Fall 2013 BEHP

- Webinar Handouts available at www.behp-ny.org
- Under Program Handouts tab
- Complete Exams and Evaluations
- In-Class next week!
  - Oct 1, 2, 3

- If you are in a group, designate one person to be at the computer.

- Questions will be answered throughout the presentation.
  - Raise your hand or use chat
  - Keep phone on mute when not asking questions (46)

- Today’s session is being recorded. This recording will include audio from the conference call.

What do these animals have in common?

- [Images of various animals]

- [Sample text or questions related to the animals]
What do these animals have in common?
All members of the Phylum Arthropod:
1. Have a hard external shell = exoskeleton
2. Have jointed legs
3. Cold-blooded = exothermic

What makes these animals different?
1. Number of Legs - 100s, 4, 3 (pairs),
2. Habitats - aquatic or terrestrial
3. Life strategy - incomplete or complete

How does an Arthropod/Insect Grow?
They grow by shedding their skin = their exo (external) skeleton

When does an Arthropod/Insect Grow?
1. Simple metamorphosis—shape doesn’t change
2. Complete or Complex metamorphosis
   a. eggs - larvae - pupae - adult
   b. immatures different from adults
   c. pupae - inactive (does not feed)
Life Strategies: Habits & Habitats

Simple (same)
- male
- female
- nymph
- larva

Complex (different)

Ways Arthropods/Insects Impact Health

As Parasites
1. Accidental - venoms, secretions, injuries
   - spiders, bees & wasps, caterpillars, flies
2. Temporary Ectoparasites - Bloodsuckers
   - ticks, fleas, true bugs and biting flies
   - mosquitoes, black flies, deer flies, horse flies
3. Continuous Ectoparasites = As Diseases
   - Lice = Pediculosis - head, body or crab lice
   - Mites = Scabies - human scabies mite

As Vectors of Disease
- Mechanical
- Biological
1. Accidental - secretions (dermatitis - hives)

1. Accidental - toxins (necrotic)

1. Accidental - toxins (necrotic)
1. Accidental - venoms (anaphylactic shock)

2. Temporary Ectoparasites (bloodsuckers)
2. Temporary Ectoparasites (bloodsuckers)

3. Continuous Ectoparasites = As Diseases
3. Continuous Ectoparasites = As Diseases

Within Arthropod Pathogen Transmission
Transstadial Transmission - across stages

Transovarial transmission - across (through) eggs

Detect pathogens and prevent their spread!
Surveillance
Human
Vector
Host

Education
Public
Provider

Research
Lab
Non-Lab

- Detect Pathogens
- Prevent Their Spread (though could also help in detecting)

Vector Emergence
- Introduction of new species
- Spread of existing species into new area
- Habitat modification
  - Biogeographical changes
  - Change in hydrology
- Increasing reservoir host populations
- Cultural factors
  - Decreased pesticide application
  - Wetland restoration
  - Increased human contact with natural areas during recreation and occupation

Vector-borne Diseases in NY

Tick-borne Diseases:
- Lyme disease
- Babesiosis
- Ehrlichiosis/Anaplasmosis
- Rocky Mountain Spotted Fever
- Powassan Encephalitis
- Q-Fever (more commonly transmitted in other ways)
- Tularemia (tick-bite = one of several modes of transmission)
Vector-borne Diseases (cont.)

Mosquito-borne Diseases:
- West Nile Virus
- Jamestown Canyon / LaCrosse
- St. Louis Encephalitis
- Eastern / Western / Venezuelan Equine Encephalitis
- Dengue Fever
- Yellow Fever
- Chikungunya

Vector-borne Diseases (cont.)

Louse-borne / Flea-borne Diseases:
- Typhus Fever

Ticks and Tick-Borne Diseases
Tick - talk:

~30 species of ticks are found in New York State.
10 species commonly bite humans.
4 species can potentially transmit disease (in New York)

Who can transmit what?

American Dog tick:
Rocky Mountain spotted fever & Human Monocytic Ehrlichiosis (HME)

Lone Star tick:
Human Monocytic Ehrlichiosis (HME)

Deer tick:
Lyme disease
Babesiosis & Human Granulocytic Anaplasmosis (HGA)

Woodchuck tick:
Powassan Encephalitis
**Distribution of Tick-Borne Diseases in New York State**

Babesiosis
- 269 cases reported in 2010

Ehrlichiosis (HME)
- 40 cases reported in 2010

Anaplasmosis (HGA)
- 231 cases reported in 2010

Rocky Mountain spotted fever
- 30 cases reported in 2010

Lyme Disease
- 6316 cases reported in 2010

* Reported to the New York State Department of Health by medical providers

---

**Lyme Disease**

Lyme disease is caused by a bacteria (spirochete) called *Borrelia burgdorferi* (shown right).

