Bug and other critter diseases that sometimes make Iowan’s sick....
Discuss Diseases by Critter

- Mosquito Diseases
- Tick Diseases
- Rodent Diseases
- Bat Diseases
How many different types of mosquitoes have been identified in Iowa?

- <10 species
- About 50 species
- Over 100 species

The answer is......

- 55 different species

- Been around for >150 million years
- Over 3,500 species worldwide
- Some are good giving us diseases and some aren’t
Most species are poor disease vectors
- Floodwater mosquitoes

Exceptions:
- *Aedes japonicus*
  - First found 7 years ago
  - Likely competent vector of several viruses

- *Aedes aegypti & Aedes albopictus*
  - Not in IA, in Southern US (*Aedes albopictus* has been identified 4 times)
  - Dengue Virus

- *Aedes triseriatus*
  - LaCrosse Encephalitis
Culex Mosquitoes

Culex pipiens

Culex tarsalis
Culex Mosquitoes

Good at giving us diseases—
primary WNV vectors in Iowa
Anopheles

- Also big mosquitoes
- Bite hard
- Not efficient disease transmitters in Iowa
- Vector for Malaria
Culiseta Mosquitoes

- Big in size
- Aggressive biters
- Primarily feeds on birds
- Not good disease transmitters
What year was West Nile virus first found in Iowa?

- 1999
- 2000
- 2001

- WNV was first identified in a crow in Scott County in 2001
West Nile virus

- First isolated from a febrile adult woman in the West Nile District of Uganda in 1937
- Recognized as a cause of severe human meningitis or encephalitis in elderly patients in the 1950’s
- Equine disease was first noted in Egypt and France in the early 1960’s
West Nile virus in US

- First appeared in US
  - Dead crows and wild birds in June
  - First human cases of encephalitis in early August
  - Late August equine encephalitis outbreak in Long Island

- Preliminary human diagnosis was St. Louis Encephalitis virus
  - Analysis of tissues from wild crows and several exotic birds that had died at the Bronx Zoo in September revealed West Nile virus
  - Human and equine cases re-evaluated and confirmed as WNV
West Nile Virus

- **Symptoms:**
  - 80% **No symptoms**
  - Nearly 20% **mild flu-like symptoms**
  - 1 in 150 **severe life threatening illness-encephalitis**

- **At risk for infection:**
  - Anyone outside without protection

- **At risk for severe illness:**
  - Persons over 50 years of age
  - Immune compromised
1999 West Nile Activity
2000 West Nile Activity

West Nile Virus Activity
- Non-Human WNV Activity
- Human Disease Cases

National Center for Infectious Diseases
West Nile Virus Activity
Cumulative results for 2000 calendar year
2001 West Nile Activity
2002 West Nile Activity
2003 West Nile Activity
2005 West Nile Activity
2006 West Nile Activity
2007 West Nile Activity
2008 West Nile Activity
2010 West Nile Activity
2011 West Nile Activity
2012 West Nile Activity
West Nile Activity in the U.S in 2012

[Map of the United States showing various symbols for different levels of West Nile Virus activity.]
West Nile Virus Activity in Iowa in 2012

- **31 human cases**
  - No reported deaths
  - 9 cases reported last year
- **6 positive blood donors**
- **35 horses**
- **14 mosquito pools**
- **17 sentinel chickens**

West Nile Virus Activity in Iowa in 2013

- 26 human cases and additional cases are being investigated
- 9 positive blood donors
- 9 sentinel chickens
- 30 mosquito pools
- 5 horses
# West Nile Resources

**Overview:**
Thirty cases of West Nile Virus have been reported in Iowa in 2012 and additional cases are being investigated. Six positive blood donors have been reported so far this year. Thirty-three horses have also tested positive for the virus. Fourteen mosquito pools and seventeen sentinel chickens have tested positive for West Nile virus thus far. In 2011, there were 9 human cases of West Nile Virus, and 2 deaths resulting from the disease.

