Tick images not to scale

Ticks are generally found in brushy or wooded areas, near the ground; they cannot jump or fly. Ticks are attracted to a variety of host factors including body heat and carbon dioxide. They will transfer to a potential host when one brushes directly against them and then seek a site for attachment.

**DEER TICK**

*Ixodes scapularis* (also called blacklegged tick)

**Diseases**
Lyme disease, anaplasmosis, babesiosis

**What bites**
Nymph and adult females

**When**
Anytime temperatures are above freezing, greatest risk is spring through fall

**Coloring**
Adult females have a reddish-brown tear shaped body with dark brown hood

**Size:**
Nymphs: Poppy seed
Unfed Adults: Sesame seed

**DOG TICK**

*Dermacentor variabilis* (also called wood tick)

**Diseases**
Rocky Mountain spotted fever and tularemia

**What bites**
Adult females

**When**
April through August

**Coloring**
Adult females have a dark brown body with whitish markings on its hood

**Size:**
Unfed Adults: Watermelon seed

**LONESTAR TICK**

*Amblyomma americanum*

**Diseases**
Ehrlichiosis

**What bites**
Nymph and adult females

**When**
April through September in New England, year-round in Southern U.S.

**Coloring**
Adult females have a brown body with a white spot on the hood

**Size:**
Nymphs: Poppy seed
Unfed Adults: Sesame seed
ALGORITHM FOR DIFFERENTIATING TICK-BORNE DISEASES IN MAINE

This algorithm is intended for use as a general guide when pursuing a diagnosis. It does not replace the physician’s clinical judgment or the need for definitive laboratory testing.

OTHER CONSIDERATIONS
- Rash occurs in 70-80% of Lyme disease patients.
- Rash occurs in less than 10% of anaplasmosis patients.
- Rash occurs in less than 40% of adult Ehrlichia patients, and less than 60% of children.
- Rash occurs in 70-80% of RMSF patients but only appears several days after onset of febrile illness.
- Hyponatremia may occur with RMSF or tularemia.
- Lyme disease can present as Bell’s palsy, further tests needed.
- Ulceroglandular tularemia usually presents as regional lymphadenopathy with a small ulceration distally, further tests needed.
- Coinfections involving Lyme disease, babesiosis, and/or anaplasmosis may occur because a single deer tick may carry multiple pathogens.
- Consider pneumonic tularemia in any patient presenting with community-acquired pneumonia who resides on, or has recently visited, Martha’s Vineyard, Massachusetts.

SUMMER FEVER ALGORITHM

Patient resides, works, or recreates in an area likely to have ticks and is exhibiting fever, headache, malaise and/or lymphadenopathy

Does the patient have a rash?

YES

Blood smear review

Parasites in RBC
* Babesiosis
   * If patient has an international travel history, malaria should be ruled out

NO

Complete blood count (CBC)

Normal CBC
* May be Anaplasma, RMSF, tularemia** or Lyme disease, further tests needed
* RMSF—thrombocytopenia may be observed
** tularemia—WBC normal or elevated, thrombocytopenia may be observed

Erythema migrans (single or multiple lesions)
* Lyme disease

Maculopapular
* May be anaplasmosis (rash is very uncommon), further tests needed

WBC low or normal, thrombocytopenia, low hematocrit, elevated reticulocytes
* May be anaplasmosis or babesiosis, further tests needed

Cutaneous ulcer
* May be tularemia (ulceroglandular), further tests needed

Normal hematocrit, thrombocytopenia, leukopenia
* May be anaplasmosis or ehrlichiosis, further tests needed

Maculopapular to Petechial*
* May be RMSF, or ehrlichiosis, further tests needed
* If petechial rash of palm and sole (characteristic of RMSF) is present, treat immediately

Morulae in WBC
* May be anaplasmosis (seen in less than 50% of serious cases), further tests needed

* If petechial rash of palm and sole (characteristic of RMSF) is present, treat immediately

Other Considerations
- Rash occurs in 70-80% of Lyme disease patients.
- Rash occurs in less than 10% of anaplasmosis patients.
- Rash occurs in less than 40% of adult Ehrlichia patients, and less than 60% of children.
- Rash occurs in 70-80% of RMSF patients but only appears several days after onset of febrile illness.
- Hyponatremia may occur with RMSF or tularemia.
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- Consider pneumonic tularemia in any patient presenting with community-acquired pneumonia who resides on, or has recently visited, Martha’s Vineyard, Massachusetts.
# ANAPLASMOSIS (AKA HUMAN GRANULOCYTIC ANAPLASMOSIS)

