Tick-Borne Disease, Lyme Disease, Rocky Mountain Spotted Fever (RMSF) & Ehrlichiosis in Children

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Bacteria, viruses, and parasites can get transmitted to the human body through a tick bite. The most common tick-borne disease in the U.S is Lyme disease. Almost 80% of Lyme disease cases present with Erythema migrans rash. The first line of treatment for children and adults is doxycycline. Rocky Mountain spotted fever can prove fatal if not treated promptly. The disease presents as a sudden onset of fever and headache. Doxycycline is the treatment of choice.

Definition of Tick-borne Disease

There are many tick species, and relatively few will bite humans. However, those that do carry disease-causing microorganisms, such as parasites, viruses, or bacteria, usually acquired from other animals on which the tick has fed before latching on to a human host.
Common Tick-borne Diseases

- Lyme disease
- Human Monocytic Ehrlichiosis
- Human Granulocytic Ehrlichiosis (now known as Anaplasmosis)
- Tularemia
- Rocky Mountain spotted fever

Rare Tick-borne diseases

- Anaplasmosis
- Colorado tick fever
- Tick-borne relapsing fever
- Q fever
- Southern tick-associated rash illness
- Powassan encephalitis

Lyme Disease

Lyme disease is the most common tick-borne disease in the US, especially in the northeast and north-central regions. It is caused by the transmission of Borrelia burgdorferi through the bite of infected ticks. Early signs and symptoms appear 3 to 30 days after a tick bite. Late symptoms present after weeks to months. Black-legged ticks and deer ticks spread it.

There are three major stages of the disease:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Time of onset</th>
<th>Clinical presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early local disease</td>
<td>1-2 weeks</td>
<td><em>Erythema migrans</em> rash, fever, myalgia, arthralgia, fatigue, headache, lymphadenopathy</td>
</tr>
<tr>
<td>Early disseminated</td>
<td>1 month</td>
<td>Disseminated <em>E. migrans</em> rash, meningitis, facial palsy, carditis, radiculopathy</td>
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<tr>
<td>Late disease</td>
<td>2-12 months</td>
<td>Arthritis</td>
</tr>
</tbody>
</table>

Early signs and symptoms

- Fever
- Chills
- Headache
- Fatigue
- Malaise
- Arthralgia
- Joint aches
- Myalgia
- Swollen lymph nodes
- Lymphadenopathy
- Tender local adenopathy
- *E. migrans* rash: This rash is seen in about 80% of infected individuals. It appears at the site of a tick bite on average about 7 days and gradually expands to an area of 12 inches or more. It appears as a bullseye and is rarely
painful or itchy.

Later signs and symptoms

- Severe headaches
- Neck stiffness
- *E. migrans* rash on areas other than the site of the tick bite
- Arthritis particularly involving large joints
- Facial palsy
- Intermittent pain (bones, muscles, and joints)
- Lyme carditis (palpitations, chest pain, vertigo, and syncope)
- Dizziness episodes
- Shortness of breath
- Meningitis
- Neuropathy
- Tingling, numbness, or shooting pains in the hands and feet
- Problems related to short-term memory

Diagnosis

- Blood titers with confirmatory Western Blot test-enzyme immunoassay
- During the early stage of the disease, blood titers may give false-negative results
- Rule of 7: A headache for 7 days, seventh nerve palsy (Bell palsy), and 70% monocytes in CSF
- Joint aspiration may be necessary to exclude other diseases
- CSF analysis will be used to ascertain Lyme disease for patients suffering from meningitis
- ECG may be necessary to identify the presence of Lyme carditis

Management

**Early Lyme disease**

Adults: Doxycycline 100 mg bid (10-21 days) or Amoxicillin 500 mg t.i.d (2-3 weeks)

Children: Doxycycline 4 mg/kg per day

Ceftriaxone is used for Lyme meningitis and other neurological manifestations.

**Late Lyme Disease**

Adults: Doxycycline 100 mg bid (28 days)

Children: Doxycycline 4 mg/kg per day

**Late Lyme disease with neurological manifestations**

Adult patient: IV ceftriaxone – 2 to 4 weeks

Cefotaxime and cefuroxime axetil may also be administered if there is no contraindication.

