

Lyme Disease

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| Signs and Symptoms | <ul style="list-style-type: none"> • Early localized Lyme disease: erythema migrans (EM) target-shaped rash, may have fatigue, chills and fever, headache, myalgia, arthralgia, and lymphadenopathy • Early disseminated Lyme disease: may be multiple EM lesions, lymphocytic meningitis, cranial neuropathy (e.g., facial palsy), peripheral radiculoneuritis, migratory joint and muscle pain, transient atrioventricular (AV) blocks • Late disease: arthritis usually of a few large joints, neurologic, or cardiac findings | |
| Incubation | Usually 7 to 14 days (range 3-32 days) for EM, days to weeks after EM for early disseminated Lyme disease, weeks to months for late disease | |
| Case classification (not used for clinical diagnosis) | <p>Clinical criteria: Systemic disease with various manifestations including dermatologic (physician-diagnosed) EM \geq 5 cm, rheumatologic, neurologic, and cardiac abnormalities; late disease: recurrent joint swelling or chronic arthritis, lymphocytic meningitis, cranial neuritis, particularly facial palsy (may be bilateral), radiculoneuropathy, encephalomyelitis, acute onset high-grade (2^o or 3^o) AV block lasting days to weeks</p> <p>Exposure: in potential tick habitat in high incidence (\geq10 confirmed cases/100,000) or low incidence (<10/100,000 confirmed cases, e.g., Washington)</p> <p>Laboratory: culture, two-tiered testing (EIA + Western blot), or IgG WB</p> | |
| | <p>Confirmed: case of EM with exposure in high incidence state; <u>or</u> EM with laboratory evidence; <u>or</u> late manifestation with laboratory evidence</p> | <p>Probable: any other physician-diagnosed Lyme disease with laboratory evidence of infection</p> <p>Suspect: EM with no known exposure and no laboratory evidence <u>or</u> laboratory evidence with no clinical information</p> |
| Differential diagnosis | Cellulitis, urticarial, rickettsiosis, local reaction to tick bite, viral rash illness, facial nerve palsy, viral meningitis, heart block, inflammatory arthritis, gout, neuropathy | |
| Treatment | See: https://www.cdc.gov/lyme/Treatment/index.html for appropriate antibiotics. Prophylactic antibiotics are appropriate only where infected tick prevalence is high. | |
| Duration | Erythema migrans lasts 3-4 weeks untreated, late manifestations may be permanent | |
| Exposure | Vector: <i>Ixodes pacificus</i> in Washington, other species elsewhere. All tick stages are potential vectors with most bites occurring May through August. Tick habitat includes wooded, brushy, or grassy areas. | |
| Laboratory testing | <p>Local Health Jurisdiction (LHJ) and Communicable Disease Epidemiology (CDE) can arrange testing at CDC if a person was likely exposed in Washington</p> <ul style="list-style-type: none"> • Best specimens: <u>acute and convalescent sera, skin biopsy in BSK culture medium (take before treatment)</u> • Keep human specimens cold, ship cold with Microbiology form http://www.doh.wa.gov/Portals/1/Documents/5230/302-013-Micro.pdf | |
| Public health actions | <p>LHJ can consult with CDE 877-539-4344 for testing</p> <ul style="list-style-type: none"> • Identify potential exposures • Notified CDE promptly for locally acquired cases (e.g., no out-of-state travel) • Educate about avoiding tick exposure • Recommend prompt tick removal, since 24 h attachment may be needed to transmit <p><i>Infection Control:</i> standard precautions, no person-to-person transmission</p> | |

Lyme Disease

1. DISEASE REPORTING

A. Purpose of Reporting and Surveillance

1. To determine the incidence of Lyme disease, the degree of endemicity, and potential risk of contracting Lyme disease in Washington State.
2. To identify endemic geographic areas within Washington State.
3. To educate people about how to reduce their risk of infection.

B. Legal Reporting Requirements

1. Health care providers: notifiable to local health jurisdiction within 3 business days.
2. Health care facilities: notifiable to local health jurisdiction within 3 business days.
3. Laboratories: *Borrelia burgdorferi* notifiable to local health jurisdiction within 2 business days; specimen submission is on request only.
4. Veterinarians: animal cases notifiable to Washington State Department of Agriculture on a monthly basis (see: <http://app.leg.wa.gov/WAC/default.aspx?cite=16-70>).
5. Local health jurisdictions: notifiable to the Washington State Department of Health (DOH) Communicable Disease Epidemiology (CDE) within 7 days of case investigation completion or summary information required within 21 days.

