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Lyme Disease

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Bode, Courtney, "Lyme Disease" (2017). *Nursing Student Class Projects (Formerly MSN)*. 220.
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Lyme Disease

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Introduction

- Lyme disease is a zoonotic infection transmitted by black-legged (deer) ticks. This disease is the most common vector-borne illness in the United States (Maloney, 2016). The tick transmits *Borrelia burgdorferi*, which is the bacterial agent of LD.
- The Center of Disease Control (CDC) suspects the disease is highly underreported in the United States (Clayton, Dunn, Jones, Jones, & Schaffner, 2015).
- Even with the disease being underreported, LD is the fifth most commonly reported nationally notifiable disease (Delorey, et al., 2015).
- Signs and symptoms of Lyme disease can vary greatly in severity. This disease often causes multisystemic illness, starting locally at the skin, and then the bacteria can spread to other body sites during the late stages of the disease (Maloney, 2016).

Every year there is always a battle with ticks for those people who live in wooded areas or people who enjoy outdoor activities. Also, although animals are not the same as humans, a local veterinary mentioned that there have been quite a few confirmed cases of Lyme disease for animals in the surrounding Columbus area. With that being said, learning about Lyme disease is important because as a future healthcare practitioner the community need to be aware of what the signs and symptoms of Lyme disease appear as and how to treat the disease.



This illustration shows the appearance of a deer tick.

(Adult deer tick, 2016)



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Underlying Pathophysiology

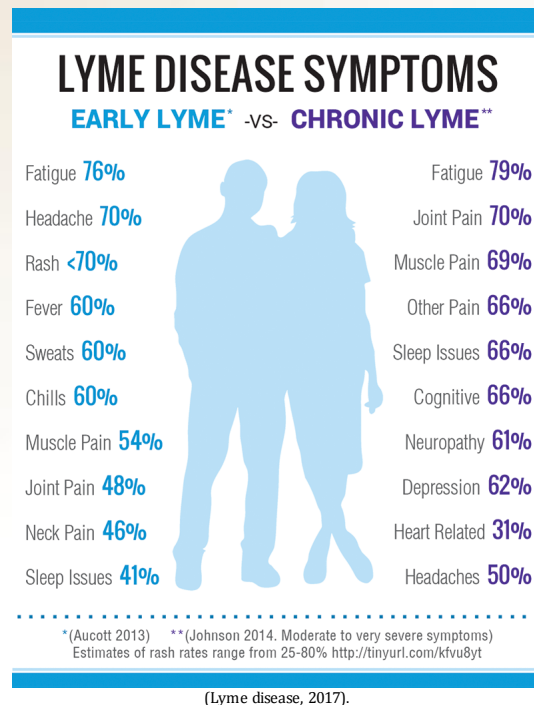
- Borrelia burgdorferi* is a diverse group of bacteria that is distributed worldwide, including 18 genospecies, with three that commonly infect humans (Chomel, 2015).
- LD is one of the major vector-borne zoonoses caused by spirochete bacteria and *Borrelia burgdorferi* is transmitted by a *Ixodes* tick bite (Chomel, 2015).
- Ticks transmit the bacteria by the tick eggs hatching as unaffected larvae, and feeding on an infected host. As the tick matures into a nymph, the bacteria remains in the gut until the next time the tick feeds, which triggers spirochete proliferation in the tick. The spirochete migrates to the tick's salivary glands and is then injected into the second host (human). This process involves spirochete proliferation, migration, and injection into the new host (Halperin, 2015).
- Usually the tick must be attached for 36 to 48 hours to transmit the bacteria (Eggers, 2016).
- Spirochete dissemination develop symptoms similar to bacteremia (Halperin, 2015).