## Agent

**Bacteria:** *Anaplasma phagocytophilum* (formerly *Ehrlichia phagocytophilum*)

**Tick:** *Ixodes scapularis*

## Signs/Symptoms

**Incubation Period 1-2 weeks**

- Fever, chills
- Severe headache
- Malaise
- Myalgia
- Gastrointestinal symptoms (nausea, vomiting, diarrhea, anorexia)
- Cough
- Arthralgia
- Stiff neck
- Confusion

## Labs

**Common Findings on Routine Laboratory Tests**

Generally observed during the first week of clinical disease

- Mild anemia
- Thrombocytopenia
- Leukopenia (characterized by relative and absolute lymphopenia and a left shift)
- Modest elevations in hepatic transaminases

**Diagnostic Laboratory Criteria**

- Detection of DNA by PCR assay *(preferred method)*; or
- Demonstration of a four-fold change in IgG-specific antibody titer by IFA in paired serum samples; or
- Immunohistochemistry (IHC) staining of organism; or
- Isolation of organism from a clinical specimen in cell culture.

## Notes

- Visualization of morulae in the cytoplasm of neutrophils or eosinophils during examination of blood smears is highly suggestive of a diagnosis; however, blood smear examination is insensitive and should never be relied upon solely to rule anaplasma in or out.

- Confirmation of the diagnosis is based on laboratory testing, but antibiotic therapy should not be delayed in a patient with a suggestive clinical presentation.

- Clinical signs of anaplasmosis and ehrlichiosis are similar, and testing for both species is indicated due to presence of both tick vectors. Also consider the possibility of coinfection with *B. microti* and/or *B. burgdorferi*.
ANAPLASMOsis

TREATMENT

The regimens listed below are guidelines only and may need to be adjusted depending on a patient’s age, medical history, underlying health conditions, pregnancy status or allergies. Consult an infectious disease specialist for the most current treatment guidelines or for individual patient treatment decisions.†

<table>
<thead>
<tr>
<th>AGE CATEGORY</th>
<th>DRUG</th>
<th>DOSAGE</th>
<th>MAXIMUM</th>
<th>DURATION (DAYS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
<td>Doxycycline</td>
<td>100 mg twice per day orally or IV</td>
<td>N/A</td>
<td>10</td>
</tr>
<tr>
<td>Children</td>
<td>Doxycycline</td>
<td>4 mg/kg per day orally or IV in 2 divided doses</td>
<td>100 mg per dose</td>
<td>10</td>
</tr>
<tr>
<td>Children less than 8 years of age severe illness without Lyme disease</td>
<td>Doxycycline</td>
<td>4 mg/kg per day orally or IV in 2 divided doses</td>
<td>100 mg per dose</td>
<td>4-5 OR approx. 3 days after resolution of fever</td>
</tr>
<tr>
<td>Children less than 8 years of age severe illness with Lyme disease</td>
<td>Doxycycline</td>
<td>4 mg/kg per day given orally or IV in 2 divided doses</td>
<td>100 mg per dose</td>
<td>4-5</td>
</tr>
<tr>
<td>FOLLOWED BY</td>
<td>Amoxicillin</td>
<td>50 mg/kg per day in 3 divided doses</td>
<td>500 mg per dose</td>
<td>To complete a 14 day total course of antibiotic therapy</td>
</tr>
<tr>
<td>OR</td>
<td>Cefuroxime axetil</td>
<td>30 mg/kg per day in 2 divided doses</td>
<td>500 mg per dose</td>
<td>To complete a 14 day total course of antibiotic therapy</td>
</tr>
</tbody>
</table>

NOTES

• Patients with mild illness for whom doxycycline treatment is contraindicated may be treated with rifampin for 7-10 days using a dosage regimen of 300 mg twice per day by mouth for adults and 10 mg/kg twice per day for children (maximum, 300 mg per dose).

• Because anaplasmosis can be life-threatening and limited courses of therapy do not pose a substantial risk for tooth staining, the American Academy of Pediatrics has identified doxycycline as the drug of choice for treating anaplasmosis in children of any age.