C. Local Health Jurisdiction Investigation Responsibilities

1. For cases exposed outside of endemic areas (especially those exposed in the Pacific Northwest), facilitate the transport of specimens to Public Health Laboratories for confirmatory testing. Call CDE to discuss appropriate specimens to collect.
2. Report all *confirmed*, *probable*, and *suspect* cases using the Lyme disease case report form (<http://www.doh.wa.gov/Portals/1/Documents/5100/210-036-ReportForm-Lyme.pdf>). Enter the data into the Public Health Issues Management System (PHIMS).

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Lyme disease is caused by the spirochete *Borrelia burgdorferi* sensu stricto.

B. Description of Illness

1. Early Localized Lyme Disease

The most common and distinctive feature of early Lyme disease is erythema migrans (EM), though it only occurs in 60%-80% of cases. Classic EM lesions have a “bull’s eye” (or target-shaped) appearance with partial central clearing, but may appear as a solid red rash with a vesicular center. The rash is of variable diameter, generally <5 cm to 30 cm. EM begins at the site of the tick bite, commonly the thigh, groin, or armpits. It may be warm, but is generally not painful. EM develops 3–32 days after the tick bite; lesions occurring within hours of a bite and disappearing within 24 hours are not caused by

Lyme disease. EM usually resolves spontaneously within 3–4 weeks, if untreated, and within one week if treated.

Early localized illness is usually marked by one or more non-specific signs and symptoms: fatigue, chills and fever, headache, myalgias, arthralgias, and lymphadenopathy.

2. Early Disseminated Lyme Disease

Lyme disease spirochetes disseminate from the site of the tick bite by cutaneous, lymphatic and blood borne routes. The signs of early disseminated infection usually occur days to weeks after the appearance of a solitary erythema migrans lesion. Early disseminated infection may manifest in many ways including multiple (secondary) EM lesions and disease of the nervous system, the musculoskeletal system, or the heart.

Early neurologic manifestations include lymphocytic meningitis, cranial neuropathy (especially facial palsy), and peripheral radiculoneuritis. Musculoskeletal manifestations may include migratory joint and muscle pains with or without objective signs of joint swelling. Cardiac manifestations are rare but may include transient atrioventricular blocks of varying degree.

3. Late Disease

B. burgdorferi infection in the untreated or inadequately treated patient may progress to late disseminated disease weeks to months after infection. The most common objective manifestation of late disseminated Lyme disease is intermittent swelling and pain of one or a few joints, usually large, weight-bearing joints such as the knee. Lyme disease is rarely, if ever, fatal.

C. Lyme Disease in Washington State and the United States

In recent years, 8 to 25 reports of Lyme disease meeting case definition are received annually. Almost all Washington cases are the result of tick exposure out of state; endemic Lyme disease is not common, with generally only 0 to 3 cases per year. The risk of infection in-state is low throughout the state. Between 1/2005 and 12/2016, only 13 *confirmed* Lyme cases with in-state exposure were documented.

Lyme disease has a wide distribution in northern temperate regions of the world. Lyme disease is the most commonly reported vector-borne disease in the United States with the reported incidence highest in the Northeast and upper Midwest states.

D. Vectors and Reservoirs

The vectors of Lyme disease are certain *Ixodes* species of ticks. In Washington State and the rest of the western U.S. coast, *I. pacificus* is the only recognized vector. Tick collection studies in Washington during the late 1990s and from 2010–2016 have found *I. pacificus* primarily west of the Cascade Mountains, but some have been found in the central counties on the eastern slopes of the Cascades. In 6 years of tick surveillance, only 19 of 1147 (1.7%) of *I. pacificus* tested in Washington were found to be positive for *B. burgdorferi*. These positive ticks were collected from Clallam, Mason, Yakima, and Klickitat counties. Tick collection has not yet occurred in all counties in Washington. In the rest of the U.S., *I. scapularis* is the major vector.

