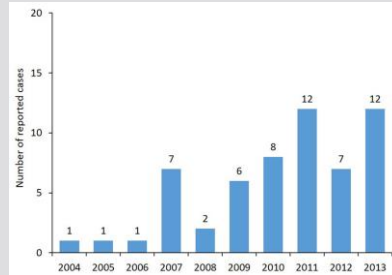
- Incubation period: 1 – 4 weeks
- Symptoms range from asymptomatic to encephalitis/meningitis
- Many people who are infected do not develop any symptoms.
- Others who become infected with Powassan virus may have the following symptoms:
 - Fever
 - Headache
 - Vomiting
 - Weakness
 - Confusion
 - Encephalitis
 - Meningitis
 - Loss of coordination
 - Trouble speaking
 - Memory loss

Powassan virus: Treatment

- No specific treatment for Powassan
- Supportive therapy for severe illnesses
 - Hospitalization
 - Respiratory support
 - Intravenous (IV) fluids

Statistics

Powassan virus neuroinvasive disease cases reported by year, 2004–2013



Source: CDC, Powassan Statistics

Testing of Ticks


- Not recommended
- Positive tick ≠ human infection
 - may not have been attached long enough to transmit infection
- Negative tick may give false sense of security
 - may have been bitten by a different tick that was infected
- Testing not available at NJDOH



Tick-borne Disease Prevention




Personal Prevention



- **Personal protective measures**
 - Know where to expect ticks
 - During hike, stay on trail
 - Protective clothing that covers skin
 - Insect repellent
 - Permethrin is gold standard
 - Applied to clothing and equipment
 - Tick checks
 - Protect pets from ticks

Environmental Prevention

- **Environmental Measures:**
 - Keep grass mowed short
 - Woodchip/mulch border
 - Picnic/playground equipment away from woods
 - Keep birdfeeder clean
 - Chemical control agents



Mosquito-borne Disease




Mosquito-borne Disease

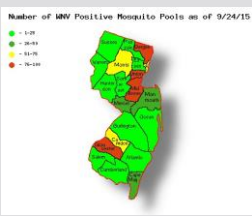
- Mosquito-borne diseases are caused by viruses transmitted by the bite of an infected mosquito.
- Adult female mosquitoes feed on blood to provide nutrients for the developing eggs they will deposit.
- If the mosquito feeds on a bird infected with one of the viruses, there is a chance that she will pick up the virus from the bird's blood.
- After a couple of weeks, if the virus has survived in the mosquito and increased to high numbers, she is able to infect a new blood host (e.g. another bird, a human, or a horse.)

Mosquitoes in New Jersey

- Roughly 2600 species of mosquitoes exist worldwide
- 160 species are present in North America and 63 species are in NJ
- Most mosquitoes in the US are more of a nuisance than a disease threat



Statistics: Mosquito-borne Disease in New Jersey

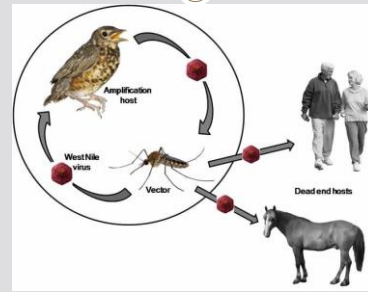


- West Nile virus (WNV) activity (mosquito and/or avian) has been identified in all 21 counties.
- 18 WNV positive human cases, including two (2) fatalities in Monmouth and Passaic counties.
- Eastern equine encephalitis activity (EEE) has been identified in 6 counties: Burlington, Camden, Cape May, Cumberland, Gloucester and Salem.
- No Chikungunya virus (CHIKV) positive mosquito pools have been identified.

West Nile Virus (WNV)



WNV: Transmission



WNV: Symptoms

- Approximately 80% of people who are infected with WNV will not show any symptoms at all.
- Up to 20% will have mild symptoms:
 - Fever, headache, body aches, nausea, vomiting, and sometimes swollen lymph glands or a skin rash on the chest, stomach and back
 - Symptoms can last for as short as a few days to as long as several weeks
- About 1 in 150 people infected will develop severe illness:
 - High fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis
 - These symptoms may last several weeks, and neurological effects may be permanent

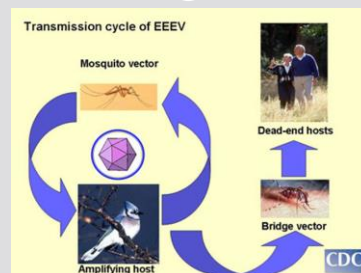
WNV: Diagnosis & Treatment

- Laboratory testing of symptomatic and seriously ill people can help distinguish WNV from other conditions causing similar symptoms.
- Testing is not used for screening asymptomatic people.
- No vaccine or specific antiviral treatments are available.
- Over-the-counter pain relievers can be used to reduce fever and relieve some symptoms.