• Treatment response is expected within 48 hours. Failure to respond in 3 days suggests infection with a different agent.

• Treatment is not recommended for asymptomatic individuals who are seropositive for antibodies to A. phagocytophila.

REFERENCES


BABESIOSIS

AGENT
Parasite: Babesia microti
Tick: Ixodes scapularis

SIGNS/SYMPOTOMS
[incubation period: 1-6 weeks]
• Malaise, fatigue
• Sustained or intermittent fever, chills
• Gastrointestinal symptoms (anorexia, nausea, abdominal pain, vomiting)
• Myalgia
• Arthralgia
• Depression, emotional lability
• Photophobia
• Conjunctival injection
• Dark urine
• Petechiae, splinter hemorrhages, ecchymoses
• Mild splenomegaly and/or hepatomegaly
• Cough
• Sore throat

LABS
Common Findings on Routine Laboratory Tests
• Decreased hematocrit secondary to hemolytic anemia
• Elevated reticulocyte counts
• Elevated erythrocyte sedimentation rate
• Thrombocytopenia
• WBC count may be normal or mildly decreased
• Decreased serum haptoglobin
• Elevated serum BUN and creatinine
• Mildly elevated hepatic transaminases
• Proteinuria
• Hemoglobinuria
• Direct Coombs’ test may react positively

Diagnostic Laboratory Criteria
• Positive PCR assay (preferred method); or
• Identification of intraerythrocytic Babesia parasites in a peripheral blood smear or
• Isolation of the parasite from a whole blood specimen by animal inoculation.

NOTE: Due to the sparse parasitemia typical of most Babesia microti infections, additional diagnostic tests should be performed in suspect patients if the initial blood smear is negative.

Supportive Laboratory Criteria
• Demonstration of a Babesia-specific antibody titer by Immunofluorescent Antibody (IFA) test for IgG. In general, higher cutoff titers (≥ 1:256) are associated with greater diagnostic specificity.
# BABESIOSIS

## TREATMENT

The regimens listed below are guidelines only and may need to be adjusted depending on a patient's age, medical history, underlying health conditions, pregnancy status or allergies. Consult an infectious disease specialist for the most current treatment guidelines or for individual patient treatment decisions.†

<table>
<thead>
<tr>
<th>AGE CATEGORY</th>
<th>DRUG</th>
<th>DOSAGE</th>
<th>MAXIMUM</th>
<th>DURATION (DAYS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
<td>Atovaquone</td>
<td>750 mg orally every 12 hours</td>
<td>N/A</td>
<td>7-10</td>
</tr>
<tr>
<td></td>
<td>PLUS</td>
<td>Azithromycin</td>
<td>500-1000 mg on day 1 and 250 mg orally once per day thereafter</td>
<td>100 mg per dose</td>
</tr>
<tr>
<td></td>
<td>OR</td>
<td>Clindamycin</td>
<td>300-600 mg IV every 6 hours OR 600 mg orally every 8 hours</td>
<td>N/A</td>
</tr>
<tr>
<td>Children</td>
<td>Atovaquone</td>
<td>20 mg/kg every 12 hours</td>
<td>750 mg per dose</td>
<td>7-10</td>
</tr>
<tr>
<td></td>
<td>PLUS</td>
<td>Azithromycin</td>
<td>10 mg/kg once per day on day 1 and 5 mg/kg once per day thereafter orally</td>
<td>500 mg per dose on day 1 and 250 mg per dose thereafter</td>
</tr>
<tr>
<td></td>
<td>OR</td>
<td>Clindamycin</td>
<td>7-10 mg/kg IV or orally every 6-8 hours</td>
<td>600 mg per dose</td>
</tr>
<tr>
<td></td>
<td>PLUS</td>
<td>Quinine</td>
<td>8 mg/kg orally every 8 hours</td>
<td>650 mg per dose</td>
</tr>
</tbody>
</table>

### NOTES

- For adult patients who are immunocompromised, higher doses of azithromycin, 600-1000 mg per day, may be used.
- The recommended treatment for patients with severe babesiosis, as indicated by high-grade parasitemia (> 10%), significant hemolysis, or renal, hepatic or pulmonary compromise, is quinine and IV clindamycin, and the patient should be considered for partial or complete RBC exchange transfusion.
- Consider the possibility of coinfection with *B. burgdorferi* and/or *A. phagocytophila* in patients with especially severe or persistent symptoms, despite appropriate antibabesial therapy.
- Asymptomatic patients with a positive babesial smear and/or PCR results should have these studies repeated. Treatment should be considered if parasitemia persists for more than three months.