Important reservoirs in the western U.S. may include wood rats and other *Ixodes* species that do not themselves feed on humans. Deer and other rodents may be of less importance here than in the eastern U.S., although this is uncertain.

The usual two-year life cycle of the tick includes larval, nymphal, and adult stages. Larvae and nymphs typically become infected while feeding on small rodents and remain infected as they mature (transstadial transmission).

E. Modes of Transmission

Lyme disease is acquired by a tick bite. While all stages of *Ixodes* ticks can feed on humans, nymphs are probably the most important source of human infections. In North America, most infections are acquired between May and August, when *Ixodes* nymphs are most active. Transmission of *B. burgdorferi* is directly correlated with duration of tick attachment. Studies suggest that attachment for at least 24 to 48 hours is required for spirochete transmission to occur. Thus, prompt removal of ticks can prevent transmission. *Ixodes* tick bites are generally painless and many Lyme disease patients have no recollection of a tick bite, so the absence of a tick bite history is not inconsistent with a diagnosis of Lyme disease.

F. Incubation Period

Typically 7 to 14 days (range: 3 to 32 days).

G. Period of Communicability

There is no evidence of person-to-person transmission.

H. Treatment

For specific antibiotic regimens for treatment of all stages of Lyme disease, refer to: <http://www.cdc.gov/lyme/Treatment/index.html>.

Patients should be observed at the start of antibiotic therapy for a Jarisch-Herxheimer-like reaction which occurs in ~15% of patients with disseminated infection.

Prophylaxis is not recommended for asymptomatic persons with histories of tick bites. It may be appropriate when infected tick prevalence is high, the tick on a person can be reliably identified as a vector species, and the tick has been attached for more than 24 hours. See the IDSA guidelines for current recommendations (See: Clin Infect Dis. 2006; 43(9):1089-1134. Available at: <http://cid.oxfordjournals.org/content/43/9/1089.full>).

3. CASE DEFINITION

This surveillance case definition was developed for national reporting of Lyme disease; it is not intended to be used in clinical diagnosis. It may be appropriate to treat a patient for Lyme disease who does not meet the surveillance case definition.

A. Clinical Criteria for Diagnosis

A systemic, tick-borne disease with protean manifestations, including dermatologic, rheumatologic, neurologic, and cardiac abnormalities. The most common clinical marker for the disease is erythema migrans (EM), which occurs in 60%-80% of patients.

For purposes of surveillance, EM is defined as a skin lesion that typically begins as a red macule or papule and expands over a period of days to weeks to form a large round

lesion, often with partial central clearing. A single primary lesion must reach greater than or equal to 5 cm in size across its largest diameter. Secondary lesions also may occur. Annular erythematous lesions occurring within several hours of a tick bite represent hypersensitivity reactions and do not qualify as EM. For most patients, the expanding EM lesion is accompanied by other acute symptoms, particularly fatigue, fever, headache, mildly stiff neck, arthralgia, or myalgia. These symptoms are typically intermittent. The diagnosis of EM must be made by a physician. Laboratory confirmation is recommended for persons with no known exposure.

For purposes of surveillance, late manifestations include any of the following when an alternate explanation is not found:

- *Musculoskeletal system.* Recurrent, brief attacks (weeks or months) of objective joint swelling in one or a few joints, sometimes followed by chronic arthritis in one or a few joints. Manifestations not considered as criteria for diagnosis include: chronic progressive arthritis not preceded by brief attacks and chronic symmetrical polyarthritis. Additionally, arthralgia, myalgia, or fibromyalgia syndromes alone are not criteria for musculoskeletal involvement.
- *Nervous system.* Any of the following that cannot be explained by another etiology, alone or in combination: lymphocytic meningitis, cranial neuritis, particularly facial palsy (may be bilateral), radiculo-neuropathy, or encephalomyelitis. Headache, fatigue, paresthesia, or mildly stiff neck alone, are not criteria for neurologic involvement.
- *Cardiovascular system.* Acute onset of high-grade (2nd-degree or 3rd-degree) atrioventricular conduction defects that resolve in days to weeks and are sometimes associated with myocarditis. Palpitations, bradycardia, bundle branch block, or myocarditis alone are not criteria for cardiovascular involvement.

