WASHOE COUNTY HEALTH DISTRICT
ENHANCING QUALITY OF LIFE

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EPI-NEWS

Public Health

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TICKBORNE DISEASES: Lyme Disease

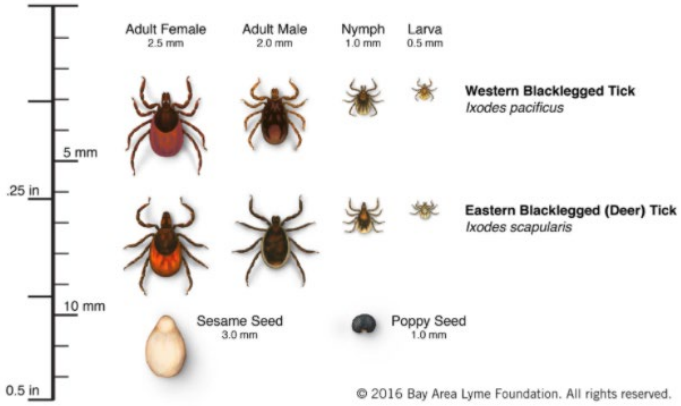
Introduction

This series of Epi News articles aims to bring awareness and education about tickborne diseases including identification, diagnosis, and treatment in human populations.

Epidemiology of Lyme Disease

Lyme disease is caused by the bacterium *Borrelia burgdorferi* and less commonly by *Borrelia mayonii. B. mayonii* is found only in the upper Midwest region of the United States.[i] Lyme disease can be transmitted to humans through the bite of an infected blacklegged tick [Figure 1]. The western blacklegged tick (*Ixodes pacificus*) spreads the disease on the Pacific Coast. In most cases the tick must be attached for 36 to 48 hours or longer before *Borrelia* bacterium can be transmitted. Lyme is usually transmitted by ticks in the nymph stage as they are smaller and more difficult to see, therefore are not removed in time to prevent transmission. Lyme disease is considered vector-borne and is not transmitted from person-to-person contact, fomites, or food/water.[ii]

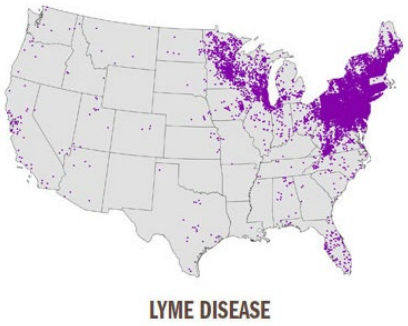
Figure 1: Blacklegged Tick Life Stages



Source: Bay Area Lyme Foundation. Accessed April 2021 https://www.bayarealyme.org/about-lyme/what-causes-lyme-disease/blacklegged-tick/

Each year approximately 30,000 cases of Lyme disease are reported to the Centers for Disease Control and Prevention (CDC), however, estimates suggest 476,000 people may be infected with Lyme disease each year in the United States. Nevada is categorized as a low incidence state with fewer than 10 probable cases reported in 2018.[iii] Nationally incidence rates are higher among males compared to females. Most cases in the U.S. occur in the Northeastern regions of the country [Figure 2].

Figure 2: Lyme Disease Cases Reported to CDC, 2018



Signs & Symptoms

Symptoms of Lyme disease may develop within 3 to 30 days after a tick bite and include: fever, chills, headache, fatigue, muscle and joint aches, and swollen lymph nodes.

Approximately 60% to 80% of infected persons will develop a skin rash called erythema migrans (EM), which expands gradually and may reach up to 12 inches or more in diameter. Secondary lesions may occur, and of note, EM does not always appear at the site of the initial tick bite. Images of EM rashes are available here: https://www.cdc.gov/lyme/signs_symptoms/rashes.html.

If left untreated, infection can spread to the joints, heart, and nervous system. Later signs and symptoms of Lyme disease includes severe headaches, neck stiffness, secondary EM lesions, facial palsy, and arthritic joint pain and swelling. Lyme can also cause intermittent pain in tendons, muscles, joints, and bones. Symptoms of the cardiac and nervous system may include heart palpitations or irregular heartbeat, dizziness or shortness of breath, inflammation of brain and/or spinal cord, nerve pain, and shooting pain, numbness or tingling in hands or feet.[iv]

Diagnosis & Testing

Serologic testing is the standard form of laboratory diagnostic for Lyme disease, although if a patient is experiencing central nervous system symptoms, then testing may be performed on cerebrospinal fluid (CSF). CDC recommends a two-step process for testing, both steps are required and can utilize the

same specimen. If the first step is negative, then no further testing is recommended. If the first step is positive or equivocal, then proceed to the second step. Overall results are considered positive when both the first and second steps are positive or equivocal. While not necessary, acute and convalescent titers may be helpful.