Significance of Pathophysiology

- A "two-step" approach has been mainly used to diagnosis LD. "Both steps can be accomplished using the same blood sample. First, a quantitative screening is done using an enzyme immunoassay (EIA). Specimens that yield positive or equivocal results should then be tested by Western immunoblotting. Immunoblot should not be performed if the EIA test is negative or instead of an EIA. When testing to confirm early disease without EM, immunoglobulin (Ig) G and IgM assays should be performed. To confirm late disease, only IgG should be performed as false-positive results may occur with the IgM. A positive IgG immunoblot requires detection of antibody ("bands") to ≥5 kDa polypeptides while a positive IgM immunoblot requires detection of antibody to ≥2 kDa polypeptides. Results are considered positive if both the EIA and immunoblot are both positive." (Eggers, 2016).
- Antibodies against *Borrelia burgdorferi* are present in humans with late LD, but may not be developed in those people tested who have early LD (Eggers, 2016).
- The bacterial infection can cause additional manifestations including the nervous system, heart, or joints, with symptoms of fatigue, arthralgias, myalgias, headache, neck pain, paresthesia, and memory or concentration difficulties (Bittker et al., (2017).
- Males and females with confirmed LD have similar clinical features and outcomes (Visintainer, Weitzner, & Wormser, 2016).

Signs & Symptoms

- LD ranges in severity, including erythema migrans, arthritis, facial palsy, radiculoneuropathy, arrhythmia, and meningitis (Delorey, et al., 2015).
- Two to thirty days after the tick bite signs and symptoms begin. In the early stage of LD, the infection is localized to the skin. The *erythema migrans* rash is the hallmark sign during this stage (Maloney, 2016). The rash appears as a solid colored, oval shaped "bull's eye" pattern.
- Other early symptoms that may occur are fever, fatigue, headaches, and muscle or joint pain (Chomel, 2015).
- During the late stage of the disease, the infection involves several tissue types and body systems due to the bacterial dissemination, without antibiotic treatment (Maloney, 2016).
- Late stage symptoms that may occur several weeks or months later are neuroborreliosis, in the form of meningo-radiculitis, meningitis, or meningo-encephalitis, Lyme arthritis, and borrelial lymphocytoma. Months to years after LD infection acrodermatitis chronica atrophicans, chronic arthritis, encephalomyelitis and neuro-borreliosis can occur (Chomel, 2015).
- Symptoms that occur after appropriate treatment is referred to as post-treatment Lyme disease syndrome (PTLDS), which is a documented episode of early or late LD with post-treatment resolution of objective signs of LD, but continuation or subsequent onset of symptoms of fatigue, widespread musculoskeletal pain, and complaints of cognitive difficulties (Aucott, Bechtold, Crowder, Johnson-Greene, & Rebman, 2017).



This illustration shows the most frequently seen signs and symptoms of Lyme disease for early stages and late stages of the disease.

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Implications of Nursing Care

- Diagnosis of LD is based on *erythema migrans* with a history of tick bite, which can be supported by a serologic test (Cami, DeMaria, Goldmann, Mandl, & Tseng, 2015).
- Treatment of early and late LD involves a 10-to-21-day course of doxycycline or amoxicillin (Chomel, 2015).
- Symptoms that persist greater than six months have diagnostic and management controversy (Cami et al., 2015). Prolonged antibiotics are not recommended by the Infectious Disease Society of America for PTLDS.
- Preventative treatment should also be considered for asymptomatic individuals who have been bitten. "A single dose of doxycycline can be given when all of the following circumstances exist: (a) the attached tick can be reliably identified as an adult or nymphal tick that is estimated to have been attached for >36 hours on the basis of engorgement of the tick with blood or of certainty about the time of exposure to the tick; (b) prophylaxis can be started within 72 hours of the time that the tick was removed; (c) ecologic information indicates that the local rate of infection of these ticks with *B. burgdorferi* is >20%, and (d) doxycycline treatment is not contraindicated." (Eggers, 2015).
- Educate about minimizing exposure to ticks, such as covering up by wearing shoes and clothes that cover the body, avoiding walking through low bushes and long grass, using insect repellent, performing tick checks on yourself, and removing a tick as soon as possible (Eggers, 2016).

Conclusion

- LD is caused by a deer tick that transmits a bacterial infection called *Borrelia burgdorferi*.
- The most common symptoms of LD consist of *erythema migrans*, along with flu-like symptoms.
- Provide antibiotic treatment for those infected with LD.
- Sometimes, with and without treatment, PTLDS can occur, but early antibiotic treatment is encouraged.
- Continuous monitoring after a tick bite is necessary to monitor for late stages of LD.
- Minimize exposure to ticks!