B. Laboratory Criteria for Diagnosis

For the purposes of surveillance, laboratory evidence includes:

1. A positive culture for *B. burgdorferi*; *OR*
2. Two-tier testing interpreted using established criteria*, where:
 - a. Positive IgM is sufficient only when ≤ 30 days from symptom onset, or
 - b. Positive IgG is sufficient at any point during illness; *OR*
3. Single-tier IgG immunoblot seropositivity interpreted using established criteria*; *OR*

* Two-tier testing refers to a two-step process in which a positive or equivocal result from an EIA (or IFA) is followed by a positive Western blot (WB),

<http://www.cdc.gov/lyme/diagnostesting/LabTest/TwoStep/index.html>). IgM WB is considered positive when at least two of the following three bands are present: 24 kDa (OspC*), 39 kDa (BmpA), and 41 kDa (Fla). Disregard IgM results for specimens collected >30 days after symptom onset.

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

*OspC can also be indicated by a band of 21, 22, 23, or 25 kDa, depending on the assay.

C. Exposure

Exposure is defined as having been (less than or equal to 30 days before onset of EM) in wooded, brushy, or grassy areas (i.e., potential tick habitats) of Lyme disease vectors. Since infected ticks are not uniformly distributed, a detailed travel history to verify whether exposure occurred in a high or low incidence state is needed. An exposure in a high incidence state is defined as exposure in a state with an average Lyme disease incidence of at least 10 confirmed cases/100,000 people for the previous three reporting years. A low incidence state is defined as a state with a disease incidence of <10 confirmed cases/100,000. The 3-year average incidence of Lyme disease in Washington is 0.02 cases/100,000; Washington is therefore a low incidence state. A history of tick bite is not required.

E. Case Definition (2017)

Lyme disease reports will not be considered cases if the medical provider specifically states it is not a case of Lyme disease or if the only symptom listed is “tick/insect bite.”

Confirmed:

- a) a case of EM with a known exposure in a high incidence state (as defined above); OR
- b) a case of EM with laboratory evidence of infection and a known exposure in a low incidence state (as defined above, includes Washington); OR
- c) any case with at least one late manifestation that has laboratory evidence of infection.

Probable: any other case of physician-diagnosed Lyme disease that has laboratory evidence of infection (as defined above).

Suspect:

- a) a case of EM where there is no known exposure (as defined above) and no laboratory evidence of infection (as defined above); OR
- b) a case with laboratory evidence of infection but no clinical information available (e.g., a laboratory report).

Note that suspect cases are not officially counted in the DOH Communicable Disease Annual Report or the MMWR; however the case reports are reviewed and submitted to CDC.

4. DIAGNOSIS AND LABORATORY SERVICES

A. Diagnosis

The diagnosis of early Lyme disease is based primarily on clinical findings since serologic testing is insensitive during the first few weeks after onset. In later stages, the diagnosis is commonly based on clinical findings with support from serologic tests.

1. Serology: Serologic tests from some commercial labs have been found to be unreliable.* Serology from patients who were likely exposed in Washington should be confirmed through CDC. When serologic testing is indicated, CDC recommends testing initially with an enzyme immunoassay (EIA) or an immunofluorescent assay (IFA), followed by the more specific Western immunoblot (WB) assay to corroborate equivocal or positive

results obtained with the first test. This is considered “two-tiered” testing. Although antibiotic treatment in early localized disease may blunt the antibody response, patients with early disseminated or late-stage disease usually have strong immunoglobulin G (IgG) serological reactivity. Antibodies often persist for months or years following successfully treated or untreated infection. Thus, sero-reactivity alone cannot be used as a marker of active disease.

* CDC. Notice to Readers: Caution Regarding Testing for Lyme Disease. MMWR 2005; 54(05):125. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/mm5405a6.htm. Also see cautionary notice from CDC regarding other laboratory assays: <http://www.cdc.gov/lyme/diagnostesting/LabTest/OtherLab/index.html>.

