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

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

Tick-borne diseases are transferred to humans as a result of the tick bite. There are various types of ticks, but they all can carry disease-causing microorganisms. They are widespread in different regions in the US depending on how well they can survive in the areas, but some are specific to certain states. Ticks can be infected with parasites, viruses, or bacteria.
Common Tick-borne Diseases

- Lyme disease (most common in the U.S)
- Human Monocytic Ehrlichiosis
- Human Granulocytic Ehrlichiosis
- Tularemia
- Rocky Mountain spotted fever - caused by ticks that are very common in the south-east and California but can also be found in other unmountainous areas

Rare Tick-borne diseases

- Anaplasmosis
- Colorado tick fever
- Tick-Borne Relapsing Fever
- Q fever
- Babesiosis - Malaria-like infection that usually affects dogs by attacking their red blood cells.
- Southern Tick-Associated Rash Illness
- Powassan encephalitis

Prevention

- Tick checks at night in endemic areas
- Long clothing
- Socks over pants
- Use of insect repellent (Composition: 20% DEET, or Picaridin)
- Anti-tick dog collars
- Use of pre-treated clothing which repels ticks
- Avoiding areas with leaf litter
- Avoiding high grass places
- Keep the areas surrounding the home clear of bushes and ensure that animals are kept at a safe distance from human residence
- Carefully examine pets, including dogs and cats as well as clothing for ticks
- Wearing hats and tying back long hair
- Wear bright colored clothes so that a tick can be spotted

Finding Ticks

Take a bath as soon as you come indoors. It helps get rid of ticks that are still crawling on the body.

After coming back from tick-infested areas, one should check their full body to find areas of tick bites. Parents should do this for their children. Pay attention to pressure point and parts that bend, such as the knees and behind the ears.

Lyme Disease

It is a tick-borne disease that is caused by the transmission of Borrelia burgdorferi through the bite of infected ticks. Early signs and symptoms appear 3 to 30 days after the bite of a tick. Late symptoms present after days to months. Black-legged tick and deer ticks spread it. All dogs are susceptible to Lyme disease.
It is endemic mostly in the eastern United States and has three major stages of 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>Erythema migrans rash, fever, myalgia, arthralgia, fatigue, headache, lymphadenopathy</td>
</tr>
<tr>
<td>Early disseminated disease</td>
<td>1 month</td>
<td>Disseminated E. migrans rash, meningitis, facial palsy, carditis, radiculopathy</td>
</tr>
<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
- Erythema 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
- Erythema migrans rash on areas other than that of the tick
- Arthritis particularly involving large joints
- Facial palsy
- Intermittent pain (bones, muscles, and joints)
- Lyme carditis (irregular heartbeats)
- 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 phase of the disease, blood titers may give false negative results

Rule of 7:
- A headache for 7 days
- 7th nerve palsy (Bell’s palsy)
- 70% monocytes on 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 lime disease**

Adults: Doxycycline 100mg b.d (10-21 days) or Amoxicillin 500mg 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: Doxycyclin 100mg b.d (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 of different ages:**

<table>
<thead>
<tr>
<th>Children under 8</th>
<th>Children 8 or over</th>
<th>Chronic lyme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meningitis – ceftriaxone</td>
<td>Meningitis – ceftriaxone</td>
<td>Therapy and psychiatric support</td>
</tr>
<tr>
<td>Other disease – oral amoxicillin</td>
<td>Other disease – doxycycline</td>
<td>Antibiotic do not help with disease</td>
</tr>
</tbody>
</table>

**Rocky Mountain Spotted Fever**

It is a disease caused by the bacterium Rickettsia rickettsii as a result of the tick bite. It can even prove to be fatal in the absence of 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 to distinguish it.

**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 fever and presents in up to 90% of the cases
- Red eyes
- Nausea
- Vomiting
- Myalgia
- Thrombosis
- DIC
Frontal headache
Abdominal pain
Loss of appetite

Diagnosis
Diagnosis is made on the basis of clinical presentation and symptoms of the patient. 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.

Anaplasmosis
A tick that has bitten a rodent or a deer that is infected bites a human and gives them this disease. It is common in mid-Atlantic, north-central states, California and the northeast.

Symptoms
- Joint pain
- Fever
References


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