**Management of the Lyme Disease in children:**

<table>
<thead>
<tr>
<th>Children under 8</th>
<th>Children 8 or over</th>
<th>Chronic Lyme</th>
</tr>
</thead>
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</table>
Rocky Mountain Spotted Fever

It is a disease caused by the bacterium *Rickettsia rickettsii*, which is transmitted to humans through tick bites. It can be fatal without appropriate management. The disease presents itself as a sudden onset of fever and headache. It easily disguises itself as another disease; thus, sophisticated tests may be necessary for a definitive diagnosis.

**Common signs and symptoms are as follows:**

- Sudden onset of fever
- The petechial rash starts on the hands and feet and spreads inward. It occurs 2-5 days after a fever and presents in up to 90% of the cases
- Red eyes
- Nausea
- Vomiting
- Myalgia
- Thrombosis
- Disseminated intravascular coagulation (DIC)
- Frontal headache
- Abdominal pain
- Loss of appetite

**Diagnosis**

Diagnosis is made based on the patient’s clinical presentation and symptoms. It is later confirmed through specialized lab tests.

**Treatment**

The first-line treatment for adults and children is doxycycline. It is given until the patient is afebrile for 3 days.

**Ehrlichiosis**

There are at least three different ehrlichial species in the United States that cause human ehrlichiosis:

- *Ehrlichia chaffeensis*
- *Ehrlichia ewingii*
- *Ehrlichia muris*-like

**Symptoms**

Typically, symptoms appear within 1-2 weeks after the tick bite.

- Fever
- Headache
- Fatigue
- Muscle aches
Diagnosis

Diagnosis is made by clinical presentation and symptoms of the patient. It is later confirmed through lab tests. The gold standard serologic test for ehrlichiosis is an indirect immunofluorescence assay.

Treatment

The first line of treatment for adults and children of all ages is doxycycline. After treatment, symptoms usually resolve within 24-48 hours. Physicians may prescribe a longer course of doxycycline if the patient lives in an area endemic to Lyme disease since both diseases are transmitted by the same type of tick.

Anaplasmosis

This disease is caused by the *Anaplasma phagocytophilum*. A tick (usually a black-legged tick) that has bitten an infected rodent or deer will transmit the infection to humans. It is common in mid-Atlantic, north-central states, California, and the northeast. Anaplasmosis may be more severe in individuals who are immunocompromised or elderly.

**Early-stage Symptoms**

- Joint pain
- Fever
- Muscle aches
- Headache
- Chills
- Nausea and vomiting
- Diarrhea

**Late-stage Symptoms**

- Respiratory failure
- Confusion
- Seizures or coma
- Bleeding problems
- Organ failure
- Septic shock
- Death

Diagnosis

The standard serologic test for the diagnosis of anaplasmosis is the indirect immunofluorescence antibody (IFA) assay for immunoglobulin G (IgG) using the *A. phagocytophilum* antigen.

Treatment

The first line of treatment for adults and children of all ages is doxycycline. When treated early with doxycycline, the symptoms resolve within a few days to a few weeks.
Preventing Tick Bites

When you spend time outdoors, take the following precautions to reduce the risk of tick bites, especially in endemic areas.

- Wear bright-colored clothing to spot ticks more easily
- Wear a hat and tie back long hair
- Wear long sleeves and trousers
- Tuck trousers into socks
- Use insect repellent (Composition: 20% DEET, or Picaridin)
- Avoid areas with leaf litter and tall grass
- Avoiding areas with tall grass

When you return from spending time outdoors, take the following precautions.

- Take a bath or shower as soon as you come indoors to help get rid of ticks that may still be crawling on the body.
- Check the entire full body to find areas of tick bites. Pay special attention to parts that bend, such as the knees, and pressure points, such as the area behind the ears.

If you live in a rural area, keep the area surrounding the home clear of weeds and brushy areas to deter wild animals.

If you have pets, examine them carefully for ticks. Fit dogs with anti-tick collars. All dogs are susceptible to Lyme disease as well as babesiosis, a malaria-like infection that usually affects dogs by attacking their red blood cells. Cats tend to be more resistant to tick-borne diseases and are hypersensitive to the chemicals in anti-tick collars; consult a veterinarian before using anti-tick collars with cats.

References


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