### REFERENCES


**EHRLICHIOSIS** (AKA HUMAN MONOCYTIC EHRLICHIOSIS)

### Agent
- **Bacteria:** *Ehrlichia chaffeensis*
- **Tick:** *Amblyomma americanum*

### Signs/Symptoms
- **[Incubation period 7-10 days]**
  - Fever, chills
  - Severe headache
  - Malaise
  - Myalgia
  - Gastrointestinal symptoms (nausea, vomiting, diarrhea, anorexia)
  - Cough
  - Arthralgia
  - Stiff neck
  - Confusion

### Labs
**Common Findings on Routine Laboratory Tests**
- Generally observed during the first week of clinical disease
  - Thrombocytopenia
  - Mild to moderate leukopenia
  - Modest elevations in hepatic transaminases

**Diagnostic Laboratory Criteria**
- Detection of DNA by PCR assay **(preferred method)**; or
- Demonstration of a four-fold change in IgG-specific antibody titer by IFA in paired serum samples; or
- Immunohistochemistry (IHC) staining of organism; or
- Isolation of organism from a clinical specimen in cell culture.

### Notes
- Confirmation of the diagnosis is based on laboratory testing, but antibiotic therapy should not be delayed in a patient with a suggestive clinical presentation.
- Clinical signs of anaplasmosis and ehrlichiosis are similar, and testing for both species are indicated due to presence of both tick vectors. Also consider the possibility of coinfection with *B. microti* and/or *B. burgdorferi.*
# Ehrlichiosis

## Treatment

The regimens listed below are guidelines only and may need to be adjusted depending on a patient's age, medical history, underlying health conditions, pregnancy status or allergies. Consult an infectious disease specialist for the most current treatment guidelines or for individual patient treatment decisions.

<table>
<thead>
<tr>
<th>Age Category</th>
<th>Drug</th>
<th>Dosage</th>
<th>Maximum</th>
<th>Duration (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
<td>Doxycycline</td>
<td>100 mg twice per day orally or IV</td>
<td>N/A</td>
<td>10</td>
</tr>
<tr>
<td>Children 8 years of age or older</td>
<td>Doxycycline</td>
<td>4 mg/kg per day orally or IV in 2 divided doses</td>
<td>100 mg per dose</td>
<td>10</td>
</tr>
<tr>
<td>Children less than 8 years of age severe illness without Lyme disease</td>
<td>Doxycycline</td>
<td>4 mg/kg per day orally or IV in 2 divided doses</td>
<td>100 mg per dose</td>
<td>4-5 OR approx. 3 days after resolution of fever</td>
</tr>
<tr>
<td>Children less than 8 years of age severe illness with Lyme disease</td>
<td>Doxycycline</td>
<td>4 mg/kg per day given orally or IV in 2 divided doses</td>
<td>100 mg per dose</td>
<td>4-5</td>
</tr>
</tbody>
</table>

**Followed by**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage</th>
<th>Maximum</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin</td>
<td>50 mg/kg per day in 3 divided doses</td>
<td>500 mg per dose</td>
<td>to complete a 14 day total course of antibiotic therapy</td>
</tr>
<tr>
<td>Cefuroxime axetil</td>
<td>30 mg/kg per day in 2 divided doses</td>
<td>500 mg per dose</td>
<td>to complete a 14 day total course of antibiotic therapy</td>
</tr>
</tbody>
</table>

### Notes

- Patients with mild illness for whom doxycycline treatment is contraindicated may be treated with rifampin for 7-10 days using a dosage regimen of 300 mg twice per day by mouth for adults and 10 mg/kg twice per day for children (maximum, 300 mg per dose).
- Because ehrlichiosis can be life-threatening and limited courses of therapy do not pose a substantial risk for tooth staining, the American Academy of Pediatrics has identified doxycycline as the drug of choice for treating ehrlichiosis in children of any age.
- Treatment response is expected within 48 hours. Failure to respond in 3 days suggests infection with a different agent.
- Treatment is not recommended for asymptomatic individuals who are seropositive for antibodies to *E. chaffeensis*.

