‘TIS THE SEASON: TICK-BORNE DISEASES

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Objectives

• Describe the recognition and management of Lyme Disease, Rocky Mountain Spotted Fever and Ehrlichiosis

• Describe the best practices for management of patients with Tick Bites

• Detail how to counsel patients regarding Prevention of Tickborne Diseases and Tick Removal
LYME DISEASE
Lyme Disease: Risk of Acquisition

- Most common reportable Tickborne Disease in U.S.
- 20,000-24,000 cases annually
- Overall risk 1-2%
- Risk increased with nymphal tick and engorgement at discovery
- 8-10% risk following bite by infected nymphal tick

Stages of Lyme Disease

- **Early localized disease**
  - Erythema migrans

- **Early disseminated and late disease**
  - Multiple erythema migrans
  - Isolated facial palsy
  - Arthritis
  - Carditis
  - Meningitis
  - Encephalitis, peripheral neuropathy, encephalopathy
Erythema Migrans Rash

- Rash appears at site of tick bite 67-80%
- Erythematous macular rash - may have central clearing
- Flu-like symptoms
Early disseminated disease

- Multiple Erythema migrans lesions seen in 25% of patients
Lyme Disease: Neurologic Disease

- Cranial neuropathy
- Aseptic meningitis
- Pseudotumor cerebri
- Peripheral neuropathy
- Encephalitis
Lyme Neuroborreliosis

- Fever more common in viral meningitis (Pediatr. 1999. 103:657-60)
- Long duration of symptoms prior to LP supports Lyme meningitis (Pediatr. 1999. 103:657-60)
- Children with facial palsy appear to do well
- Neurocognitive function after treatment for Lyme disease appears to be excellent (Pediatr 1994; 94:185-89)
Lyme Disease: Arthritis

- Knee involved in 90% of cases
- Swollen, warm knee
- Better ROM and less pain than septic joint
- Resolves in 2-6 weeks with therapy
- Excellent prognosis (J Rheumatol. 2010. 37:1049-55)
Lyme Disease: Serodiagnosis

- **Refrain from ordering** tests for patients with nonspecific symptoms (i.e. fatigue or arthralgia)
- **Do order tests** when clinical signs suggest Lyme Disease (i.e. nerve palsy, arthritis)
- Two step method with Elisa and Western Blot
- C6 detects antibody to peptide of *B. burgdorferi* and appears equivalent to two step protocol
- PCR detects *B. burgdorferi* DNA in joint fluid
- Urinary antigen has no role in diagnosis
Lyme Disease: Management of the Child with a Tick Bite

• Prophylactic antibiotics not routinely indicated
• Risk of Lyme low after brief attachment (flat, non-engorged tick)
• Higher risk after engorgement and nymphal tick attached ≥ 36 hours
• Analyzing tick for spirochete infection has poor predictive value
• Ask parents to report any concerning symptoms
• Ask parents to look for a skin lesions at the site of the tick bite in 30 days
Lyme Disease: Chemoprophylaxis

- Prophylax for tick bite in hyperendemic area of infection (> 20% of ticks infected with Borrelia burgdorferi):
  - If engorged deer tick attached ≥ 36 hours
  - If prophylaxis can be started within 72 hours of tick removal
  - Consider Doxycycline for ≥ 8 years
    - < 45 kg: Single dose 4.4 mg/kg
    - ≥ 45 kg: Single dose 200 mg

- 2012 Redbook. AAP Committee Infect Dis. Lyme Disease. p 479
Lyme Disease Treatment:

Early Localized Disease

Erythema Migrans

> 8 yrs Doxycycline:
- 4 mg/kg/day divided BID (Max: 100 mg PO BID) for 14-21 days

< 8 yrs Amoxicillin:
- 50 mg/kg/day divided TID (Max: 500 mg PO TID) for 14-21 days OR

Cefuroxime:
- 30 mg/kg/day divided BID (Max: 500 mg PO BID)