**Human / Blood Donor / Sentinel Chicken / Mosquito Surveillance, 2012 Positive Samples**

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<tr>
<th>County</th>
<th>Human</th>
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<th>Sentinel Chicken</th>
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**Number of West Nile Virus Human Cases, Iowa 2011-2012**

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**FAQ - Use of Mosquito Repellent on Children**

**Can insect repellents be used on children?**
- Repellent products must state any age restriction. If there is none, the US Environmental Protection Agency (EPA) has not required a restriction on the use of the product.
- For example according to the label, picaridin and oil of lemon eucalyptus products should NOT BE USED ON CHILDREN UNDER 3 YEARS.
- The American Academy of Pediatrics (AAP) recommends that repellents with DEET should not be used on infants less than 2 months old.

**How should repellent be applied on children?**
- Always follow the recommendations on the product label.
- Do not allow young children to apply insect repellent themselves; have an adult do it for them.
- When using repellent on a child, apply it to your own hands and then rub them on your child.
- Avoid children’s eyes and mouth and use it sparingly around their ears. Do not apply repellent to children’s hands. (Children may put their hands in their mouths.)
- Use enough repellent to cover exposed skin or clothing. Don’t apply repellent to skin that is under clothing. Heavy application is not necessary to achieve protection.
- Do not spray aerosol or pump products in enclosed areas or around food.
- Keep repellents out of reach of children.
- If repellent is applied to clothing, wash treated clothing before wearing again. Check label instructions for specific care instructions.

**Mosquito Repellents**

- **DEET**
  - The American Academy of Pediatrics recommends that repellents with DEET should not be used on infants less than 2 months old.
  - Repellents that contain up to 30 percent DEET are safe for children.
  - Refer to the DEET fact sheet for more information.
- **Picaridin**
- **Oil of Lemon Eucalyptus (PM)**
- **2%避蚊胺**
- **2%避蚊胺**
- **Permethrin**
- Only recommended for use on clothing, shoes, feed bags, and camping gear. Permethrin should not be applied directly to skin.

**Mosquito-proof your home:**
- Replace or repair torn screens on windows and doors.
- Repair or replace damaged window screens and hanging screens.
- Remove discarded tires, gutters, and other items that could collect water.
- Check for containers or trash cans that may be hard to see, such as under bushes or under your home.
- Mosquitoes should not be able to enter the house.

**How often should mosquito repellent be reapplied?**
- The label directions on the repellent should be followed. The length of protection against mosquito bites varies based on the active ingredient, environmental factors such as temperature and humidity, amount of physical activity/evaporation, water exposure, and other factors.

**What precautions should be followed when using insect repellents?**
- Read and carefully follow product label directions and precautions.
- Apply repellent sparingly on exposed skin and clothing.
- Do not apply repellent near eyes, lips, or mouth.
- Never apply repellent over cuts, wounds, or irritated skin.
- Avoid spraying repellent in enclosed areas.
- Do not apply repellent to the hands of young children.
- Do not allow young children to apply repellent to themselves.
- After returning indoors, wash treated skin with soap and warm water.
- Avoid over application. Heavy application is not necessary to achieve protection.
- Wash treated clothing before wearing again.

**Can mosquito repellent be used with sunscreen?**
- Yes, people can and should use both a sunscreen and an insect repellent when they are outdoors. Follow the instructions on the package for proper application of each product. In general, the recommendation is to apply sunscreen first, followed by repellent.
West Nile Virus Prevention Messages

- Use insect repellent
- Avoid outdoor activities at dusk and dawn when mosquitoes are most active.
- Wear long-sleeved shirts, pants, shoes, and socks whenever possible outdoors.
- Eliminate standing water around the home because that’s where mosquitoes lay eggs.
  - Empty water from buckets, cans, pool covers and pet water dishes.
  - Change water in bird baths every three to four days.
What mosquito-borne virus was most commonly identified in our state?
- La Crosse Encephalitis

Where was this virus discovered?
- La Crosse, Wisconsin

BONUS QUESTION: What Iowa public health professional grew up in that town?
- Dr. Patty Quinlisk
Human Arbovirus Cases 2005-2007

Human Cases
- La Crosse virus
- St. Louis virus
- Western equine encephalitis
- West Nile virus
La Crosse Encephalitis

- Discovered in La Crosse, WI in 1963
  - 4-year old Minnesota girl died in La Crosse of acute encephalitis.
- Greatest risk for clinical disease in children <16 years old
  - Cases often un- or misdiagnosed
  - Case-fatality rate: < 1%
- Mosquito vector?
  - *Aedes triseriatus* (tree hole mosquito)
- Amplifier chipmunks and squirrels
California Serogroup Virus Neuroinvasive Disease Cases* Reported by State, 1964-2010
True or False?