## References


LYME DISEASE

AGENT
Bacteria: *Borrelia burgdorferi*
Tick: *Ixodes scapularis*

SIGNS/SYMPOTMS
Early localized stage (within 3-30 days post-exposure)
- Erythema migrans (EM)—red ring-like or homogenous expanding rash (this is a pathognomonic sign)
- Flu-like symptoms including malaise, fatigue, headache, fever, chills, myalgia, regional lymphadenopathy

Early disseminated stage (within days to weeks post-exposure)
- Severe malaise and fatigue
- Multiple secondary annular rashes
- Regional or generalized lymphadenopathy
- Migratory pain in joints, tendons, bursae, muscle and bone
- Transient, migratory arthritis
- Atrialventricular nodal block
- Myopericarditis
- Meningitis, motor and sensory radiculoneuritis, subtle encephalitis, mononeuritis multiplex, pseudotumor cerebri
- Bell’s palsy or other cranial nerve neuritis
- Splenomegaly
- Microscopic hematuria or proteinuria

Late disseminated stage (within months post-exposure)
- Prolonged episodes of arthritis
- Peripheral enthesopathy
- Chronic axonal polyradiculopathy
- Spastic parapareses
- Ataxic gait
- Chronic encephalomyelitis
- Subtle mental disorders
- Keratitis
- Fatigue

LABS
Common Findings on Routine Laboratory Tests
- Elevated sedimentation rate (generally with localized or early disseminated disease)
- For cases of Lyme disease meningitis, CSF typically has a lymphocytic pleocytosis with slightly elevated protein levels and normal glucose levels

Diagnostic Laboratory Criteria
- Demonstration of diagnostic IgM (in first 6 weeks ONLY) or IgG antibodies in serum or cerebrospinal fluid. Due to high false-positive rates in both enzyme immunoassay (EIA) and immunofluorescence assay (IFA) tests, a two-tier testing protocol is recommended; a positive or equivocal EIA or IFA should be followed by a Western blot (preferred method)

Limitations to Serologic Tests for Lyme Disease:
- Serologic tests are insensitive during the first few weeks of infection.
- In persons with illness > than 1 month, a positive IgM test alone is not recommended for determining current disease
- Due to antibody persistence, single positive serologic test results can not distinguish between active and past infection and serologic tests can not be used to measure treatment response.
- Due to their high sensitivity and low specificity, EIA and IFA tests may yield false-positive results due to cross-reactivity with antibodies to commensal or pathogenic spirochetes, certain viral infections (e.g., varicella, Epstein-Barr virus), or certain autoimmune diseases (e.g., systemic lupus erythematosus).

NOTE: Coinfection with *B. microti* and/or *A. phagocytophilum* should be considered in patients who present with initial symptoms that are more severe than are commonly observed with Lyme disease alone, especially in those who have high-grade fever for more than 48 hours despite appropriate antibiotic therapy or who have unexplained leucopenia, thrombocytopenia, or anemia. Coinfection might also be considered in patients whose erythema migrans skin lesion has resolved but have persistent viral infection-like symptoms.
LYME DISEASE

TREATMENT

The regimens listed below are guidelines only and may need to be adjusted depending on a patient’s age, medical history, underlying health conditions, pregnancy status or allergies. Consult an infectious disease specialist for the most current treatment guidelines or for individual patient treatment decisions.†

Early Localized Stage

<table>
<thead>
<tr>
<th>AGE CATEGORY</th>
<th>DRUG</th>
<th>DOSAGE</th>
<th>MAXIMUM</th>
<th>DURATION (DAYS/RANGE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
<td>Doxycycline</td>
<td>100 mg twice per day orally or IV</td>
<td>N/A</td>
<td>14 (14-21)</td>
</tr>
<tr>
<td></td>
<td>Cefuroxime axetil</td>
<td>500 mg twice per day</td>
<td>N/A</td>
<td>14 (14-21)</td>
</tr>
<tr>
<td></td>
<td>Amoxicillin</td>
<td>500 mg 3 times per day</td>
<td>N/A</td>
<td>14 (14-21)</td>
</tr>
<tr>
<td>Children</td>
<td>Amoxicillin</td>
<td>50 mg/kg per day in 3 divided doses</td>
<td>500 mg per dose</td>
<td>14 (14-21)</td>
</tr>
<tr>
<td></td>
<td>Doxycycline</td>
<td>4 mg/kg per day in 2 divided doses</td>
<td>100 mg per dose</td>
<td>14 (14-21)</td>
</tr>
<tr>
<td></td>
<td>Cefuroxime axetil</td>
<td>30 mg/kg per day in 2 divided doses</td>
<td>500 mg per dose</td>
<td>14 (14-21)</td>
</tr>
</tbody>
</table>

