

DISEASE CONTROL 101: VECTORBORNE/ZOONOTIC DISEASES

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WEST NILE VIRUS

General Information

- Arthropod-borne virus (arbovirus)
- Transmitted in an enzootic cycle between mosquitoes and vertebrate hosts
 - Mostly birds
- 70-80% of human cases are asymptomatic
- Some mammals can also become symptomatic
 - WNV disease is reportable in horses



WEST NILE VIRUS

Transmission

- Most commonly via infected mosquitoes
- Blood transfusions
- Organ transplants
- From mother to baby during pregnancy, delivery, or breastfeeding



WEST NILE VIRUS

Types of Illness

- Neuroinvasive
 - Less than 1% of cases
 - Encephalitis
 - Meningitis
 - Acute flaccid paralysis
- Nonneuroinvasive (West Nile fever)
 - About 20% of cases
 - Acute systemic febrile illness
 - Symptoms must include fever/chills, and may include headache, muscle aches, joint pain, rash, and/or GI symptoms



WEST NILE VIRUS

Diagnosis

- Laboratory testing for virus or virus-specific antibodies, meets clinical criteria

Treatment

- Supportive treatment



WEST NILE VIRUS

United States

- 2014
 - 2,205 cases
 - 97 deaths

North Dakota

- 2014
 - 23 cases
 - 1 death



LYME DISEASE

General Information

- *Borrelia burgdorferi* bacterium is spread by infected ticks
- Vector in ND: blacklegged tick (deer tick, *Ixodes scapularis*)
- Must be attached 36—48+ hours before Lyme disease bacterium can be transmitted
- Most people are infected through the bites of nymphs
 - Feed during spring and summer months



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LYME DISEASE

Signs and Symptoms

- Early (3—30 days after bite)
 - Fever/chills, headache, fatigue, muscle and joint aches, swollen lymph nodes
 - Erythema migrans (EM) rash
- Late (days to months after bite)
 - Severe headaches and neck stiffness
 - EM rashes on other areas of body
 - Shooting pains, numbness or tingling in hands or feet
 - Facial or Bell's palsy
 - Intermittent pain
 - Inflammation of brain and spinal cord
 - Problems with short-term memory
 - Arthritis

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LYME DISEASE

Diagnosis

- Clinical signs and symptoms
- History of possible deer tick exposure
- Laboratory blood tests

Treatment

- Antibiotics

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LYME DISEASE

United States

- About 30,000 cases per year

North Dakota

- 2014: 14 cases



ANAPLASMOSIS

General Information

- Tickborne disease caused by bacterium *Anaplasma phagocytophilum*
- Previously known as human granulocytic ehrlichiosis (HGE)
- Vector in ND: blacklegged tick (deer tick, *Ixodes scapularis*)
- Most often transmitted by nymphal and adult ticks



ANAPLASMOSIS

Symptoms

- Fever/chills
- Headache
- Muscle pain
- Malaise
- Nausea
- Abdominal pain
- Cough
- Confusion
- Rash (rare!)

Severe Illness

- Difficulty breathing
- Hemorrhage
- Renal failure
- Neurological problems
- Can be fatal



ANAPLASMOSIS

Diagnosis

- Difficult!
- Symptoms vary and laboratory tests often appear negative in first 7—10 days of illness
- "The diagnosis of anaplasmosis must be made based on clinical signs and symptoms, and can later be confirmed using specialized confirmatory laboratory tests." CDC

Treatment

- Doxycycline
 - Consider alternate antibiotics only if necessary



ANAPLASMOSIS

United States

- 2010: 1761 cases

North Dakota

- 2010: Not reportable
- 2014: 6 cases



EHRlichiosis

General Information

- Tickborne disease caused by bacterial *Ehrlichia* species
 - *E. chaffeensis*
 - *E. ewingii*
 - *E. muris*
 - *E. muris*-like (WI, MN)
- Primary vector: lone star tick (*Amblyomma americanum*)