- Malaria was once very common in Iowa
- Yes
- Over 1100 cases reported in the 1940’s alone
- Malaria eliminated from the US in 1951
  - Eliminating wetlands
  - DDT spraying
What state is currently seeing locally acquired Dengue infections?

FLORIDA
Dengue Virus

- Locally acquired dengue cases in Key West
  - 2009 – 22 cases
  - 2010 – 66 cases
  - 2011 – 7 cases
  - 2012 – 4 cases
  - YTD 2013 – 19 cases

- This year cases in additional counties

[Map of Florida showing additional counties with cases]
Mosquito-related questions?
Name these 3 ticks types commonly found in Iowa?

- *Dermacentor variabilis* – American Dog tick
  - Most common species in IA

- *Ixodes scapularis* – Blacklegged / Deer tick
  - Most abundant in NE and E Iowa

- *Amblyomma americanum* – Lone Star Tick
  - Most abundant in Southern Iowa
Tick diseases in Iowa

- **Deer Tick** (*Ixodes scapularis*)
  - Lyme disease
  - Anaplasmosis

- **American Dog Tick** (*Dermacentor variabilis*)
  - Rocky Mt. Spotted Fever
  - Tularemia

- **Lone Star Tick** (*Amblyomma americanum*)
  - Ehrlichiosis
  - Tularemia
Lyme Disease

- First recognized in 1975
  - Juvenile rheumatoid arthritis outbreak near Lyme, CT
- Cases (27) first reported in Iowa in 1989
- Cases now reported statewide
  - Recently 100-160 cases/year

Symptoms
- Usually appear 3-30 days after exposure
- 70% - 80% of infected persons develop bulls-eye-rash
- If untreated:
  - 60% develop arthritis, with severe joint pain and swelling
  - 5% develop chronic neurological complaints
Human Cases of Lyme Disease from 1989 to 2007
Anaplasmosis

- First recognized in the US in the mid-1990’s
- Transmitted by deer tick
- Fever, headache, chills, and muscle aches
  - Rash—very rare
  - 1-2 weeks after exposure
  - <1% case fatality rate
- Cases increasing nationally
  - 248 cases in 2000
  - 1761 cases in 2010
Rocky Mountain Spotted Fever

- **Vector:** American Dog Tick
- **Symptoms:**
  - 2-14 days post tick bite
  - Sudden onset fever and headache
  - Rash 2-5 days after fever
- Can progress to vasculitis, which can cause permanent neurological damage to internal organs
Rocky Mountain Spotted Fever Incidence
Tularemia

- Caused by bacteria *Francisella tularensis*
- Transmitted by:
  - Both the dog and the lone star tick
  - Deer fly bites
  - Handling animals
    - Hunting or skinning infected rabbits, muskrats, prairie dogs and other rodents
    - Bites from infected cats (saliva exposure)
  - Inhaling contaminated dust or aerosols
  - Contaminated water
  - Laboratory exposure – wound or blood cultures
Illness ranges from mild to life-threatening.  
- Symptoms vary depending on how the bacteria enters the body.

Main forms of this disease are:
- Ulceroglandular, Glandular, Oculoglandular, Oropharyngeal, Pneumonic
- All forms are accompanied by fever, which can be as high as 104 °F.

Naturally occurring nationwide (except Hawaii)
Reported Tularemia Cases 2001-2010

1 dot placed randomly within county of residence for each confirmed case.
Tularemia

1-2 cases occur in Iowa yearly
- Look for a history of skinning animals, tick bites, or spending a lot of time outdoors
- Usually ulceroglandular or pneumonic forms

Recommend prophylaxis for laboratory exposures
- Blood or wound culture
Erlichiosis

- First recognized in the 1980’s
- Caused by 3 species in U.S.
  - *Ehrlichia chaffeensis* - Lone Star Tick
  - *Ehrlichia ewingii* – Lone Star Tick
  - *Ehrlichia muris* – Unidentified tick in MN and WI
- fever, headache, fatigue, and muscle aches
- 1-2 weeks following a tick bite
- 1.8% case fatality if untreated
What antibiotic can be used to treat all of these diseases?

