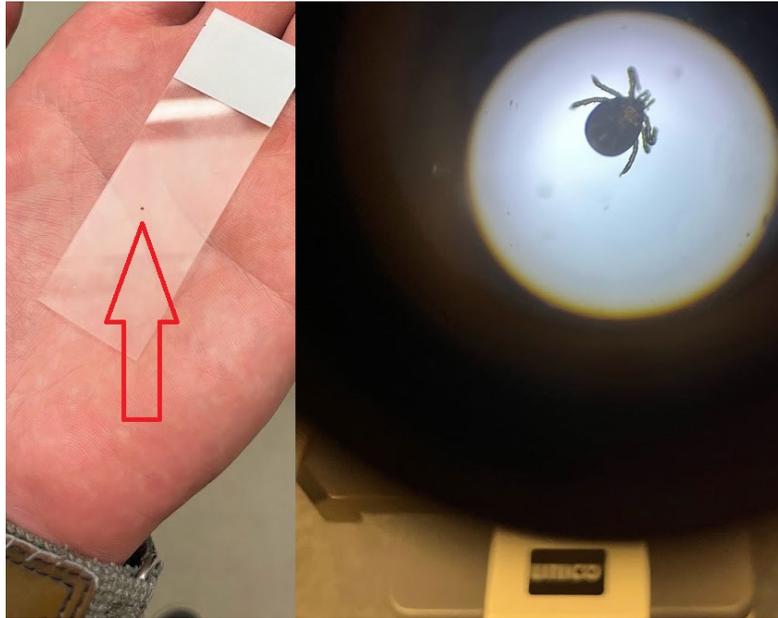


Tickborne Disease!

- Be sure to consider in flu-like illness, especially in the absence of upper respiratory symptoms and when symptoms last longer than 4-5 days
- [\*Ixodes scapularis\*](#) and [\*Dermacentor variabilis\*](#) are the most common ticks in our area
  - How small can a tick be? Check out this picture of a larval *Ixodes* tick I took from urgent care:



- Lyme
  - Presentation
    - Tick must be attached 36-48 hours to transmit disease
    - EM present in 70-80% of patients. Occurs at site of the bite, 3-30 days after bite.
    - Disseminated disease occurs days to weeks later: neurologic, MSK, CV symptoms and possibly multiple EM lesions
  - Prophylaxis
    - 200mg single dose doxycycline within 72 hours of tick removal, if tick attached for 36+ hours
    - Depending on the study, 0.2-0.4% of patients given prophylactic doxy subsequently developed Lyme, whereas 2.2-3.2% of non-prophylaxed patients developed Lyme This is an 87-90% Relative Risk Reduction with NNT of approximately 35-50 to prevent one case of Lyme.
  - Diagnosis
    - Presence of EM along with possible tick exposure is diagnostic for Lyme on its own
    - Use the 'Tick Borne Illness Work Up" order set will include the appropriate diagnostics
      - Two-tiered testing with ELISA followed by Western blot

- Testing is less than 50% sensitive in early disease and greater than 90% in subsequent stages
- Treatment
  - Doxycycline (first line), Amoxicillin
    - Avoid doxy in patients less than 8 years old or pregnant, however AAP now supports doxy in young children if used 21 days or less due to the low-risk for dental staining
  - Ceftriaxone for late neurologic symptoms
  - 10-28 days of treatment depending on abx and indication (check UTD)
- Persistent Symptoms
  - 10-20% of patients are symptomatic even after treatment
  - "Post-Lyme Disease Syndrome" Encompasses symptoms that persist for greater than 6 months after completion of antibiotics. Antibiotics should not be extended in these patient since it will not improve symptoms; likely from inflammatory dysregulation.
  - Interestingly, patients with Lyme Arthritis are commonly found to have peptidoglycan (very inflammatory) from *Borrelia* bacteria remaining in the synovial fluid leading to the persistent inflammation, as opposed to actively growing bacteria.
- Anaplasma
  - Presentation
    - General viral-like syndrome, 5-14 days after exposure
    - Rash is rare
  - Diagnosis
    - Use the "Tick Borne Illness Work Up" order set, PCR and serology are generally used
    - PCR is likely to positive in the first week of illness, whereas serology will likely be negative in the first week
    - *In my experience, I have never had serology come back positive but I have had many PCR come back positive*
  - Treatment
    - Doxycycline for a minimum of 10 days, at least 3 days after resolution of the fever
    - If can't tolerate tetracycline, use 7-10 day course of rifampin
  - Prior infection may not confer long-lasting immunity
- Babesia
  - Presentation
    - Fever, Myalgias, lysis of erythrocytes
    - Symptoms develop 1-9 WEEKS after exposure
  - Diagnosis
    - PCR
      - Could diagnose by microscopy with Wright or Giemsa stain if available
    - Hemolysis, thrombocytopenia, elevated transaminases