NOTE: For patients intolerant of amoxicillin, doxycycline, and cefuroxime axetil, the macrolides azithromycin, clarithromycin, or erythromycin may be used, although they have a lower efficacy. Patients treated with macrolides should be closely observed to ensure resolution of clinical manifestations.

Treatment guidelines for patients with disseminated or late stage Lyme disease are outlined in the references.†

REFERENCES


ROCKY MOUNTAIN SPOTTED FEVER

AGENT
Bacteria: Rickettsia rickettsii
Tick: Dermacentor variabilis

SIGNS/SYMPOTOMS
[incubation period 2-14 days]
- Fever, chills
- Severe headache
- Malaise
- Myalgia
- Gastrointestinal symptoms (nausea, vomiting, anorexia, abdominal pain, diarrhea, abdominal tenderness)
- Rash, 2-5 days after fever starts, begins as small, blanching, pink macules on the ankles, wrists, or forearms that evolve to muculopapules. May expand to the entire body including the palms and soles. The classic spotted, or generalized petechial, rash is not usually apparent until the 5th or 6th day of illness.
- Cough
- Conjunctival injection, +/-photophobia
- Altered mental status
- Focal neurologic deficits, including cranial or peripheral motor nerve paralysis or sudden transient deafness

NOTE: Rash may be completely absent or atypical in up to 20% of RMSF cases. Rocky Mountain “spotless” fever is more likely to occur in older patients.

LABS
Common Findings on Routine Laboratory Tests
- Anemia
- Thrombocytopenia
- Mildly elevated hepatic transaminase levels
- Hyponatremia
- Azotemia

Diagnostic Laboratory Criteria
- Detection of DNA in a clinical specimen by PCR assay (generally unreliable for acute blood samples) [preferred method]; or
- Demonstration of a four-fold change in IgG-specific antibody titer by IFA in paired sera; or
- IHC staining of organism in a biopsy or autopsy specimen; or
- Isolation of organism in cell culture.

NOTES
- Tests for IgM antibodies are generally not useful for serodiagnosis of acute disease, due to cross-reactivity and persistence of the antibody.
- Confirmation of the diagnosis is based on laboratory testing, but antibiotic therapy should not be delayed in a patient with a suggestive clinical presentation.
**TREATMENT**

The regimens listed below are guidelines only and may need to be adjusted depending on a patient’s age, medical history, underlying health conditions, pregnancy status or allergies. Consult an infectious disease specialist for the most current treatment guidelines or for individual patient treatment decisions.†

<table>
<thead>
<tr>
<th>AGE CATEGORY</th>
<th>DRUG</th>
<th>DOSAGE</th>
<th>MAXIMUM</th>
<th>DURATION (DAYS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
<td>Doxycycline</td>
<td>100 mg twice daily, orally or IV</td>
<td>N/A</td>
<td>At least 3 days after the fever subsides and until evidence of clinical improvement is noted which is typically for a minimum total course of 5-7 days.</td>
</tr>
<tr>
<td>Children weighing =&gt;100 lbs (45.4 kg)</td>
<td>Doxycycline</td>
<td>100 mg twice daily, orally or IV</td>
<td>Consult a pediatric infectious disease specialist</td>
<td>At least 3 days after the fever subsides and until evidence of clinical improvement is noted which is typically for a minimum total course of 5-7 days.</td>
</tr>
<tr>
<td>Children weighing &lt; 100 lbs (45.4 kg)</td>
<td>Doxycycline</td>
<td>2.2 mg/kg body weight per dose twice daily, orally or IV</td>
<td>Consult a pediatric infectious disease specialist</td>
<td>At least 3 days after the fever subsides and until evidence of clinical improvement is noted which is typically for a minimum total course of 5-7 days.</td>
</tr>
</tbody>
</table>

**NOTE:** Because RMSF can be life-threatening and limited courses of therapy do not pose a substantial risk for tooth staining, the American Academy of Pediatrics has identified doxycycline as the drug of choice for treating RMSF in children of any age.


