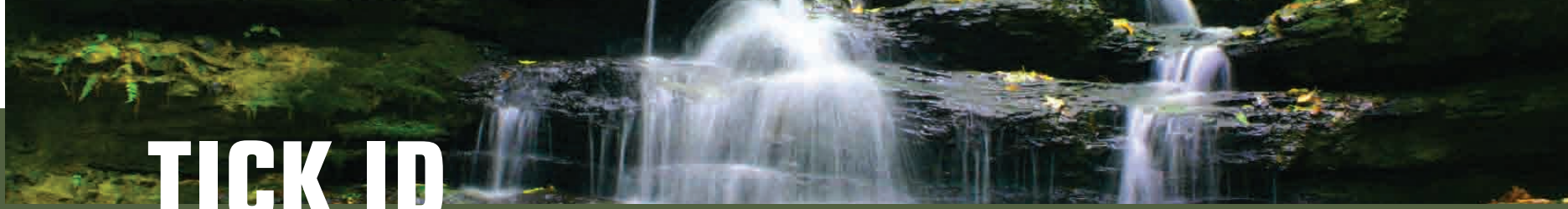


# TICKBORNE DISEASES IN MASSACHUSETTS

a physician's reference manual

second edition

Massachusetts Department of Public Health
Division of Epidemiology and Immunization
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# TICK ID

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*



Adult female deer tick (CDC photo)



Nymph

Adult Male

Adult Female

Images not to scale

**Deer ticks** are capable of spreading the agents of Lyme disease, human granulocytic anaplasmosis/ehrlichiosis (HGA) and babesiosis.

The nymph and adult female stages of the deer tick most frequently bite humans. The greatest risk of being bitten exists throughout the spring, summer and fall. However, deer tick adults may be out searching for a host any time winter temperatures are above freezing.

The adult female deer tick has a reddish-brown tear-drop shaped body with a dark brown dorsal scutum (plate) located behind the mouthparts.

Unfed deer tick nymphs are the size of a poppy seed and unfed adults are the size of a sesame seed.

## AMERICAN DOG TICK *DERMACENTOR VARIABILIS*



Adult female dog tick (CDC photo)



Adult Male

Adult Female

Images not to scale

**Dog ticks** (also called wood ticks) are capable of spreading the agents of tularemia and Rocky Mountain spotted fever.

The adult stage of the female dog tick most frequently bites humans. The highest risk of being bitten by a dog tick occurs during the spring and summer.

The adult female dog tick has a dark brown body with whitish markings on its dorsal scutum (plate) located behind the mouthparts.

Unfed adult dog ticks are the size of a watermelon seed.



# SUMMER FEVER ALGORITHM

**ALGORITHM FOR DIFFERENTIATING TICKBORNE DISEASES IN MASSACHUSETTS**

*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.*

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**

Erythema migrans
**Lyme disease**

Maculopapular
**Consider human granulocytic anaplasmosis/ehrlichiosis, further tests may be indicated**

**No**

Blood smear review

Parasites in RBC*
**Babesiosis**

**If patient has an international travel history, malaria should be ruled out*

Morulae in WBC
**Consider human granulocytic anaplasmosis/ ehrlichiosis, further tests may be indicated**

Complete Blood Count (CBC)

Normal CBC
**Consider RMSF*, tularemia** or Lyme disease, further tests may be indicated**

** **RMSF** -- thrombocytopenia may occur*

*** **tularemia** -- WBC normal or elevated, thrombocytopenia may occur*

Maculopapular to Petechial*
**Consider RMSF, further tests may be indicated**

**If petechial rash of palms and soles (characteristic of RMSF) is present, treat immediately.*

Cutaneous ulcer
**Consider tularemia (ulceroglandular), further tests may be indicated**

WBC low or normal, thrombocytopenia, low hematocrit, elevated reticulocytes
**Consider babesiosis, further tests may be indicated**

Normal hematocrit, thrombocytopenia, leukopenia
**Consider human granulocytic anaplasmosis/ehrlichiosis, further tests may be indicated**

## OTHER CONSIDERATIONS

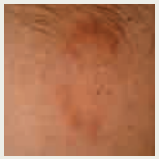
- Rash occurs in 70-80% of Lyme disease patients and in 10% or less of HGA patients.
- Rash occurs in 70-80% of RMSF patients but only appears several days after onset of febrile illness.
- Hyponatremia may occur with RMSF or tularemia.
- Lyme disease can present as Bell's palsy, further tests may be indicated.
- Ulceroglandular tularemia usually presents as regional lymphadenopathy with a small ulceration distally, further tests may be indicated.
- Coinfections involving Lyme disease, babesiosis, and/or HGA 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.