- One of the local ID physicians recently recommended checking haptoglobin and LDH - if both normal, very unlikely to be Babesia. If low haptoglobin and elevated LDH, could be Babesia.
- Treatment
  - Combination of atovaquone and azithromycin for 7-10 days
- Immunocompromised patients, those treated with rituximab, patients with malignancy (specifically B cell lymphoma), HIV, organ transplant may develop a relapse of Babesia despite a prior course of treatment.

TABLE 1

**Incidence, Causative Agents, Vectors, and Geographic Distribution of Tickborne Diseases in the United States**

Disease	Reported annual incidence	Causative agents	Vectors	Geographic distribution
Lyme disease	30,000	<i>Borrelia burgdorferi</i>	Black-legged/deer tick ( <i>Ixodes scapularis</i> or <i>Ixodes pacificus</i> )	New England, mid-Atlantic states, upper Midwest, northern California
Rocky Mountain spotted fever and other spotted fever Rickettsioses: <i>Rickettsia parkeri</i> rickettsiosis, Pacific Coast tick fever, Rickettsial pox	6,000	<i>Rickettsia rickettsia</i> <i>R. parkeri</i> <i>Rickettsia</i> species 364D <i>Rickettsia akari</i>	Wood tick ( <i>Dermacentor andersoni</i> ) American dog tick ( <i>Dermacentor variabilis</i> ) Brown dog tick ( <i>Rhipicephalus sanguineus</i> )	Southeastern and south-central states (Oklahoma, Arkansas, Missouri, Tennessee, and North Carolina account for more than 60% of cases), Arizona and New Mexico
Anaplasmosis	5,000	<i>Anaplasma phagocytophilum</i>	Black-legged/deer tick ( <i>I. scapularis</i> or <i>I. pacificus</i> )	Northeast, Midwest, and West Coast
Ehrlichiosis	1,500	<i>Ehrlichia chaffeensis</i> <i>Ehrlichia ewingii</i> <i>Ehrlichia muris euclairensis</i>	Lone Star tick ( <i>Amblyomma americanum</i> ) Black-legged/deer tick ( <i>I. scapularis</i> ) American dog tick ( <i>D. variabilis</i> )	Southeastern and south-central states
Babesiosis	1,000-2,000	<i>Babesia microti</i> <i>Babesia duncani</i>	Black-legged/deer tick ( <i>I. scapularis</i> or <i>I. pacificus</i> )	Northeast, upper Midwest, few cases in Washington and California
Tularemia	Few hundred	<i>Francisella tularensis</i>	Lone star tick ( <i>A. americanum</i> ) Wood tick ( <i>D. andersoni</i> ) Dog tick ( <i>D. variabilis</i> )	South-central states (Oklahoma, Arkansas, Missouri, and Kansas)
Colorado tick fever	200-300	Colorado tick fever virus (double-stranded RNA arbovirus)	Wood tick ( <i>D. andersoni</i> )	Rocky Mountain region
Tickborne relapsing fever	20-30	<i>Borrelia</i> species: <i>Borrelia hermsii</i> , <i>Borrelia parkerii</i> , <i>Borrelia turicatae</i>	Ticks of <i>Ornithodoros</i> genus	Rocky Mountain region

Information from references 1, 2, and 4-18.