- Doxycycline
How can Tick disease be prevented?

1. Do not walk barelegged in tall grass or woods

2. Wear a long-sleeved shirt, long pants, and high socks.
   ◦ Tuck pants legs into socks.
   ◦ Wear light-colored clothing so crawling ticks can be seen more easily.

3. Conduct “tick checks” every two to three hours if spending a lot of time outdoors.
   ◦ Remove any attached ticks immediately.

4. Use tick repellents containing the ingredients DEET for skin applications.
Iowa Tick Surveillance

- Operated continuously from 1990 – 2008 and processed more than 8,000 specimens

- Goals of the program:
  - Identify ticks from public
  - Monitor tick population, distribution, and spread
  - Test for the presence of *B. burgdorferi*
  - Provide ticks and tick-borne disease information.
Outreach Information

1. [http://www.ent.iastate.edu/medent/ticks_IA](http://www.ent.iastate.edu/medent/ticks_IA)


[http://www.extension.iastate.edu/Publications/PM2036.pdf](http://www.extension.iastate.edu/Publications/PM2036.pdf)
Tick-related questions...?
Rodent Diseases

- Salmonella
- LCMV
- Hantavirus
Salmonella

- Fecal oral

- Introduced a lot of different ways
  - Rodents just one of many sources

- >600 cases in Iowa last year
- Estimate over a million cases nationally
  - Estimate nearly 20,000 hospitalizations
  - Estimate close to 400 deaths
What does LCMV stand for?

- Lymphocytic Choriomeningitis Virus
Lymphocytic Choriomeningitis Virus

- **Source**
  - common house mouse, *Mus musculus* (and other rodents)
  - about 5% of mice in U.S. infected
  - wild and pet rodents

- **Presents as:**
  - aseptic meningitis
  - encephalitis
  - meningoencephalitis

- **Pregnancy-related infection:**
  - congenital hydrocephalus
  - chorioretinitis
  - mental retardation
LCMV

- Virus in saliva, urine, & feces
  - Infected rodents shed for rest of lives without getting sick

- Exposure through broken skin, nose, eyes, or mouth
  - Also through rodent bite

- Urban serologic studies show prevalence from 2% to 5%

- Wild and pet rodent exposures
  - Recent outbreak
Hantavirus

- Primary reservoir - deer mouse
  - Carriage rate in mice is 10%
- Highly sensitive to UV light
- Viable in mice feces for <2 days
- 50% case fatality rate
How many cases of Hantavirus have there been in Iowa?

- <10
- 11-50
- 51-100
Hantavirus in Iowa

- 465 cases as of Mid-March 2007 in the U.S.
- Nine cases in Iowa since 1993
  - 1997: 1 case
  - 1998: 2 cases
  - 1999: 2 cases
  - 2003: 1 case
  - 2008: 1 case
  - 2011: 1 case
  - 2012: 1 case
Prevention

How to clean up rodent urine and droppings:
• Wear rubber or plastic gloves
• Spray area with a disinfectant or a mixture of bleach and water and soak for 5 minutes
• Use a paper towel to wipe up the urine or droppings
• Throw the paper towel in the garbage
• Mop or sponge the area with a disinfectant or bleach solution
• Wash gloved hands with soap and water before taking them off
• Wash hands with soap and warm water after taking off your gloves
How to clean out cabins, sheds, barns, or other outbuildings

1. Open all doors and windows for 30 minutes
2. Wear rubber or plastic gloves
3. Clean up all rodent urine, droppings, nests, or dead mice or rats as described on last slide
4. Mop floors or spray dirt floors with disinfectant or bleach water
5. Clean countertops, cabinets, and drawers with a disinfectant or a mixture of bleach and water
6. Steam clean, shampoo, or spray upholstered furniture with a detergent, disinfectant, or a mixture of bleach and water
7. Wash any bedding and clothing with laundry detergent in hot water if you see any mouse or rat urine or droppings on them
Rodent-related questions?
Bat Diseases