EHRLICHIOSIS

Symptoms	Severe Illness
<ul style="list-style-type: none">• Fever/chills• Headache• Muscle pain• Malaise• Nausea/vomiting/diarrhea• Conjunctival injection (red eyes)• Confusion• Rash (more common in children)	<ul style="list-style-type: none">• Difficulty breathing• Bleeding disorders• Can be fatal



EHRLICHIOSIS

Diagnosis

- Again, difficult!
- Symptoms vary and laboratory tests often appear negative in first 7—10 days of illness
- *"The diagnosis of ehrlichiosis must be made based on clinical signs and symptoms, and can later be confirmed using specialized confirmatory laboratory tests."* CDC

Treatment

- Doxycycline
 - Consider alternate antibiotics only if necessary



EHRLICHIOSIS

United States

- 2010: 740 cases

North Dakota

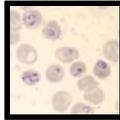
- 2010: Not reportable
- 2014: 1 case



BABESIOSIS

General Information

- Tickborne parasitic disease caused by *Babesia microti*
- Vector: Deer tick (blacklegged tick, *Ixodes scapularis*)
- Parasites infect red blood cells
- Mainly occurs in upper Midwest and parts of the Northeast
- Infection can range from asymptomatic to life-threatening



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BABESIOSIS

Symptoms

- Fever/chills
- Headache
- Body aches
- Anorexia
- Fatigue
- Hemolytic anemia

Complications

- Low/unstable blood pressure
- Severe hemolysis
- Thrombocytopenia
- Bleeding disorders
- Malfunction of vital organs (i.e., kidneys, lungs, liver)
- Death

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BABESIOSIS

Diagnosis

- Usually diagnosed via microscopy of blood smear

Treatment

- Asymptomatic cases do not usually require treatment
- Symptomatic cases are treated with a combination of antiprotozoal and antibiotic medications

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BABESIOSIS

United States

- 2013: 1,762 cases from 27 states

North Dakota

- 2013: 1 case
- 2014: 0 cases



ROCKY MOUNTAIN SPOTTED FEVER

General Information

- Tickborne disease caused by bacterium *Rickettsia rickettsia*
- Vectors:
 - American dog tick (*Dermacentor variabilis*)
 - Rocky Mountain wood tick (*Dermacentor andersoni*)
 - Brown dog tick (*Rhipicephalus sanguineus*)



ROCKY MOUNTAIN SPOTTED FEVER

Symptoms

- Fever/chills
- Severe headache
- Deep muscle pain
- Abdominal pain
- Anorexia
- Conjunctival injection (red eyes)
- Rash

Complications

- Severe vasculitis
- Neurological deficits
- Damage to internal organs
- Death



ROCKY MOUNTAIN SPOTTED FEVER

Diagnosis

- Challenging!
- Symptoms vary and laboratory tests often appear negative in first 7—10 days of illness
- "The diagnosis of RMSF must be made based on clinical signs and symptoms, and can later be confirmed using specialized confirmatory laboratory tests." CDC

Treatment

- Doxycycline
 - Consider alternate antibiotics only if necessary



ROCKY MOUNTAIN SPOTTED FEVER

United States

- About 2,000 cases per year

North Dakota

- 2014: 3 cases



TULAREMIA

General Information

- Bacterial zoonotic disease caused by *Francisella tularensis*
- Rabbits, hares, and rodents are especially susceptible
- Several transmission routes to humans
 - Vectors: ticks, deer flies
 - Direct contact with infected animals
 - Contaminated water or game meat
 - Inhalation of contaminated aerosol or dust
 - Laboratory exposure
 - Bioterrorism
- Symptoms vary depending on route of entry



TULAREMIA

Forms of Illness

- Ulceroglandular
 - Most common
- Glandular
- Oculoglandular
- Oropharyngeal
- Pneumonic
 - Most serious
- Typhoidal