• 2012 Redbook. AAP Committee Infect Dis. Lyme Disease. p 478
Lyme Disease Treatment II

- **Multiple Erythema migrans**
  - Use oral regimen for Early Disease for 21 days

- **Isolated Bell’s Palsy**
  - Use oral regimen for Early Disease if no signs of meningitis
  - Steroids contraindicated

**New onset arthritis in untreated patient**

- Use oral regimen for Early Disease for 28 days

- **2012 Redbook. AAP Committee Infect Dis. Lyme Disease. p 478**
• **Persistent or Recurrent Arthritis**
  - Consider second course of oral agent for 28 days
  - IV Ceftriaxone 50-75 mg/kg IV daily (Max: 2 Grams per day for 14-28 days OR IV Penicillin or Cefotaxime

• **AV Block or Carditis**
  - Oral regimen if asymptomatic
  - IV Ceftriaxone or penicillin: syncope, chest pain

• **Meningitis**
  - IV Ceftriaxone or cefotaxime with alternative of penicillin for 14 days (range 10-28 days)

• **2012 Redbook. AAP Committee Infect Dis. Lyme Disease. p 478**
Lyme Disease Treatment IV

- **Encephalitis, Peripheral Neuropathy, Encephalopathy**
  - IV Ceftriaxone with alternative of IV penicillin or cefotaxime for 14-28 days

- 2012 Redbook. AAP Committee Infect Dis. Lyme Disease. p 478
ROCKY MOUNTAIN SPOTTED FEVER
Rocky Mountain Spotted Fever

- Annually: 300-800 cases
- 2003-2005: 1,000-2,000
- Systemic, small vessel vasculitis caused by *Rickettsia rickettsii*
- Dog tick (Eastern US)
- Wood tick (Western US)
- Summer, Fall
RMSF: Dog Ticks
RMSF: Presentation

- **Incubation period** usually 7 days (2-14 days)
- **History of tick bite** unreliable (present 60% cases)
- **Fever**: 2-8 days post bite, abrupt rise to 40°C
- **Rash**: 2-3 days post fever

![Image of a hand with rash](image)
RMSF: Clinical Signs and Symptoms

- Fever to 40 degrees
- Rash: maculopapular, petechial, hemorrhagic
- Conjunctival inject
- Pneumonia
- Myalgias
- Headache, confusion, coma
- Myocarditis, acute renal failure, DIC, gangrene
- Case fatality rate of 5-25%
RMSF: Clinical and Laboratory Abnormalities

- Hyponatremia
- Leukopenia
- Thrombocytopenia
RMSF: Treatment

Doxycycline is drug of choice in patients of any age

- Less affinity for dental enamel than tetracycline
- Staining of dental enamel is dose dependent
- Treat until patient afebrile for 3 days (7 days usual course)
- Effective against Ehrlichiosis
- Does not have the serious adverse effects of chloramphenicol
EHRlichiosis AND ANAPLASTICOSIS
Ehrlichiosis and Anaplasmosis

- Bacteria of genus Ehrlichia and Anaplasma
- Similar to Rocky Mountain Spotted Fever
- Southeastern US; Lone Star Tick
- Flu-like illness: Fever, headache, myalgia
- Maculopapular rash in 50%
- Leukopenia, thrombocytopenia, hepatitis
- ARDS, encephalopathy, meningitis, renal failure
- Mortality: 1-3%
# Ehrlichiosis and Anaplasmosis

