



Lyme Disease: A Zoonosis Tick-Borne Borrelia Bacterium [3/4]

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Editorial

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Abbreviations: CAA: Chronic Atrophying Acrodermatitis; DBPS: Decorin Binding Proteins; ECG: Electrocardiogram; ECM: Erythema Chronicum Migrans; EM: Erythema Migrans; NMDA Receptor: N-Methyl-D-Aspartate Receptor.

Editorial

Lyme disease, medically known as borreliosis, initiates with a skin manifestation known as erythema chronicum migrans (ECM). ECM is a ring-shaped patch with inflammation that appears around the tick bite and typically develops within a month after being bitten (Figure

1). If not treated, borreliosis can advance to a later stage, leading to neurological, articular, and cardiac complications. Lyme disease is an intricate illness that manifests in various symptoms affecting multiple bodily systems. The incubation period typically ranges from one to two weeks. Symptoms can present themselves anywhere from a few days to several years later. The primary clue is the development of a circular or oval-shaped rash known as erythema migrans (EM) at the tick bite site. This rash usually appears within one to two weeks but can take up to 32 days. Patients may experience flu-like symptoms such as tiredness, migraines, muscle soreness, fever, and shivering sensations. Diagnosing EM relies heavily on clinical manifestations since many patients do not recall being bitten by a tick. However, appropriate antimicrobial treatment generally leads to favorable outcomes [1].



Figure 1: Erythema *Chronicum Migrans* (ECM) from Lyme Disease. This image is Licensed under Creative Commons Attribution.

Lyme disease, transmitted by ticks, manifests with erythema migrans. If untreated, it can result in complications affecting the nervous system, joints, heart, and skin. Neurological complications include meningitis, encephalitis, memory and behavioral disorders, and fatigue. Diagnosis

involves serological tests and cerebrospinal fluid analysis when the central nervous system is affected. Proper medical attention is crucial to prevent further harm, as timely treatment can mitigate severe symptoms and complications [2,3]. Lyme disease, caused by *Borrelia burgdorferi*

transmitted through tick bites, presents diverse symptoms and complications. These include migratory polyarthritis and cardiac issues such as atrioventricular blocks, which occur after the initial ECM rash. Chronic rheumatic conditions can affect joints, while dermatological symptoms involve chronic atrophying acrodermatitis (CAA). Lyme arthritis, a late complication, causes swelling, discomfort, and inflammation in large joints like the knee (Figure 2) [4]. Additionally, Lyme

disease can trigger Lyme encephalopathy, characterized by cognitive problems, insomnia, and personality changes. It may be mistaken for a central nervous system infection [5]. Lyme borreliosis exhibits three skin manifestations: erythema migrans, borrelial lymphocytoma, and ACA. ACA initially appears as a reddish-blue patch that gradually atrophies over time [6].



Figure 2: Lyme Arthritis from Lyme Disease. This Image is Licensed under Creative Commons Attribution.

Borrelia burgdorferi causes Lyme disease transmitted through tick bites. Tick saliva contains substances that hinder blood clotting, reduce inflammation, and suppress the immune response, aiding bacterial spread. Spirochetes adapt within the host, protected by tick saliva and modified bacterial proteins. They travel through the bloodstream, targeting specific organs like the skin, joints, and neurons.

Borrelia burgdorferi spreads throughout the body, causing various symptoms, including the circular skin lesion called erythema migrans. Despite challenges, the bacteria thrive, leading to Lyme disease [7]. These bacteria modify their surface proteins and produce decorin-binding proteins (Dbps) A and B, which bind to decorin in the host's matrix to evade the immune system [8]. The spirochetes stimulate the release of quinolinic acid, activating the NMDA receptor associated with encephalopathy [9,10]. Exposure to the *Borrelia* bacterium in Lyme disease is related to chronic arthritis characterized by persistent inflammation. Thus the immune system activates inflammatory mediators that contribute to inflammation in chronic arthritis characterized by joint swelling and inflammation. Lyme carditis can result in an atrioventricular block, disrupting heart conduction. Accurate diagnosis requires symptom evaluation, serological testing, ECG, and echocardiography [11-13].

These editorials highlight the clinical, epidemiology, and diagnosis of tick-borne pathogenic *Borrelia*. Ticks' role in transmitting Lyme disease is significant, so highlighting the infectious agents tick-borne to humans and animals is primordial [14]. There are two barriers to tick-borne Lyme disease, the host's immunity to tick bites and the tick's immunity to pathogens [15]. In Lyme disease, exposure of the host's immune system to the bacterium *Borrelia* induces chronic immune disease. Many targeting molecules have a role in modulating the immunity system against Lyme disease [16-25]. Accurate and rapid diagnosis with high sensitivities is one of the challenges in the medical field of infectious diseases for quick treatment in infected patients. The immune system responds to *Borrelia burgdorferi* infection by producing antibodies, resulting in humoral and cell-mediated immune reactions. Detection of the humoral immune response depends on detecting the antibody response. The diagnosis of Lyme disease is still a significant concern.

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