2. **Tick identification:** Identifying the species of tick removed from a patient may help to determine which pathogens should be considered if the person becomes ill. However, identification of a vector species neither guarantees nor rules out the possibility a person will develop Lyme or any other tickborne disease (see below). Clinical decisions to test and treat should be based on the patient’s symptoms rather than the tick identified.
3. **Tick testing:** In general, testing of ticks is not useful for individual health and diagnostic purposes because: (a) negative results cannot rule out exposure to *B. burgdorferi* since the person may have been unknowingly bitten by different undetected ticks that could have transmitted the agent; and (b) even if the tick tests positive, the agent may not have been transmitted to the host (it usually takes at least 24 hours of attachment). Moreover, the tick could be infected with other agents of tickborne disease so the patient could still become ill. Thus ticks are not routinely tested in Washington through the public health system. Clinicians are encouraged to make treatment decisions based on the patient’s clinical presentation, not positive or negative results from the tick. If a provider wants to test a tick, some commercial laboratories provide fee-based testing for *B. burgdorferi* by DFA, IFA, or PCR. Ticks need to be submitted alive for DFA or IFA but can be dead for PCR.

B. Services Available at the Washington State Public Health Laboratories (PHL)

PHL does not perform serologic testing for Lyme disease but will forward serum or CSF (for serology) or skin biopsies (for culture) to the CDC for testing for any case upon request. PHL requires approval from the local health jurisdiction and the DOH Office of Communicable Disease Epidemiology.

Note that PHL require all clinical specimens have two patient identifiers, a name **and** a second identifier (e.g., date of birth) both on the specimen label and on the submission form. Due to laboratory accreditation standards, specimens will be rejected for testing if not properly identified. Also include specimen source and collection date.

Neither PHL nor CDC routinely test ticks for agents of disease (bacteria, viruses). However, PHL provide year-round identification services; the tick genus and species will be reported. During 2010-2016, an ongoing grant-funded project is supporting pathogen testing of ticks collected in Washington State. Ticks must be submitted to PHL by a healthcare provider or on behalf of the local health jurisdiction (LHJ) investigating a human case of Lyme or other tickborne disease. Travel history must be obtained to verify that the likely exposure location was in-state. Pathogen test results are not timely.

C. Specimen Collection

Serologic tests: For antibody testing, 1–2 mL of serum or CSF is needed. Ideally, acute sera should be collected at least 2 weeks after onset; the convalescent should be obtained 2–4 weeks later. Place labeled tubes in individual self-sealing plastic bags. Use sufficient absorbent material to secure contents and contain any leakage. If the specimen is refrigerated, then ship cold with regular ice packs. If the specimen is already frozen, keep frozen during shipping using dry ice. Submit with a completed PHL Serology form (<http://www.doh.wa.gov/Portals/1/Documents/5230/302-017-SerVirHIV.pdf>).

Culture: For culture, place skin biopsy (2-mm punch biopsy) directly into BSK culture medium, and ship cold (not frozen). Skin biopsies should be taken prior to treatment because the recovery rate decreases substantially after only one day of antibiotic therapy. Submit with a completed PHL Microbiology form (<http://www.doh.wa.gov/Portals/1/Documents/5230/302-013-Micro.pdf>).

Tick submission: A health care provider or LHJ can request tick identification when a tick is removed from a person. The tick should be removed properly to ensure the mouthparts remain intact, as they are important for identification. Guidelines on tick removal are available at: www.cdc.gov/ticks/removing_a_tick.html. Ticks can be submitted alive or dead. They should be placed in a sealed unbreakable container, e.g. urine cup, and submitted with a completed PHL Microbiology form (<http://www.doh.wa.gov/Portals/1/Documents/5230/302-013-Micro.pdf>). Check “parasitology” and document the geographic location the tick was acquired in the Comments section.

5. ROUTINE CASE INVESTIGATION

Interview the case and others who might provide pertinent information.

A. Evaluate the Diagnosis

Using the case report form, itemize patient-reported symptoms, documented clinical findings, and lab results. Obtain copies of lab reports that support the diagnosis and medical reports from the provider. **It is important to consult the medical records or the provider in evaluating Lyme disease reports, as many of the clinical findings required by case definition must be objectively verified by a provider,** not subjectively reported by the patient. It is also important to establish whether the provider diagnosed Lyme disease, or specifically stated that the illness is not Lyme disease; the latter means the patient will not be considered a case. CAUTION: Tick testing results should not be considered as part of the patient diagnosis (see Section 4-A above).