TULAREMIA

AGENT
Bacteria: Francisella tularensis
Tick: Dermacentor variabilis

SIGNS/SYMPTOMS

[Average incubation period 3-5 days, range 1-21 days]

NOTE: The clinical presentation of tularemia will depend on a number of factors, including the portal of entry.

General (may be present in all forms of tularemia)
- Fever, chills
- Headache
- Malaise, fatigue
- Anorexia
- Myalgia
- Chest discomfort, cough
- Sore throat
- Vomiting, diarrhea
- Abdominal pain

Ulceroglandular
- Localized lymphadenopathy
- Cutaneous ulcer at infection site

Glandular
- Regional lymphadenopathy with no cutaneous lesion

Typhoidal
- Characterized by any combination of the general symptoms

Oculoglandular
- Photophobia
- Excessive lacrimation
- Conjunctivitis
- Preauricular, submandibular and cervical lymphadenopathy

Pharyngeal
- Severe throat pain
- Cervical, preauricular, and retropharyngeal lymphadenopathy

Pneumonic
- Non-productive cough
- Substernal tightness
- Pleuritic chest pain

NOTE: Pneumonic tularemia should be considered in any patient presenting with community-acquired pneumonia who resides on, or has recently visited, Martha’s Vineyard, Massachusetts.

LABS

Common Findings on Routine Laboratory Tests
- Leukocyte count and sedimentation rate may be normal or elevated
- Thrombocytopenia
- Hyponatremia
- Elevated hepatic transaminases
- Elevated creatine phosphokinase
- Myoglobinuria
- Sterile pyuria

Diagnostic Laboratory Criteria
- Demonstration of a four-fold change in antibody titer in paired sera; or
- Isolation of organism.

NOTE: Detection of organism by fluorescent assay or a single elevated serum antibody titer is supportive of the diagnosis; however, these results should be confirmed by either one of the methods above.
TULAREMIA

TREATMENT

The regimens listed below are guidelines only and may need to be adjusted depending on a patient's age, medical history, underlying health conditions, pregnancy status or allergies. Consult an infectious disease specialist for the most current treatment guidelines or for individual patient treatment decisions.†

<table>
<thead>
<tr>
<th>AGE CATEGORY</th>
<th>DRUG</th>
<th>DOSAGE</th>
<th>MAXIMUM</th>
<th>DURATION (DAYS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
<td>Gentamicin</td>
<td>5 mg/kg IM or IV daily (with desired peak serum levels of at least 5 mcg/mL)</td>
<td>N/A</td>
<td>10</td>
</tr>
<tr>
<td>OR</td>
<td>Streptomycin</td>
<td>1 g IM twice daily</td>
<td>N/A</td>
<td>10</td>
</tr>
<tr>
<td>Children</td>
<td>Gentamicin</td>
<td>2.5 mg/kg IM or IV 3 times daily</td>
<td>Consult a pediatric infectious disease specialist</td>
<td>10</td>
</tr>
<tr>
<td>OR</td>
<td>Streptomycin</td>
<td>15 mg/kg IM twice daily</td>
<td>2 g/day</td>
<td>10</td>
</tr>
</tbody>
</table>

NOTES

- Doses of both streptomycin and gentamicin need to be adjusted for renal insufficiency.
- Chloramphenicol may be added to streptomycin to treat meningitis.
- Alternative therapies to the preferred regimens of streptomycin and gentamicin are outlined in references.†

REFERENCES


FOR MORE INFORMATION ON TICK-BORNE DISEASES OR TO REPORT A CASE OF TICK-BORNE DISEASE

Maine Center for Disease Control and Prevention
Infectious Disease Epidemiology
800-821-5821
www.mainepublichealth.gov

OTHER RESOURCES:

Centers for Disease Control and Prevention
www.cdc.gov

American College of Physicians/American Society of Internal Medicine
http://www.acponline.org/lyme/

ACKNOWLEDGEMENTS:
Maine CDC would like to acknowledge the following for their contribution to this physicians reference guide:
  • Federal CDC
  • Maine Medical Center Research Institute Vector-borne Disease Lab
  • Massachusetts Department of Public Health