TULAREMIA

Diagnosis

- Laboratory testing

Treatment

- Antibiotics

TULEREMIA

United States

- 2014: 180 cases

North Dakota

- 2014: 4 cases

Q FEVER

General Information

- Zoonotic disease caused by *Coxiella burnetii* bacteria
- Primary reservoirs:
 - Cattle
 - Sheep
 - Goats
- *C. burnetii* is extremely hardy and resistant to heat, drying, and many disinfectants
- Transmission routes:
 - Inhalation of aerosol or dust
 - Tick bites
 - Ingestion of unpasteurized dairy products
 - Person-to-person



Q FEVER

Acute Q Fever Symptoms

- High fevers
- Severe headache
- Malaise
- Muscle aches
- Chills/sweats
- Non-productive cough
- Nausea
- Vomiting
- Diarrhea
- Abdominal pain
- Chest pain

Severe Illness

- Pneumonia
- Granulomatous hepatitis
- Myocarditis
- CNS complications



Q FEVER

Chronic Q Fever Symptoms

- Endocarditis
 - 60—70% of all reported chronic cases
- Aortic aneurysm
- Infections of bone, liver, or reproductive organs



Q FEVER

Diagnosis

- Challenging!
- Symptoms vary and laboratory tests often appear negative in first 7—10 days of illness
- “Suspect diagnosis of Q fever is made based on signs and symptoms and a high index of clinical suspicion. Diagnosis can later be confirmed using specialized confirmatory laboratory tests.” CDC

Treatment

- Doxycycline
 - Consider alternate antibiotics only if necessary



Q FEVER

United States

- 2010
 - 106 acute Q fever cases
 - 25 chronic Q fever cases

North Dakota

- 2010
 - 1 case
- 2014
 - 2 cases



BRUCELLOSIS

General Information

- Zoonotic bacterial disease caused by *Brucella* species
 - *Brucella melitensis*
 - Most pathogenic in humans
 - Primary hosts: goats, sheep
 - *Brucella abortus*
 - Primary host: cattle
 - *Brucella suis*
 - Primary host: swine
 - *Brucella canis*
 - Primary host: dog



BRUCELOSIS

Signs and Symptoms <ul style="list-style-type: none">• Fever• Sweats• Malaise• Anorexia• Headache• Pain in muscles, joints, and/or back• Fatigue	Persistent/Recurring Symptoms <ul style="list-style-type: none">• Recurrent fevers• Arthritis• Neurologic symptoms• Chronic fatigue• Depression• Swelling of liver and/or spleen• Endocarditis• Swelling of the testicle and scrotum area
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BRUCELOSIS

Diagnosis

- Laboratory testing

Treatment

- Antibiotics



BRUCELOSIS

United States

- 2010: 115 cases

North Dakota

- 2010: 0 cases
- 2014: 0 cases



HANTAVIRUS

General Information

- Rodentborne virus
- Many Hantavirus strains exist throughout world
- Reservoirs in the United States
 - Deer mouse
 - Cotton rat
 - Rice rat
 - White-footed mouse
- Cause hantavirus pulmonary syndrome (HPS) in the Americas
- Diagnosed via laboratory testing
- No treatment, supportive therapy only



HANTAVIRUS

Hantavirus Pulmonary Syndrome (HPS)

- Early presentation: Fever, headache, muscle aches, GI problems, dizziness, chills
- Late presentation: Shortness of breath, lungs fill with fluid

Hemorrhagic Fever with Renal Syndrome (HFRS)

- Early presentation: Back and abdominal pain, headaches, fever/chills, nausea, blurred vision, rash (sometimes)
- Late presentation: Low blood pressure, acute shock, vascular leakage, acute kidney failure



HANTAVIRUS

United States

- 2013: 21 HPS cases
- Cumulative case count as of April 21, 2014: 639 HPS cases

North Dakota

- 2013: 0 HPS cases
- Cumulative case count as of April 21, 2014: 11 HPS cases



QUESTIONS?



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