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

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

LYME DISEASE

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

Treatment
- Antibiotics
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
- Fever/chills
- Headache
- Muscle pain
- Malaise
- Nausea/vomiting/diarrhea
- Conjunctival injection (red eyes)
- Confusion
- Rash (more common in children)

Severe Illness
- Difficulty breathing
- Bleeding disorders
- Can be fatal

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

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

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

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
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)

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

TULAREMIA

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

## 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

## 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
  - Brucella abortus
    - Primary host: cattle
  - Brucella suis
    - Primary host: swine
  - Brucella canis
    - Primary host: dog
### BRUCELLOSIS

#### Signs and Symptoms
- Fever
- Sweats
- Malaise
- Anorexia
- Headache
- Pain in muscles, joints, and/or back
- Fatigue

#### Persistent/Recurring Symptoms
- Recurrent fevers
- Arthritis
- Neurologic symptoms
- Chronic fatigue
- Depression
- Swelling of liver and/or spleen
- Endocarditis
- Swelling of the testicle and scrotum area

### BRUCELLOSIS

#### Diagnosis
- Laboratory testing

#### Treatment
- Antibiotics

### BRUCELLOSIS

#### United States
- 2010: 115 cases

#### North Dakota
- 2010: 0 cases
- 2014: 0 cases
HANTAVIRUS

General Information

- Rodentborne virus
- Many Hantavirus strains exist throughout the 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