The most recent 2017 CDC case definition for Lyme disease still requires an enzyme immunoassay (EIA) or immunofluorescence assay (IFA) followed by a western immunoblot assay. In 2019, the CDC and Food and Drug Administration (FDA) updated the recommendation for the serologic diagnostic for Lyme disease to utilize a second EIA in place of a western blot as an acceptable alternative.[v]

For the purposes of surveillance, laboratory evidence includes[vi]:

- A positive culture for B. burgdorferi, **OR**
- A positive two-tier test. (A positive or equivocal enzyme immunoassay (EIA) or immunofluorescent assay (IFA) followed by a positive Immunoglobulin M[1] (IgM) or Immunoglobulin G[2] (IgG) western immunoblot (WB) for Lyme disease) **OR**
- A positive single-tier IgG[2] WB test for Lyme disease[3]

1 **IgM WB** is considered positive when at least two of the following three bands are present: 24 kilodalton (kDa), outer surface protein C (OspC)*, 39 kDa basic membrane protein A (BmpA), and 41 kDa (Fla). **Disregard IgM results for specimens collected >30 days after symptom onset.**

2 **IgG WB** is considered positive when at least five of the following 10 bands are present: 18 kDa, 24 kDa (OspC)*, 28 kDa, 30 kDa, 39 kDa (BmpA), 41 kDa flagellin (Fla), 45 kDa, 58 kDa (not GroEL), 66 kDa, and 93 kDa.

*Depending upon the assay, OspC could be indicated by a band of 21, 22, 23, 24 or 25 kDA.

3 While a single IgG WB is adequate for surveillance purposes, a two-tier test is still recommended for patient diagnosis.

Treatment

If diagnosed and treated appropriately in the early stages of Lyme disease, most people will recover rapidly and completely prevent late Lyme disease. Treatment depends on duration of infection and symptoms present; however, most cases can be resolved with a 2 to 4-week course of antibiotics. Treatment regimens for EM lesions include doxycycline, amoxicillin, or cefuroxime multiple times a day for 10 to 14 days, depending on the treatment regimen prescribed. The link below provides dosage and duration for both children and adults. Treatment recommendations for neurologic Lyme disease, Lyme carditis, and arthritis are available as well.

Lyme disease treatment
https://www.cdc.gov/lyme/treatment/index.html

Post-treatment Lyme disease syndrome may occur, and some people can experience pain, fatigue, or difficulty thinking for longer than 6 months after treatment.

Reporting

The list of reportable communicable diseases and reporting forms can be found at:
http://tinyurl.com/WashoeDiseaseReporting

Report all tickborne diseases to the Washoe County Health District. To report a communicable disease, please call 775-328-2447 or fax your report to the WCHD at 775-328-3764.

Acknowledgement

We are grateful to all health care providers, infection control practitioners, laboratory staff, as well as schools and daycares for their reporting and collaboration to make this work possible.

[i] Centers for Disease Control and Prevention. Lyme Disease. What you need to know about *Borrelia mayonii*. Accessed April 2021 https://www.cdc.gov/lyme/mayonii/index.html
[ii] Centers for Disease Control and Prevention. Lyme Disease. Transmission. Accessed April 2021 https://www.cdc.gov/lyme/transmission/index.html
[iii] Centers for Disease Control and Prevention. Lyme Disease Data Tables: Historical Data. Accessed April 20210 https://www.cdc.gov/lyme/stats/tables.html
[iv] Centers for Disease Control and Prevention. Lyme Disease. Signs and Symptoms of Untreated Lyme Disease. Accessed April 2021 https://www.cdc.gov/lyme/signs_symptoms/index.html
[v] Mead P, Petersen J, Hinckley A. Updated CDC Recommendation for Serologic Diagnosis of Lyme Disease. MMWR Morb Mortal Wkly Rep 2019; 68:703. DOI: http://dx.doi.org/10.15585/mmwr.mm6832a4
[vi] Centers for Disease Control and Prevention. National Notifiable Diseases Surveillance System (NNDSS). Lyme Disease (borrelia burgdorferi 2017 Case Definition. Accessed April 20210 https://wwwn.cdc.gov/nndss/conditions/lyme-disease/case-definition/2017/