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**Lyme Disease: A Tick’s Risky Bite**

**Jana Keller, RN, BSN**

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**Introduction**

Lyme Disease is a bacterial infection transmitted primarily by the deer tick and is commonly seen in the United States. It is an infectious disease caused by the bacterium *Borrelia burgdorferi*, which is a spirochete (Pearson, 2014). Lyme disease’s presence is confirmed by the Centers for Disease Control and Prevention who estimates that 300,000 people per year are diagnosed with Lyme disease in the United States (Moore, 2015). It is imperative that primary health care workers (such as Nurse Practitioners) are familiar with this disease and the early signs and symptoms. If early signs and symptoms go unnoticed or misdiagnosed by a healthcare professional, the spirochete infection may lead to a more difficult disease pathway that may be fatal (Moore, 2015).

**Pathophysiological Process**

Lyme Disease is transmitted when the bacterium *Borrelia burgdorferi* enters the body (most commonly through a tick bite). Studies have shown there is a delay of sixty-three hours from the time the tick attaches to the host to transmission of the spirochete to the host (Nichols, & Wiedermann, 2015). The bacteria pass from the tick to the human through the tick’s saliva and salivary glands. During transmission, the spirochete binds with a tick salivary protein to shield against host antibodies and complement. The spirochete then multiply and evasively move away from the site of the initial bite. The pathophysiological causes of Lyme borreliosis that do not directly elicit extracellular matter, they instead rely on their mobility and the expression of adhesion and proteins that bind host proteins to evade immune response (Bockenstedt & Wormser, 2014). The spirochetes also create a production of matrix metalloproteinases, which makes tissues more permeable to pathogen invasion furthering incidence of infection (Bockenstedt & Wormser, 2014).

**Pathophysiological Significance**

During transmission, when the spirochetes bind to the tick’s saliva, the protein-coin that is formed works as a shield against the host’s antibodies and complement. The *B. burgdorferi* genome does not have virulence factors or toxins, therefore the clinical signs of Lyme disease is a result from the immune response to the infection (Bockenstedt & Wormser, 2014). The bacteria spreads through the blood and lymphatic system to other organs or skin sites and cause joint inflammation, cardiac involvement, as well as neurologic symptoms (Marchese & Primer, 2013).

**Case Study**

A 32-year old pregnant woman from southeastern Connecticut presents to her physician in July at 26 weeks’ gestation because of a skin lesion. She reports she has had fatigue, arthritis, and headache for 2 days and a rash in her left axilla for 1 day. She lives in a wooded area and works in her garden frequently. Six weeks earlier, she had removed a small tick that was attached behind her right knee. On physical examination, she is afibrile. She has an erythematous, oval macular lesion, 7 to 8 cm in diameter, in her left axilla, with central erythema (Shapiro, 2014). The patient is evaluated for Lyme Disease.

**Nursing Implications**

It is imperative for healthcare professionals to be aware of Lyme disease to start antibiotic treatment early and prevent late phase development. Lyme disease can be difficult to diagnose as the symptoms may often mimic other diseases. The healthcare professional should be mindful to ask the patient about possible exposure to ticks and wooded areas. High Lyme disease endemic areas are considered to be the northeastern part of the United States from Maine to Maryland, as well as Wisconsin and Michigan (Snow, 2013). Healthcare professionals in these areas should be aware of the increased incidence of Lyme disease. Patients with active lifestyles that enjoy camping, hiking, or any activities in wooded areas should be made aware of the risks of Lyme disease and the importance of checking for ticks. For the reason that the tick must be attached for greater than 36 hours to transmit *Borrelia burgdorferi*, the removal of ticks right away is of utmost importance (Muschert & Blommer, 2015).

**Case Study Significance**

The patient described in the case has a rash that is consistent with erythema migrans, 6 weeks after a tick was removed from the back of her knee. The patient should be recommended to start antibiotics (safe for pregnancy) prophylactically to treat Lyme disease. The patient should be given emotional support that early treatment leads to excellent outcomes, and that congenital Lyme disease has never been documented (Shapiro, 2014). Serological testing can also be done for diagnosis of disease.

**Signs and Symptoms**

There are three different phases of Lyme disease. The first phase, early localized, consists of a dermatologic involvement, such as erythema migrans rash. This rash is described as a "bull’s eye" rash. This is the most identifiable and earliest sign presenting days to weeks after the initial tick bite, but does not present in all cases. Other early symptoms may be flu-like, headache, fever, malaise, gastrointestinal, or a headache with recent tick exposure (Griuau, 2013). As the infection advances, especially if untreated, it affects the body systemically via the lymphatic system or blood. The later stages of Lyme disease are divided into early disseminated infection or late phase 1 (which affects cardiac [atrioventricular block], multiple erythema migrans lesions, muscularkeletal [arthritis, myalgia], and neurologic [lymphocytic meningoencephalitis, facial nerve palsy and encephalitis]. The late phase of Lyme disease includes arthritic and advanced neurologic symptoms with accompanying encephalomyelitis and peripheral neuropathy (Wright, Reidel, Taiwani & Gillik, 2012).

**Conclusion**

Lyme Disease is the most commonly reported vectorborne disease in the United States (Shapiro, 2014). It is important for healthcare workers to be aware of exposure risks and early diagnosis of Lyme disease for their patients. The nonspecific symptoms make the illness difficult to diagnose. The clinical manifestations of Lyme disease occur as a reaction to the host inflammatory response to the *Borrelia burgdorferi* pathogens. With early diagnosis and treatment, patient’s outcomes can be successful. Late diagnosis without treatment can lead to the later phases of the disease, which leads to much more severe and lifelong complications. Continuing research about Lyme Disease and the pathophysiological process of the late phases are continually being studied.

**References**