Eastern Equine Encephalitis (EEE)



EEE: Transmission



EEE: Symptoms

- EEE virus infection can result in one of two types of illness, systemic or encephalitic (involving swelling of the brain, referred to here on out as EEE).
- It takes 4 to 10 days after the bite of an infected mosquito to develop symptoms of EEE.
- Systemic infection has an abrupt onset characterized by chills, fever, malaise, arthralgia, and myalgia lasting 1-2 weeks.
- Severe cases of EEE begin with the sudden onset of headache, high fever, chills, and vomiting; the illness may then progress into disorientation, seizures, and coma.

EEE: Diagnosis & Treatment

- Diagnosis is based on tests of blood or spinal fluid. These tests typically look for antibodies that the body makes against the viral infection.
- There is no specific treatment for EEE.
- Severe illnesses are treated by supportive therapy which may include hospitalization, respiratory support and IV fluids.

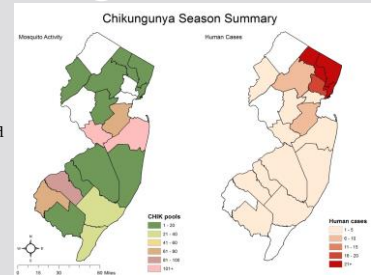
Chikungunya Virus (CHIKV)



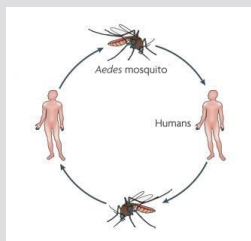
2014 CHIKV Summary

2014 CHIKV Totals

- Mosquito: 623 pools submitted from 17 counties
- Human: 178 confirmed cases (all imported) from 16 counties
- Most cases involved travel to Dominican Republic

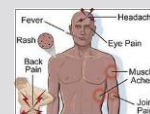


CHIKV: Transmission



CHIKV: Symptoms

- Characterized by an abrupt onset of **fever** frequently accompanied by **joint pain**
- Other common signs and symptoms include muscle pain, **headache**, **nausea**, **fatigue** and **rash**
- Joint pain is often very debilitating, but usually lasts for a few days or may be prolonged to weeks



CHIKV: Diagnosis & Treatment

- Diagnosis is based on tests of blood or spinal fluid. These tests typically look for antibodies that the body makes against the viral infection.
- The diagnosis of CHIKV varies based on travel history and exposure.
- Treatment is generally palliative (rest, fluids and use of analgesics and antipyretics)
- Newly infected patients should avoid mosquito bites for **one week** following symptom onset. This helps reduce the chance of transmitting CHIKV to local mosquito populations.

Mosquito-borne Disease Prevention



Mosquito-borne Disease Prevention: Personal Precautions

- Use air conditioning or screens when indoors.
- Weather permitting, wear long sleeves and pants when outdoors.
- Use insect repellent registered with the U.S. Environmental Protection Agency (EPA).
- Protect yourself at all times when outdoors: CHIKV vector mosquitoes bite mainly from dawn to dusk; WNV vector mosquitoes bite mainly from dusk to dawn.

Mosquito-borne Disease Prevention: Insect Repellent

- Use products containing active ingredients registered with the EPA for use as repellents applied to skin and clothing.
- Products containing DEET, picaridin, IR3535, and some oil of lemon eucalyptus and para-menthane-diol products provide longer-lasting protection.
- Repellents containing a higher percentage of the active ingredient typically provide longer-lasting protection.
- If you start to get mosquito bites, reapply the repellent according to the label instructions.
- Always follow the product label recommendations.



Mosquito-borne Disease Prevention: Source Reduction

- Eliminate mosquito breeding sites by emptying standing water.
- Get rid of standing water in rain gutters, old tires, buckets, plastic covers, toys or any other container where mosquitoes can breed.
- Empty and change the water in bird baths, fountains, wading pools, rain barrels and potted plant trays at least once a week.
- Keep swimming pool water treated and circulating.
- Drain temporary pools of water or fill with dirt.



Mosquito-borne Disease Prevention: Source Reduction

- Asian tiger mosquitoes tend to remain at ground level—under decks and shrubs, basement stairwells, and crawl spaces.
- This species prefers man-made containers with stagnant water.
- Main breeding habitats include:
 - Tarps that hold water
 - Old tires collecting water
 - Plastic chairs, tables and all outside furniture
 - Flower pots, especially those with a saucer underneath
 - Wheel barrels stored improperly
 - Anything that can hold small amounts of water
- Corrugated drain pipe off of downspouts
- Children's toys, especially plastic toys
- All containers (buckets, pails, water bottles, trash cans)



For More Tick Related Information

- NJDOH Communicable Disease Service:
www.nj.gov/health/cd
- CDC Tickborne Disease of the United States:
<http://www.cdc.gov/ticks/diseases/>
- CDC Guidance on Tick Removal:
<http://www.cdc.gov/lyme/removal/>

For More Mosquito Related Information

- NJDOH Communicable Disease Service:
www.nj.gov/health/cd
- County Mosquito Control Agency Hotline:
1-888-NO NJ WNV
- CDC Mosquito-Borne Diseases:
www.cdc.gov/ncidod/diseases/list_mosquitoborne.htm
- CDC Updates on Mosquito Repellent:
www.cdc.gov/ncidod/dvbid/westnile/repellentupdates.htm



Questions or Comments?

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