It is transmitted when an infected nymph (left) or female adult deer tick (right) bites a person, and feeds for at least 36 hours or is not removed correctly.

---

**At least 36 hours to transmit *B. burgdorferi***

- Hemocele
- Midgut
- Salivary Glands
- Body
Two Year Life Cycle of the Deer Tick:

Most cases acquired thru the bite of a nymph

Deer Tick “Questing”

How a Deer tick finds and attaches to a host...
...they do not fly or drop out of trees

The Seasonal Life Cycle of the Deer tick*

* CT Agricultural Experimental Field Station
The Seasonal Life Cycle of the Deer tick

* Based on NYSDOH passive surveillance data

NYS Lyme Disease Cases by month of onset, 1996-2001

n = 5303 (96), 3325 (97), 4554 (98), 4403 (99), 4330 (00), 3479 (01)

Lyme Disease Incidence Rates, CNY Counties, 2005-2010
**Tick Infectivity, various locations in CNY Adult Deer Ticks**

<table>
<thead>
<tr>
<th>Location</th>
<th>Date</th>
<th>County</th>
<th>Township</th>
<th>Bb %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chenango Valley State Park</td>
<td>11/3/2009</td>
<td>Broome</td>
<td>Chenango Forks</td>
<td>30.2</td>
</tr>
<tr>
<td>Chenango Valley State Park</td>
<td>11/9/2009</td>
<td>Broome</td>
<td>Chenango Forks</td>
<td>29.2</td>
</tr>
<tr>
<td>St. Stanislaus Cemetery</td>
<td>10/22/2009</td>
<td>Oneida</td>
<td>Whitesboro</td>
<td>18.0</td>
</tr>
<tr>
<td>Green Lakes State Park</td>
<td>10/27/2009</td>
<td>Onondaga</td>
<td>Marjus</td>
<td>31.0</td>
</tr>
<tr>
<td>Three Mile Bay Game Management Area</td>
<td>10/20/2009</td>
<td>Oswego</td>
<td>West Monroe</td>
<td>0.0</td>
</tr>
<tr>
<td>Three Mile Bay Game Management Area</td>
<td>10/21/2009</td>
<td>Oswego</td>
<td>West Monroe</td>
<td>25.0</td>
</tr>
<tr>
<td>Three Mile Bay Game Management Area</td>
<td>10/26/2009</td>
<td>Oswego</td>
<td>West Monroe</td>
<td>38.6</td>
</tr>
<tr>
<td>Sampson State Park</td>
<td>10/27/2009</td>
<td>Seneca</td>
<td>Romulus</td>
<td>35.3</td>
</tr>
<tr>
<td>Sampson State Park</td>
<td>11/2/2009</td>
<td>Seneca</td>
<td>Romulus</td>
<td>34.4</td>
</tr>
<tr>
<td>Calvary Cemetery</td>
<td>10/30/2009</td>
<td>Tompkins</td>
<td>Ithaca</td>
<td>32.0</td>
</tr>
</tbody>
</table>

**Babesiosis – Symptoms:**

- High fever
- Chills
- Fatigue
- Anemia
- More severe in immunosuppressed, elderly and splenectomized individuals
- Can be fatal if untreated

**Ehrlichiosis/Anaplasmosis – Symptoms:**

- Fever
- Muscle aches
- Weakness
- Headache
- Nausea & vomiting
- Joint pain
- Can be fatal if untreated
Lyme Disease – Symptoms:

- Fever
- Headache
- Fatigue
- Joint pain or stiff neck
- Muscle aches
- Characteristic “bulls eye” rash

Annual Proportion of Lyme Disease Cases by Region in New York State (Excluding New York City) 1986-2007

Nassau & Suffolk
Dutchess
Putnam
Columbia
Rockland
Elsewhere
Westchester, Putnam & Rockland

Year of Report

Percent of Cases

100%
50%
0%
Lyme disease incidence per 100,000 population by year of onset by zip code in southeast New York State by year 1986 - 2005

1986

1987
Lyme disease in New York State 1986 – 2005 by zip code

Incidence per 100,000 population

<table>
<thead>
<tr>
<th>Year</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>0.00</td>
</tr>
<tr>
<td>1990</td>
<td>0.00</td>
</tr>
<tr>
<td>2005</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Geographic Expansion

But what about this area?