# LYME DISEASE

**AGENT**

BACTERIA: *BORRELIA BURGDORFERI*

## SIGNS/SYMPTOMS









### 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
- Atrioventricular nodal block
- Myopericarditis
- Pancarditis
- Meningitis, motor and sensory radiculoneuritis, subtle encephalitis, mononeuritis multiplex, pseudotumor cerebri
- Bell's palsy or other cranial nerve neuritis
- Mild or recurrent hepatitis
- Splenomegaly
- Microsopic hematuria or proteinuria

### LATE DISSEMINATED STAGE (WITHIN MONTHS POST-EXPOSURE )

- Prolonged episodes of arthritis
- Peripheral enthesopathy
- Periostitis or joint subluxations below acrodermatitis
- Chronic axonal polyradiculopathy
- Spastic parapareses
- Ataxic gait
- Chronic encephalomyelitis
- Subtle mental disorders
- Keratitis
- Fatigue

## COMMON FINDINGS ON ROUTINE LABORATORY TESTS

- Elevated sedimentation rate (generally with localized or early disseminated disease)
- Mildly elevated hepatic transaminases (generally with early 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 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; or
- Isolation of organism from a clinical specimen.

## 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 (eg, varicella, Epstein-Barr virus), or certain autoimmune diseases (eg, 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 leukopenia, 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

**AGENT**

BACTERIA: *BORRELIA BURGDORFERI*

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

| AGE CATEGORY | DRUG | DOSAGE | MAXIMUM | DURATION, DAYS (RANGE) |
|---|---|---|---|---|
| **Adults** | Doxycycline | 100 mg twice per day | N/A | 14 (14-21) |
| | Cefuroxime axetil | 500 mg twice per day | N/A | 14 (14-21) |
| | Amoxicillin | 500 mg 3 times per day | N/A | 14 (14-21) |
| **Children** | Amoxicillin | 50 mg/kg per day in 3 divided doses | 500 mg per dose | 14 (14-21) |
| | Doxycycline | 4 mg/kg per day in 2 divided doses | 100 mg per dose | 14 (14-21) |
| | Cefuroxime axetil | 30 mg/kg per day in 2 divided doses | 500 mg per dose | 14 (14-21) |

**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 reference below.* †

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† Wormser GP, Dattwyler RJ, Shapiro ED, et al. The Clinical Assessment, Treatment and Prevention of Lyme Disease, Human Granulocytic Anaplasmosis, and Babesiosis. Clinical Practice Guidelines by the Infectious Diseases Society of America. Clinical Infectious Diseases. 2006; 43: 1089-1134.


† *REFERENCE FOR TREATMENT GUIDELINES*

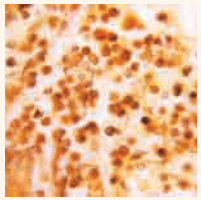


# BABESIOSIS

**AGENT**

PARASITE: *BABESIA MICROTI*

## SIGNS/SYMPTOMS



**[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

## 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

- Identification of intraerythrocytic *Babesia* parasites in a peripheral blood smear; or
- Isolation of the parasite from a whole blood specimen by animal inoculation; or
- Positive polymerase chain reaction (PCR) assay.

**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 immunofluorescence assay (IFA) test for IgG. In general, higher cutoff titers (≥ 1:256) are associated with greater diagnostic specificity.



# BABESIOSIS

**AGENT**

PARASITE: *BABESIA MICROTI*

## 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.

| AGE CATEGORY | | DRUG | DOSAGE | MAXIMUM | DURATION (DAYS) |
|---|---|---|---|---|---|
| **Adults** | Prescribe Together | Atovaquone | 750 mg orally every 12 hours | N/A | 7-10 |
| | Prescribe Together | Azithromycin | 500-1000 mg on day 1 and 250 mg orally once per day thereafter | N/A | 7-10 |
| | | | OR | | |
| | Prescribe Together | Clindamycin | 300-600 mg IV every 6 hours OR 600 mg orally every 8 hours | N/A | 7-10 |
| | Prescribe Together | Quinine | 650 mg orally every 6-8 hours | N/A | 7-10 |
| **Children** | Prescribe Together | Atovaquone | 20 mg/kg every 12 hours | 750 mg per dose | 7-10 |
| | Prescribe Together | Azithromycin | 10 mg/kg once per day on day 1 and 5 mg/kg once per day thereafter orally | 500 mg per dose on day 1 and 250 mg per dose thereafter | 7-10 |
| | | | OR | | |
| | Prescribe Together | Clindamycin | 7-10 mg/kg IV or orally every 6-8 hours | 600 mg per dose | 7-10 |
| | Prescribe Together | Quinine | 8 mg/kg orally every 8 hours | 650 mg per dose | 7-10 |

**NOTE:** *For adult patients who are immunocompromised, higher doses of azithromycin, 600-1000 mg per day, may be used.*

**NOTE:** *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.*

**NOTE:** *Consider the possibility of coinfection with B. burgdorferi and/or A. phagocytophilum in patients with especially severe or persistent symptoms, despite appropriate antibabesial therapy.*

**NOTE:** *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.*

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† *REFERENCE FOR TREATMENT GUIDELINES*

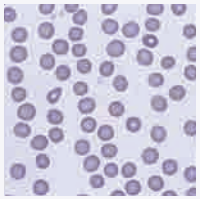
# HUMAN GRANULOCYTIC ANAPLASMOSIS

(AKA HUMAN GRANULOCYTIC EHRLICHIOSIS)

AGENT

BACTERIA: *ANAPLASMA PHAGOCYTOPHILUM (FORMERLY EHRLICHIA PHAGOCYTOPHILUM)*

SIGNS/SYMPTOMS



**[INCUBATION PERIOD 1-2 WEEKS]**

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

## 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

- Demonstration of a four-fold change in IgG-specific antibody titer by immunofluorescence assay (IFA) test in paired serum samples; or
- Detection of DNA by polymerase chain reaction (PCR) assay; or
- Immunohistochemical (IHC) staining of organism; or
- Isolation of organism from a clinical specimen.