TABLE 2

**Clinical Characteristics of Tickborne Diseases**

Disease	Signs and symptoms	Diagnosis	Treatment
Lyme disease	<p>Early localized: EM rash at site of inoculation, flulike symptoms</p> <p>Early disseminated: secondary EM lesions, neurologic (meningitis, facial palsy), musculoskeletal (arthralgias and myalgias), and cardiovascular symptoms (temporary atrioventricular block)</p> <p>Late disseminated: encephalomyelitis, polyarticular arthritis, Lyme carditis</p>	<p>Clinical diagnosis for early localized disease</p> <p>Enzyme-linked immunosorbent assay followed by Western blot assay for unclear or later stage diagnosis</p>	<p>Doxycycline 100 mg twice per day or 4 mg per kg in two divided doses for children &gt; 8 years</p> <p>Amoxicillin 500 mg three times per day or 50 mg per kg in three divided doses for children</p> <p>Cefuroxime axetil (Ceftin) 500 mg twice per day or 30 mg per kg in two divided doses for children</p> <p>Azithromycin (Zithromax) 500 mg once per day or 10 mg per kg per day for children</p> <p>IV ceftriaxone (Rocephin) 2 g per day or 50 to 75 mg per kg per day for children used for neurologic manifestations of late disease</p> <p>Duration of therapy:</p> <p>Early localized: 14 days</p> <p>Early disseminated: 14 to 21 days</p> <p>Late disseminated: 14 to 28 days</p>
Rocky Mountain spotted fever	<p>Flulike symptoms with macular rash starting on wrists, forearms, and ankles, becomes petechial</p>	<p>Clinical signs and symptoms including thrombocytopenia and hyponatremia, elevated transaminases, and hyperbilirubinemia</p> <p>IFA is confirmatory but should not delay treatment</p>	<p>Doxycycline 100 mg twice per day or 4 mg per kg for children in two divided doses</p> <p>Chloramphenicol if contraindication to doxycycline</p> <p>Duration of therapy: seven to 10 days</p>
Anaplasmosis and ehrlichiosis	<p>Flulike symptoms with gastrointestinal predominance</p> <p>Rash in up to one-third of patients with ehrlichiosis, particularly children</p>	<p>Clinical signs and symptoms including thrombocytopenia, leukopenia, and elevated transaminases</p> <p>IFA is confirmatory but should not delay treatment</p>	<p>Doxycycline 100 mg twice per day or 4 mg per kg for children in two divided doses</p> <p>Rifampin or chloramphenicol if contraindication to doxycycline</p> <p>Duration of therapy: minimum of 10 days, continue for at least three days after fever subsides</p>
Babesiosis	<p>Nonspecific flulike symptoms; jaundice may be present</p>	<p>Laboratory findings of hemolytic anemia, thrombocytopenia, elevated transaminases</p> <p>Thin blood smear with characteristic "Maltese cross" pattern or PCR</p>	<p>Atovaquone (Mepron) 750 mg twice per day or 40 mg per kg in two divided doses for children plus azithromycin 500 mg on day one followed by 250 mg per day or 10 mg per kg on day one followed by 5 mg per kg per day for children</p> <p>Duration of therapy: seven to 10 days</p> <p>IV clindamycin plus oral quinine and/or exchange transfusion for severe disease</p>
Tularemia	<p>Flulike symptoms, cutaneous eschar at site of inoculation, and painful regional lymphadenopathy</p>	<p>History of exposure to rabbits and other rodents or ticks, leukocytosis</p> <p>Culture is the diagnostic standard for diagnosis of tularemia, but has biosafety concerns; PCR or paired serologies may also be used</p>	<p>Intramuscular streptomycin 2 g in two divided doses or 15 mg per kg in two divided doses for children</p> <p>Intramuscular gentamicin or IV 5 mg per kg in two divided doses</p> <p>Duration of therapy: seven to 10 days</p>
Colorado tick fever	<p>Triad of high fever (up to 104°F [40°C]), severe myalgias, and headache; fever is often biphasic; "saddle-back" pattern</p>	<p>Common laboratory findings of leukopenia and thrombocytopenia</p> <p>Reverse-transcriptase PCR or paired sample serologic testing</p>	<p>Supportive care only</p>
Tickborne relapsing fever	<p>Flulike symptoms with high fever in relapsing or remitting pattern</p>	<p>Detection of spirochetes in blood using dark field microscopy or specific staining</p>	<p>Doxycycline 100 mg twice per day or tetracycline 500 mg every 6 hours for adults</p> <p>Erythromycin 500 mg four times per day for pregnant women or 30 to 50 mg per kg in four divided doses for children</p> <p>IV ceftriaxone or penicillin G for patients with central nervous system involvement</p> <p>Duration of therapy: seven to 10 days</p> <p>Jarisch-Herxheimer reactions common with treatment</p>

EM = erythema migrans; IFA = immunofluorescence assay; IV = intravenous; PCR = polymerase chain reaction.

Information from references 1, 2, 4, 5, 7-9, 13, and 15-24.

References:

- [One Dose of Doxycycline for the Prevention of Lyme Disease: A Review of Clinical Effectiveness and Guidelines \[Internet\] - PubMed \(nih.gov\)](#)
- [Prophylaxis with Single-Dose Doxycycline for the Prevention of Lyme Disease after an Ixodes scapularis Tick Bite | NEJM](#)
- [AAFP Tickborne Diseases Article](#)
- [Persistence of Borrelia burgdorferi peptidoglycan in Lyme Arthritis](#)
- [Meta-analysis for Lyme Prophylaxis](#)