Lyme Disease in New York State 2003 – 2009

Average annual incidence per 100,000 population

- 0
- 1 – 250
- 251 – 500
- 501 – 1,000
- 1,001+

*Excludes New York City, 2009 provisional data
Powassan Encephalitis in NYS, 2007-2009

- From 1958 through 2001, 31 cases of Powassan were identified in the US
- From 2007 through 2009 alone, NYS had 10 cases
  - 4 fatalities
  - Cases located throughout the State
Then What? • Education Campaigns

Tick Bite Prevention

- Avoid tick habitat/habitat management
  - Wooded, brushy or over-grown grassy areas
  - Keep grass cut. Clear brush, leaf litter.
- Personal Protection
  - Wear light colored clothing (to see ticks)
  - Tuck pants into socks and shirt into pants
- Body check for ticks
  - Prompt removal of ticks 36 hours
  - Check your pets
- Repellents - Follow label directions esp. children
- No vaccine

Take Home Messages:

- Many tick-borne diseases are already here in and others may be headed this way
- Most of these diseases lack a diagnostic symptom
- Ask patients about tick bite or outdoor exposure
- Ask patients about travel
Lyme Disease – One Dose Prophylaxis:

- A single 200mg dose of doxycycline has been shown to be effective in preventing Lyme disease after a tick bite, but only when the following conditions are met:
  - The tick involved is a deer tick (Ixodes scapularis)
  - The tick is/was attached for at least 36 hours
  - Treatment can be started within 72 hours from when the tick was removed
  - The tick was acquired in an area where the Borrelia burgdorferi infectivity rate in ticks is greater than 20%
  - Doxycycline is not contraindicated

  * For children 4 years of age, 4 mg/kg up to a maximum dose of 200 mg

Personal protection:
Correct Tick Removal Technique:

- Grasp tick with tweezers, as close to the skin as possible (i.e. by the mouthparts or "head" of the tick)
- Pull slowly, with a constant motion away from the skin (perpendicular to skin surface)
- Do not use petroleum jelly, gasoline, lit match or cigarette, nail polish or any other method.
- You may be increasing your risk of acquiring a tick-borne disease!

Arboviruses in New York State

- Arboviruses: viruses transmitted by the bite of arthropods.
- Almost all in New York are transmitted by the bite of an infected mosquito.
- Powassan encephalitis is transmitted by the bite of an infected tick.
- Range from non-pathogenic in humans to highly pathogenic.
- Vary in severity, age range typically showing symptoms, etc.
- Some are endemic, some are seen only rarely.
History of Arboviruses in New York State

Timeline: Arboviruses Detected in New York 1952-2004

- 1952: EEE in pheasants in Orange; 1959: EEE in ducks in Suffolk
- 1961: Flanders first identified in Suffolk, named for town
- 1969: three human CAL cases; LAC detected in Rockland
- 1971: Fatal human EEE case from Oswego; JC detected in state
- 1970: two human CAL cases; 3 EEE horses in Suffolk; DOH mosquito surveillance starts using RMEs, suckling mice used to test
- 1975: Fatal human EEE case from Orange, IL detected for first time in data
- 1983: Fatal human EEE case from Oneida; JC cases in Monroe; Ventura EEE cases in Rockland
- 1983: Switch from suckling mice for virus detection to vero cells
- 1997: Two human JC cases (Monroe, Otsego); 1 human LAC case (Queens)
- 1999: WNV appears in US in New York; combination of PCR and vero cells used to detect arboviruses
- 1999: Two human SLE cases in Western NY; 3 human POW cases
- 2003: Human SLE case (Ontario)
- 2003-04: EEE in new counties
- 2007: EEE in sentinel pheasants used for monitoring

History of Arboviruses in New York State:
Less Common Human Pathogens
St. Louis Encephalitis Virus Detected in New York

1959-2011

- SLE is a flavivirus typically found in the Gulf Coast states and the Mississippi and Ohio River valleys. NY cases in 1975 were the northern end of a multistate outbreak. It most effects the elderly.