<table>
<thead>
<tr>
<th>Disease</th>
<th>Causative Agent</th>
<th>Target Cell</th>
<th>Tick Vector</th>
<th>Geographic Distribution</th>
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<tbody>
<tr>
<td>Ehrlichiosis</td>
<td><em>Ehrlichia chaffeensis</em></td>
<td>Monocytes</td>
<td>Lone Star Tick</td>
<td>Southeast, south central, Midwest</td>
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<tr>
<td>Ehrlichiosis</td>
<td><em>Ehrlichia ewingii</em></td>
<td>Granulocytes</td>
<td>Lone Star Tick</td>
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<tr>
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<td><em>Ehrlichia muris</em></td>
<td>Unknown</td>
<td>Deer Tick</td>
<td>Minnesota, Wisconsin</td>
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<tr>
<td>Anaplasmosis</td>
<td><em>Anaplasma phagocytophilum</em></td>
<td>Granulocytes</td>
<td>Black-legged or deer tick or Western black-legged tick</td>
<td>Northeast, north central, northern California</td>
</tr>
</tbody>
</table>
Ehrlichiosis and Anaplasmosis: Clinical Presentation

• Retrospective study
• Jan 1, 1990 – Dec 31, 2002
  32 patients: 6 SE US sites (NC, TN, KY, AR, MO)
• 7/32 (22%) required PICU
• 4/32 (13%) required mechanical ventilation and pressor support
• 3/32 (9%) neurologic deficits

Fever 100%
Headache 69%
Myalgia 69%
Rash 66%
Mental status Δ 50%
Thrombocytopenia 94%
Elevated AST 90%
Elevated ALT 74%
Leukopenia 56%

Ehrlichiosis Rash

- Rash in 60% with *Ehrlichia chaffeensis*
- Rash in 10% with Anaplasmosis
- Rash involves trunk; spares hands and feet
- Develops one week after onset of illness
Ehrlichiosis: Diagnosis

- Fever, headache, myalgia, anemia, leukopenia, thrombocytopenia, elevation liver transaminases
- Serology (four fold rise in titer)
- Ehrlichia or Anaplasma DNA
- Ehrlichia or Anaplasma antigen by immunohistochemical stain
- Ehrlichia or Anaplasma bacteria in cell culture
- Morula in cytoplasm of monocytes or granulocytes
Ehrlichiosis and Anaplasmosis: Treatment

• Begin empiric Doxycycline as soon as possible
• Do not delay therapy awaiting serologic confirmation
Ehrlichiosis Case

- 7 year old girl with 1 week of fever to 40, fatigue poor appetite, generalized aches and pains.
- ER: Rash, conjunctival injection, lethargic.
- Labs: WBC = 1.78 59% neutrophils. HCT = 28%, plts = 67,000. ALT = 83, AST = 181. Sodium = 133.
Ehrlichiosis Case (continued)

- Admitted and ceftriaxone and clindamycin begun
- Later on DOA she developed hypotension, responsive to normal saline boluses
- WBC continued to drop and ALT, AST to rise
- Morula noted in monocytes on peripheral smear
- Doxycycline therapy initiated
- Hypotension resolved 24 hours after Doxycycline
- WBC began to recover 48 hours after Doxycycline
- *Ehrlichia chaffeensis* PCR and serology positive
Prevention of Tickborne Diseases

- Check for attached ticks
- Remove entire tick without crushing tick
- Long-sleeved shirts and long pants
- Permethrin sprayed on clothing
- DEET 10-30% (≥ 2 months) on exposed skin
  - Use sparingly
  - Do not apply to hands or face of child
  - Wash off when coming indoors
Tick Removal

- Use forceps
- Grasp tick firmly by the mouthparts
- Pull directly upwards
Summary: Lyme

- Order serologic tests for Lyme only when clinical evidence suggests Lyme Disease.
- Do not order Lyme serology for nonspecific signs such as fatigue or arthralgia (risk false positives).
- Serologic tests should not be used as the sole criterion for diagnosing Lyme Disease.
- Testing of ticks for pathogens has poor predictive value and is discouraged.
- Maximum duration for therapy course is 4 weeks.
Summary: RMSF and Ehrlichiosis

- Always treat empirically with Doxycyline based on clinical suspicion
- **Do not postpone treatment** waiting for laboratory confirmation
- Counsel re: appropriate **tick prevention strategies**

- **Handle engorged ticks with care!**
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