**NOTE:** *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 HGA in or out.*

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

**NOTE:** *Consider the possibility of coinfection with B. microti and/or B. burgdorferi.*

# HUMAN GRANULOCYTIC ANAPLASMOSIS

(AKA HUMAN GRANULOCYTIC EHRLICHIOSIS)

AGENT

BACTERIA: *ANAPLASMA PHAGOCYTOPHILUM (FORMERLY EHRLICHIA PHAGOCYTOPHILUM)*

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.

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

**NOTE:** *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).*

**NOTE:** *Because HGA 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 HGA in children of any age.*

**NOTE:** *Treatment response is expected within 48 hours.*

**NOTE:** *Treatment is not recommended for asymptomatic individuals who are seropositive for antibodies to A. phagocytophilum.*

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† *REFERENCE FOR TREATMENT GUIDELINES*



# TULAREMIA

**AGENT**

BACTERIA: *FRANCISELLA TULARENSIS*

## 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, preparotid, 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.*

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 immunofluorescence assay (IFA) test 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

**AGENT**

BACTERIA: *FRANCISELLA TULARENSIS*

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.

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

**NOTE:** *Doses of both streptomycin and gentamicin need to be adjusted for renal insufficiency.*

**NOTE:** *Chloramphenicol may be added to streptomycin to treat meningitis.*

**NOTE:** *Alternative therapies to the preferred regimens of streptomycin and gentamicin are outlined in the reference below.* †

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† *REFERENCE FOR TREATMENT GUIDELINES*

# ROCKY MOUNTAIN SPOTTED FEVER

**AGENT**
BACTERIA: *RICKETTSIA RICKETTSII*

## SIGNS/SYMPTOMS



**[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 maculopapules. 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.*

## COMMON FINDINGS ON ROUTINE LABORATORY TESTS

- Anemia
- Thrombocytopenia
- Mildly elevated hepatic transaminase levels
- Hyponatremia
- Azotemia

## DIAGNOSTIC LABORATORY CRITERIA

- Demonstration of a four-fold change in IgG-specific antibody titer by immunofluorescence assay (IFA) test in paired sera; or
- Detection of DNA in a clinical specimen by polymerase chain reaction (PCR) assay (generally unreliable for acute blood samples); or
- Immunohistochemical (IHC) staining of organism in a biopsy or autopsy specimen; or
- Isolation of organism in cell culture.

**NOTE:** *Tests for IgM antibodies are generally not useful for serodiagnosis of acute disease, due to cross-reactivity and persistence of the antibody.*

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



# ROCKY MOUNTAIN SPOTTED FEVER

**AGENT**

BACTERIA: *RICKETTSIA RICKETTSII*

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.

| AGE CATEGORY | DRUG | DOSAGE | MAXIMUM | DURATION (DAYS) |
|---|---|---|---|---|
| Adults | Doxycycline | 100 mg twice daily, orally or IV | N/A | 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. |
| | | | | |
| Children weighing =>100 lbs (45.4kg) | Doxycycline | 100 mg twice daily, orally or IV | Consult a pediatric infectious disease specialist | 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. |
| | | | | |
| Children weighing < 100 lbs (45.4kg) | Doxcycline | 2.2 mg/kg body weight per dose twice daily, orally or IV | Consult a pediatric infectious disease specialist | 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. |

**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.*

REFERENCES

## REFERENCES


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† Walker DH, Raoult D. *Rickettsia ricketsii* and Other Spotted Fever Group Rickettsiae (Rocky Mountain Spotted Fever and Other Spotted Fevers). In: Mandell GL, Bennett JE, Dolin R, editors. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases. 6th ed. Philadelphia, PA: Churchill Livingstone; 2005. p. 2287-2295.


† *REFERENCE FOR TREATMENT GUIDELINES*



# ADDITIONAL RESOURCES

## FOR MORE INFORMATION ON TICKBORNE DISEASES:

**Massachusetts Department of Public Health**
Division of Epidemiology and Immunization
617-983-6800
www.mass.gov/dph/epi

**Centers for Disease Control and Prevention**
www.cdc.gov

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

## TO REPORT A CASE OF TICKBORNE DISEASE OR OBTAIN INFORMATION ON THE NUMBER OF CASES OF TICKBORNE DISEASES IN YOUR AREA:

**Massachusetts Department of Public Health**
Office of Integrated Surveillance and Informatics Services
617-983-6801

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