- NY has never had a mosquito pool isolation of SLE

Unspecified California Encephalitis Virus Detected in New York

1959-2011

- CAL is a group of 14-17 related bunyaviruses, some of which are human pathogens, and some are not. Recent testing advances have allowed us to better differentiate between these viruses.

Jamestown Canyon Virus Detected in New York

1959-2011

- JC is a CAL group bunyavirus that is mildly pathogenic, and some question whether or not it is a pathogen at all. Its vertebrate hosts are typically deer.

- 94 mosquito pools (2 in 1972, 2 in 1977, 4 in 1979, 2 in 1980, 5 in 1983, 4 in 1997) from unknown counties

• 63 human cases (2 in 1971, 5 in 1972, 4 in 1974, 3 in 1977, 8 in 1977) from unknown counties

• 17 mosquito pools (6 in 1976, 10 in 1978, 2 in 1982) from unknown counties

Human cases

Mosquito pool isolations

Human cases

Mosquito pool isolations (1 pool each)

Human cases
Lacrosse Encephalitis Virus Detected in New York

1959-2011

- 11 mosquito pools (3 in 1974, 5 in 1976, 3 in 1977) from unknown counties

- 1 pool each

- Human cases

LAC is a CAL group bunyavirus that is most commonly seen in children younger than age 15. It is less pathogenic than some other arboviruses, with a case fatality rate less than 1%. It is traditionally found in the Great Lakes and Mid-Atlantic states.

History of Arboviruses in New York State:
West Nile Virus

West Nile Virus Positive Specimens, 1999

- No Confirmed Activity
- Birds &/or Mosquitoes
- Humans (and Birds &/or Mosquitoes)

- 1 pool each

- Human cases

- 11 mosquito pools (3 in 1974, 5 in 1976, 3 in 1977) from unknown counties
West Nile Virus
Positive Specimens, 2000

West Nile Virus
Positive Specimens 2001

West Nile Virus
Positive Specimens, 2002
West Nile Virus Positive Specimens, 2003

No Confirmed Activity

Birds &/or Mosquitoes

Humans (and Birds &/or Mosquitoes)

West Nile Virus Positive Specimens, 2004

No Confirmed Activity

Birds &/or Mosquitoes

Humans (and Birds &/or Mosquitoes)

West Nile Virus Positive Specimens, 2005

No Confirmed Activity

Birds &/or Mosquitoes

Humans (and Birds &/or Mosquitoes)
West Nile Virus Positive Specimens, 2006

No Confirmed Activity
Birds &/or Mosquitoes
Humans (and Birds &/or Mosquitoes)

West Nile Virus Positive Specimens, 2007

No Confirmed Activity
Birds &/or Mosquitoes
Humans (and Birds &/or Mosquitoes)

West Nile Virus Positive Specimens, 2008

No Confirmed Activity
Birds &/or Mosquitoes
Humans (and Birds &/or Mosquitoes)
History of Arboviruses in New York State: Eastern Equine Encephalitis

Eastern Equine Encephalitis Virus Detected in New York

1952

- Positive pheasants found in Orange County

EEE has a very high case-fatality rate, from 30%–80% depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

1959

- Positive ducks found in Suffolk County

EEE has a very high case-fatality rate, from 30%–80% depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.
Eastern Equine Encephalitis Virus Detected in New York

1970

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

EEE has a very high case-fatality rate, from 30% - 80% depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

1971

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

- Fatal human case in 5-week-old male from Oswego County; also 3 horse cases and 8 positive mosquito pools in Oswego; 15 positive wild avian sera

1972

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

EEE has a very high case-fatality rate, from 30% - 80% depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.
Eastern Equine Encephalitis Virus
Detected in New York

1973

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

- One positive mosquito pool from unknown county

EEE has a very high case-fatality rate, from 30%-80% depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

Human cases
Positive birds

1974

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

- Also positive mosquitoes in Oswego (7 pools) and Onondaga (1 pool)

EEE has a very high case-fatality rate, from 30%-80% depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

Human cases
Positive birds

1975

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

EEE has a very high case-fatality rate, from 30%-80% depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

Human cases
Positive birds
Eastern Equine Encephalitis Virus Detected in New York

1976

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

Also positive mosquitoes in Oneida (6 pools) and Oswego (2 pools)

EEE has a very high case-fatality rate, from 30%–80%, depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