Histoplasmosis

Rabies
In the environment, *Histoplasma capsulatum* exists as a mold (1) with aerial hyphae. The hyphae produce macroconidia and microconidia (2) spores that are aerosolized and dispersed. Microconidia are inhaled into the lungs by a susceptible host (3). The warmer temperature inside the host signals a transformation to an oval, budding yeast (4). The yeast are phagocytized by immune cells and transported to regional lymph nodes (5). From there they travel in the blood to other parts of the body (6).
Histoplasmosis

- fungus *Histoplasma capsulatum*
- lives in the environment
  - Association with bird and bat droppings
- lung infection can occur after inhale spores
  - 3 to 17 days after being exposed to the fungus.
- pneumonia, fever, chest pains, and dry or nonproductive cough
  - Some people may also experience joint pain.
- if untreated, can disseminate to other organs
- accumulations of bird or bat droppings should be cleaned up by professional companies
Rabies in Iowa

2013 Iowa Rabies Map

Source: Iowa Department of Public Health, Center for Acute Disease Epidemiology

Updated: 9/5/2013
# Rabies Surveillance Data

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<th>Species</th>
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How do you get rabies?

Saliva and Neural Tissue
- Not feces, urine, or blood

Mammals
- Saliva or neural tissue contact through bite or contact to open wound or mucous membrane

Bats (Above Plus)
- Waking up to a bat in your room
- Finding a bat in a room with an unsupervised small child or incapacitated person
- Direct contact (can’t say weren’t bitten)
Annual Rabies Report

2011 Iowa Rabies Summary

ANIMAL RABIES IN IOWA:

In 2010, 27 cases of animal rabies were reported in Iowa, which is a slight decrease from 2009 (see the Table 3 below). Rabies was identified most frequently in wildlife species including bats and skunks. Two cases were diagnosed in domestic species including 1 cat and 1 dog. One cow was also tested positive.

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Table 1: Positive Rabies Cases 2001-2010

Rabies cases in Iowa for 2011 were for raccoons and 25 were confirmed positive. In 2011, 76 were tested for rabies and 25 were confirmed positive (17%). The percent positive varies greatly by species, see Table 2 below. It is important to note that the data is greatly influenced by the number of animals tested. Many animals are tested because they exhibit unusual behavior or signs making them more likely to be infected with the rabies virus. For these reasons, the percentages should not be considered representative of the true distribution of disease within the animal population in Iowa.

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<th>Species</th>
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Table 2: Percent Positive by Species in 2011

During 2011, 1577 animals in Iowa were tested for rabies and 21 were confirmed positive (1.3%). The percent positive varies greatly by species, see Table 2 below. It is important to note that the data is greatly influenced by the number of animals tested. Many animals are tested because they exhibit unusual behavior or signs making them more likely to be infected with the rabies virus. For these reasons, the percentages should not be considered representative of the true distribution of disease within the animal population in Iowa.

<table>
<thead>
<tr>
<th>Species</th>
<th>Positive</th>
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<th>% Positive</th>
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<tbody>
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<tr>
<td>Skunk</td>
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<td>0.28%</td>
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</tbody>
</table>

Table 2: Percent Positive by Species in 2011

There are two rabies strains that commonly circulate in Iowa (bat and skunk), and many different species can be infected with these strains. In animal samples that are strongly positive for rabies (the strain typing procedure is only effective in samples that are strongly positive as opposed to weakly positive), it is possible to identify the rabies strain in 22 of the 27 positive rabies cases, 14 bat strains, and 8 skunk strains were identified in 12 skunks, 1 cat, and 1 dog. The other 13 positive cases were identified in 8 bats, 1 cow, and 1 racoon.

Rabies information is accessible on the ISDH website, visit: http://www.idph.state.ia.us/health/diseases.html

ISDH provides 24/7 rabies consultation at 800-363-2736 during business hours or 1-855-363-3632 after hours.
Questions and Comments

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ann.garvey@idph.iowa.gov