

## Borrelia burgdorferi

*Borrelia burgdorferi* is a spirochete bacteria which causes Lyme disease. The bacteria is transmitted through the ixodes tick which is required for its lifecycle. The classic presentation of the infection after a tick bite is an initial bulls-eye rash with central clearing. After weeks, the patient can experience a variety of symptoms including neurologic or cardiac, including bell's palsy and heart block. The latest manifestations of the infection include monarthropathies or migratory polyarthropathies. Due to the vector transmission by ixodes tick, the disease is endemic in the northeastern USA where the tick typically lives and is also transmitted with other pathogens which use the same vector, classically babesia. For treatment, doxycycline is used for early disease and ceftriaxone is used for later disease.



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### Characteristics

#### Lyme Disease

##### [Lyme-castle](#)

Lyme disease is a systemic disease caused by a spirochete infection transmitted by the Ixodes tick which is endemic to the northeastern United States. Patients classically develop a bull's-eye rash with central clearing and can develop Bell's palsy, heart block, and arthropathies.

#### Spirochete

##### [Spiral-spirochete Staircase](#)

A spirochete is a spiral-shaped bacterium.

#### Dark-field Microscopy

##### [Dark Field](#)

Spirochetes cannot be visualized on Gram stain and require Dark-field microscopy for visualization. This is one way a diagnosis can be made.

#### Giemsa Stain

##### [Gems](#)

Giemsa stain is used to visualize the spirochete of *Borrelia* species.

#### Silver Stain

##### [Silver](#)

Silver stain is used to visualize the spirochete of *Borrelia* species.

#### White-footed Mouse

##### [White-footed Mouse](#)

The white-footed mouse is the primary host for the lifecycle of the Ixodes tick. Therefore, these mice are necessary for the propagation of Lyme disease.

#### Ixodes Tick

##### [X-tick](#)

The Ixodes tick is the transmitting agent of the *Borrelia burgdorferi*. The Ixodes tick is considered the vector for Lyme disease, Babesia, and Anaplasma.

#### Babesia

##### [Baby-seal](#)

Babesia causes a protozoal infection in humans called babesiosis. Babesia, like *Borrelia burgdorferi*, is transmitted by the Ixodes tick. While babesiosis and malaria have similar clinical presentations, they do not share a common endemic region as babesiosis is primarily seen in the northeastern United States. There may be a coinfection of both Babesia and *Borrelia burgdorferi* since both infections are transmitted by the Ixodes tick.

## Anaplasmosis

### Plasma

Anaplasmosis is a disease caused by Anaplasma, a rickettsial parasite. Anaplasma is transmitted by the Ixodes tick, like Borrelia burgdorferi and Babesia. There may be a co-infection of both Anaplasma and Borrelia burgdorferi similar to the co-infection that may occur with Babesia and Borrelia burgdorferi. Anemia, diarrhea, tachycardia, skin rash (rare), fever, chills, headache and myalgias may be seen with anaplasmosis. Histologically, anaplasmosis can be diagnosed by the visualization of granulocytes with morulae in the cytoplasm of white blood cells.

## Signs & Symptoms

### Flu-like Symptoms

#### Thermometer and Ice-bag

Flu-like symptoms are common in the initial presentation of patients with Lyme disease.

### Erythema Migrans

#### Red Migrating-ducks

Erythema migrans is a characteristic targetoid rash, which is the classic finding in Lyme disease and shows the site of the tick bite.

### Bulls Eye Rash

#### Bullseye

“Bull’s-eye” is the classic description of the rash seen in Lyme disease because of the typical target pattern with central clearing.

### Bilateral Bell's Palsy

#### Bi-ladders on a Drooping-bell

Bilateral Bell's palsy can be one of the presentations of Lyme disease. However, the palsy can present unilaterally.

### Conduction Defects

#### Heart with Conduction Cables

Stage 2 Lyme disease can cause conduction defects of the heart, causing heart block and other cardiac findings. This typically happens weeks after the initial tick bite. Patients can present with first degree to complete heart block.

### Arthropathy

#### King-Arthur-party-hat

Arthropathy is the last of the characteristic symptoms seen in Lyme disease and is usually experienced weeks after the initial tick bite. The arthropathy is classically unilateral and can migrate from one joint to another.

## Treatments

### Doxycycline

#### Dachshund-cycling

If a patient has a tick bite and Lyme disease is suspected, the patient should be placed on doxycycline.

### Ceftriaxone

#### Chef-tri-axes

Ceftriaxone is used for late manifestations of Lyme disease after the patient has had the disease for a significant amount of time.