1977

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

Also positive mosquitoes found in Oswego (21 pools)

EEE has a very high case-fatality rate, from 30%–80%, depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

1978

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

EEE has a very high case-fatality rate, from 30%–80%, depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.
Eastern Equine Encephalitis Virus Detected in New York

1980

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

EEE has a very high case-fatality rate, from 30%‐80% depending on the outbreak. There have been approximately 228 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

1982

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

EEE has a very high case-fatality rate, from 30%‐80% depending on the outbreak. There have been approximately 228 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

1983

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

EEE has a very high case-fatality rate, from 30%‐80% depending on the outbreak. There have been approximately 228 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

Positive birds

- 1982: 4 positive horses (including transplacental horse case) and 2 positive mosquito pools from Oswego
- 1983: Also positive mosquito pools from Oswego (2 pools)
Eastern Equine Encephalitis Virus	
Detected in New York

1987

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

EEE has a very high case-fatality rate, from 30%‐80%, depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitis symptoms. There is a vaccine for horses.

Human cases
Positive birds

1988

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

EEE has a very high case-fatality rate, from 30%‐80%, depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitis symptoms. There is a vaccine for horses.

Human cases
Positive birds

1990

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

- Also positive mosquitoes found in Oswego (45 pools), Onondaga (22 pools), and Oneida (4 pools)

EEE has a very high case-fatality rate, from 30%‐80%, depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitis symptoms. There is a vaccine for horses.

Human cases
Positive birds
Eastern Equine Encephalitis Virus Detected in New York

1991

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

EEE has a very high case-fatality rate, from 30% - 80% depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

Also positive mosquitoes found in Onondaga (27 pools), Oswego (10 pools), and Madison (1 pool).

1993

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

1994

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

Human cases

Positive birds

EEE has a very high case-fatality rate, from 30% - 80% depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.
Eastern Equine Encephalitis Virus
Detected in New York

1996

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

EEE has a very high case-fatality rate, from 30%‐80% depending on the outbreak. There have been approximately 220 human cases nationally since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

Human cases
Positive birds

1997

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

EEE has a very high case-fatality rate, from 30%‐80% depending on the outbreak. There have been approximately 220 human cases nationally since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

Human cases
Positive birds

1998‐2002

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

EEE has a very high case-fatality rate, from 30%‐80% depending on the outbreak. There have been approximately 220 human cases nationally since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.
Eastern Equine Encephalitis Virus Detected in New York

2003

- Mosquito pool isolations
- Positive birds
- Human cases
- Horse cases

* Also positive birds in Orange (2) and Ulster (1), positive mosquitoes in Suffolk (1 pool)

EEE has a very high case-fatality rate, from 30% - 80% depending on the outbreak. There have been approximately 228 human cases and 228 horse cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

Human cases

Positive birds

Mosquito pool isolations

2004

- Mosquito pool isolations
- Positive birds
- Human cases
- Horse cases

* Also positive birds in Onondaga (1), Sullivan (1), and Ulster (1); positive mosquitoes in Onondaga (15 pools), Sullivan (2 pools), and Madison (1 pool)

EEE has a very high case-fatality rate, from 30% - 80% depending on the outbreak. There have been approximately 228 human cases and 228 horse cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

Human cases

Positive birds

Mosquito pool isolations

2005

- Mosquito pool isolations
- Positive birds
- Human cases
- Horse cases

* Also positive mosquito pools in Madison (1)

EEE has a very high case-fatality rate, from 30% - 80% depending on the outbreak. There have been approximately 228 human cases and 228 horse cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

Human cases

Positive birds

Mosquito pool isolations
Eastern Equine Encephalitis Virus Detected in New York

2006

- Mosquito pool isolations
- Positive birds
- Human cases
- Horse cases

* Also positive mosquito pools in Oswego (45) Madison (5)

EEE has a very high case-fatality rate, from 30%‐80% depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

Human cases

Positive birds

2007

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

* Also positive mosquito pools in Oswego (17)

EEE has a very high case-fatality rate, from 30%‐80% depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

Human cases

Positive birds

2008

- Mosquito pool isolations
- Positive birds
- Horse cases
- Human cases

* Also positive mosquito pools in Oswego (1.7)

EEE has a very high case-fatality rate, from 30%‐80% depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

Human cases
9/9/2013

Eastern Equine Encephalitis Virus Detected in New York

2009

- Also positive horses in Oswego (6) and positive mosquito pools in Oswego (43)

EEE has a very high case-fatality rate, from 60%-80% depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

2010

- Also positive horses in Onondaga (3) and positive mosquito pools in Oswego (47) and Onondaga (10)

2011

- Also positive horses in Oswego (6), and positive mosquito pools in Oswego (26 pools) and Onondaga (2 pools)

EEE has a very high case-fatality rate, from 60%-80% depending on the outbreak. There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.