For cases exposed outside of highly endemic areas (especially those exposed in the Pacific Northwest), call Communicable Disease Epidemiology (206-418-5500) to arrange for confirmatory laboratory testing offered through the PHL.

B. Manage the Case

Hospitalized patients should be cared for using standard precautions. There is no need for patient isolation or work/day care restrictions.

Educate patients/others about avoiding exposure to ticks in the future.

C. Identify Potential Sources of Infection

Ask about tick exposure, including known tick bites and likely duration of tick attachment. If no tick bite is recalled, inquire about outdoor activities, particularly time spent in potential hard tick habitats (e.g., woods, tall grasses, etc). Document the likely exposure location in the case report in the PHIMS case report. If the presumed exposure occurred in the Pacific Northwest, get a detailed description of the geographic area where the exposure likely occurred, including street address or trail head location. For example, “case was hiking on XYZ trail at Mount X National Park.”

D. Identify Potentially Exposed Persons

Identify and interview persons who participated with the case in any of the activities above to determine if they have similar illness.

E. Management of Other Exposed Persons

Educate others potentially exposed about Lyme disease symptoms to facilitate early diagnosis. Refer symptomatic persons to healthcare providers. Prophylactic antibiotics are not recommended for asymptomatic persons with a history of a tick bite.

F. Environmental Evaluation/Measures

Notify local environmental health program and/or vector control of locally acquired cases. CDE will notify the DOH Environmental Health Zoonotic Disease program, which may be able to perform or help facilitate an environmental assessment and tick drag in the area of likely exposure.

6. ROUTINE PREVENTION

A. Immunization Recommendations

A Lyme disease vaccine is not currently available.

B. Prevention Recommendations

When spending time outdoors in risk areas, persons should:

1. Wear long pants and a long-sleeved shirt. Tuck pant legs into socks or boots and shirt into pants to help keep ticks on the outside of clothing where they can be more easily spotted and removed.
2. Wear light colored, tightly woven clothing which will allow the dark tick to be seen more easily. The tight weave makes it harder for the tick to attach itself.
3. Use tick repellent on exposed skin and clothing. Products containing DEET or permethrin are very effective. Carefully follow instructions on the label. Take special care when using repellents on children.
4. Tumble clothes in a dryer on high heat for 10 minutes to kill ticks on dry clothing after you come indoors.
5. Check yourself, your children, pets, and gear thoroughly for ticks. Carefully inspect areas around the head, neck and ears. If you find a tick attached to your skin, promptly remove it. Grasp the tick using tweezers as close to the skin as possible. With a steady motion, pull the tick straight out. Wash your hands and apply antiseptic to the bite. Do not crush

ticks; this could result in direct inoculation of spirochetes. For more information about removing a tick, visit: http://www.cdc.gov/ticks/removing_a_tick.html.

6. Monitor the bite and be alert for early symptoms of tick-borne disease, e.g. fever or rash over the next month or so. If symptoms develop, contact your health care provider.

ACKNOWLEDGEMENTS

This document is a revision of the Washington State Guidelines for Notifiable Condition Reporting and Surveillance published in 2002 which were originally based on the Control of Communicable Diseases Manual (CCDM), 17th Edition; James Chin, Ed. APHA 2000. We would like to acknowledge the Oregon Department of Human Services for developing the format and select content of this document.

UPDATES

January 2008: Section 3 was revised to reflect the 2008 CSTE case definition changes.

January 2011: The Legal Reporting Requirements section has been revised to reflect the 2011 Notifiable Conditions Rule revision. Epidemiology in Washington and clinical description were updated (Section 2). The laboratory assays were updated to reflect 2011 CSTE/CDC case definition changes (Section 3). Specimen collection details and submission form links were updated (Section 4). Additional guidance on evaluating the diagnosis, determining the likely exposure, and environmental follow up were provided (Section 5).

September 2014: New tick surveillance findings were added (Section 2D). A new reference was added for 2-tier test interpretation (Section 3B) and specimen submission guidance was updated (Section 4). The Routine Case Investigation and Controlling Further Spread sections were combined (Section 5).

December 2016: Section 2 was updated to reflect current trends and findings in Washington. The clinical, laboratory, and exposure criteria were updated to reflect changes to the 2017 CSTE case definition (See section 3). Front page was added.