There have been approximately 220 human cases nationwide since 1964. It causes rapid onset of encephalitic symptoms. There is a vaccine for horses.
**What is the Purpose of Mosquito Surveillance?**

- Identify where vectors are breeding or abundant
- Identify the species present
  - Species is important in determining risk of transmission to humans
- Monitor vector population densities (in different life stages) by species over time
- Identify infectious agents in the vector population

---

**How do you trap mosquitoes?**

A CDC light trap at a tire pile in Eastern NY.
Diurnal Resting Boxes (or Shelters). These simulate areas where mosquitoes will hide during the day.

Best used to collect *Culiseta* mosquitoes associated with EEE.

Sampling for larval (immature) mosquitoes.
Sampling for larval (immature) mosquitoes.

Most Commonly Positive Mosquito Species
1959-2004; For Selected Arboviruses

Different mosquito species are involved with different diseases, meaning different approaches are sometimes necessary.
EEE in Central NY 2011

EEE Surveillance Data
2011 Season Summary

Locations of mosquito collection sites in the 4-county area surrounding Oneida Lake, August and September 2011.

Positive pools from sites indicated in table below map.
Data Available as of July 27:
10 Days Prior to Onset of Symptoms

Data Available as of August 1:
5 Days Prior to Onset of Symptoms

Data Available as of August 6:
Onset of Symptoms in Human Case
Data Available as of August 12: Human Case Reported

Data Available as of August 16: Decision to Spray

Representative image of swamps surrounding Oneida Lake. Moist soil, heavy canopy.
Culiseta mosquitoes breed in these hummocks, or cavities beneath trees.

Getting larvicides to these hummocks makes larval control for EEE difficult, and application in sensitive habitats requires approval NYSDEC.

WNV in Long Island/NYC, 2010
So What Happened in 2010?

- Climate? Very hot and very dry leads to reduced availability of water.
- Reduction in routine mosquito control in Nassau County? Kept WNV in check before?
- Role of volunteer blood donor positives
  - Had 19 volunteer donor positives—more than all other years combined.
  - Most not symptomatic or unknown.
  - Initially thought test may be flawed, but better reporting
- Surveillance system worked in identifying WNV

Mosquito Testing

- NYSDOH Wadsworth Laboratory tests mosquitoes on a weekly basis
- Turn around times for EEE positive specimens
  - Mosquitoes, 6 days (range 1-21)
  - Horses, 6 days (range 1-17)
**Cell culture inoculation**

Normal Vero monolayer → Cytopathology

- Daily observation for CPE

**Integrated Mosquito Management**

(like the food guide!)

- Adulticide Use
- Larvicide Use
- Larval Habitat Management
- Education and Personal Protection

**Human and Equine Surveillance**

- Encephalitis is a reportable condition in New York
- Alerts to physicians to be aware of the symptoms
  - Suspect cases are tested at the NYSDOH Wadsworth Laboratory
- Four-county surveillance of veterinarians for encephalitis in horses.
  - Horses are very sensitive to EEE and infection is often fatal.
Human Testing Available

- Wadsworth
  - CSF
    - PCR panel (includes WNV, HSV, CMV, VZV, EBV, EEE, SLE, enterovirus, and California group and Cache Valley virus)
    - WNV ELISA IgM testing
  - Serum
    - WNV ELISA testing
    - Arboviral IFA IgG testing (includes EEE, LaCrosse, SLE, WEE)
- PRNT testing on paired specimens

Reporting & Surveillance Process

EEE: Spraying

- NYSDOH provides technical assistance and consultation to local health departments
- Reduce the risk of EEE virus transmission to humans by decreasing mosquito populations through the appropriate use of pesticides
- Local Decision
- Only one aerial mosquito control operator in CNY

NYSDOH provides technical assistance and consultation to local health departments to reduce the risk of EEE virus transmission to humans by decreasing mosquito populations through the appropriate use of pesticides. Local Decision is made based on the situation, and only one aerial mosquito control operator operates in CNY.
**Spraying Factors**

- Recent Mosquito, Horse and Human Surveillance Data
- Numbers and Species of positive mosquito populations
  - Geographically focal or widespread
  - Proximity of human populations
- Geography of and accessibility
- Impact on humans, other insect species, and the environment
- Time of year

**Spraying Limitations**

- Uncertain and potentially, very limited benefits for preventing EEE among humans
- Only feasible in relatively limited geographic areas due to cost, the location of mosquitoes, and accessibility
- Time limited benefit because it does not kill all mosquitoes in the area and those that are killed can rapidly be replaced by new mosquitoes

**Education and Prevention**

- Given the limitations of spraying, the primary strategy must continue to be promotion of personal preventive measures
- Updated educational campaigns and fact sheets
- Tens of thousands of these materials and 100,000 DEET wipes were distributed at the New York State Fair.
Education and Prevention

- Keep doors closed and ensure that window screens are in place
- Take steps to reduce the number of mosquitoes around a home and eliminate standing water
- Consider use of repellents
- Wear long sleeves and long pants
- Avoid areas with high mosquito populations

Contact Information

Bryon Backenson
New York State Department of Health
518-473-4439
bpb01@health.state.ny.us

Typhus Fever Cluster Investigation- NYS, 2009

- Familial cluster

- NYSDOH notified by LHD of potential typhus fever case in a 58-year-old resident of Upstate NY

- Patient’s 22-year-old son also ill with symptoms consistent with typhus-group infection
Typhus Fever Cluster Investigation - NYS, 2009 (cont.)

• Initial blood tests (commercial lab):
  – Patient 1: positive for typhus fever group infection
  – Patient 2: positive for Rocky Mountain Spotted Fever (RMSF)

• Given the time of year and the infrequency of typhus fever in New York State, an investigation was conducted to determine potential sources of infection and rickettsial etiology

Typhus Fever Cluster Investigation - NYS, 2009 (cont.)

• Epidemiologic Investigation:
  – Medical record review
    • Signs / symptoms
    • Preliminary diagnostic test results
    • Treatment
    • Possible exposure sources (home / work environment, etc.)
    • Travel history

Typhus Fever Cluster Investigation - NYS, 2009 (cont.)

• Environmental Investigation:
  – Sampling
    • Mammal trapping
    • Ectoparasite surveys

• Laboratory-based Investigation:
  – NYSDOH Wadsworth Center retesting of original specimens
  – Collection and testing of convalescent specimens
Typhus Fever Cluster Investigation- NYS, 2009 (cont.)

• Epidemiology / Human Laboratory Results
  – Both patients confirmed to have typhus fever group rickettsiae
  – Both were treated and fully recovered

Typhus Fever Cluster Investigation- NYS, 2009 (cont.)

• Environmental/ Animal Laboratory Results

Typhus Fever Cluster Investigation- NYS, 2009 (cont.)

• Environmental/ Animal Laboratory Results
  – 3 grey squirrels and 11 flying squirrels collected from property
  – Predominant nesting area = roof of enclosed porch on family's home
  – Both patients reported spending significant time on the porch in the weeks prior to onset & consumed uncovered food left on porch
Typhus Fever Cluster Investigation- NYS, 2009 (cont.)

• Environmental / Animal Laboratory Results (cont.)
  – 24 pools of ectoparasites collected:
    • Fleas
    • Lice
    • Mites
    • Ticks

Typhus Fever Cluster Investigation- NYS, 2009 (cont.)

• Environmental / Animal Laboratory Results (cont.)
  – Ectoparasites negative for rickettsiae by PCR
  – All 11 flying squirrels seropositive for R. prowazekii in CDC serologic tests
    • Titer levels generally high

Typhus Fever Cluster Investigation- NYS, 2009 (cont.)

• Exact transmission mechanism of R. prowazekii to humans from flying squirrels has not yet been documented
• Inhalation, transdermal, or mucous membrane exposure to rickettsia-laden louse feces, as well as louse and flea bites have all been implicated*

Typhus Fever Cluster Investigation- NYS, 2009 (cont.)

• Exposure could have occurred via:
  – inhalation of louse feces or contaminated flying squirrel nesting material, rendered airborne by rodent activity above the porch ceiling
  – ingestion of contaminated food stored in proximity to squirrel nests
  – louse or flea bite