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Diagnosing Lyme Disease

You have asked...

>How do I determine if a dog really has Lyme disease?



The expert says...

Lyme disease is caused by infection with *Borrelia burgdorferi*, which is transmitted by *Ixodes* ticks.¹ In the United States, most cases in humans and animals occur in the northeast, upper Midwest, and parts of the west coast.² Common clinical signs include lethargy, fever, lameness, joint swelling, and regional lymph node enlargement.¹ The incubation period (time between exposure and onset of lameness) has been 2 to 5 months in experimentally infected dogs. However, exposure to *B burgdorferi* does not always lead to clinical Lyme disease. Dogs may experience a self-limiting subclinical infection.¹



Diagnostic Tests

Diagnostic tests for Lyme disease either detect antibodies produced by the immune system (ELISA, IFA, Western blot) or the presence of *Borrelia* organisms (culture, PCR, histopathology).³ Anti-*Borrelia* antibodies have been measurable 3 to 12 weeks after experimental exposure.¹

Lyme disease vaccination also stimulates antibody production, and routine ELISA and IFA cannot distinguish between infection and previous vaccination. However, an ELISA for C₆ antibodies has been shown to be specific for *Borrelia* natural exposure rather than vaccination (SNAP 3Dx, SNAP 4Dx, Lyme Quant C₆ Test; idexx.com).⁴ The in-clinic qualitative tests (SNAP 3Dx or 4Dx) are available for routine screening of healthy dogs and for those showing clinical signs.

Clinical Diagnosis

Clinical Signs

The clinical diagnosis of Lyme disease in dogs is based on a history of exposure to ticks, clinical signs (fever, painful swollen joints), a positive antibody test result, and rapid improvement with antibiotic treatment. While a negative result on ELISA or other serologic tests does not completely rule out Lyme disease, it is rare for clinical signs to occur before antibody production.¹

Further Diagnostics

Further workup is recommended to rule other diagnoses in or out. Laboratory analysis, including serum biochemical profile, and urinalysis; radiography of affected joints; and joint taps for analysis and culture are useful. Common differential diagnoses include degenerative joint disease, infectious arthritis (eg, bacterial, rickettsial), immune-mediated arthropathy, and trauma.⁵

An association between Lyme disease and renal failure (Lyme nephritis) has been reported.⁶ Affected dogs typically have proteinuria along with other signs of renal disease (anorexia, vomiting, azotemia). Therefore, in dogs with evidence of Lyme disease, some clinicians recommend screening for proteinuria with a urine protein:creatinine ratio.⁵

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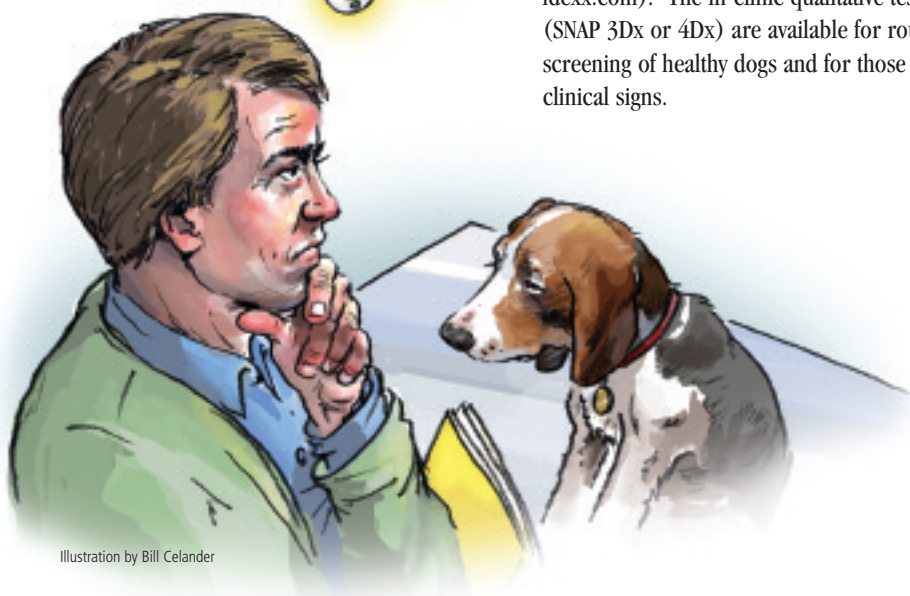


Illustration by Bill Celandier

CBC = complete blood count; ELISA = enzyme-linked immunosorbent assay; IFA = immunofluorescent assay; PCR = polymerase chain reaction

If You're Not Sure...

The interpretation of diagnostic tests for Lyme disease is more difficult in dogs that lack a typical history or clinical presentation. Healthy dogs or those with vague signs such as lethargy can test positive for exposure to *Borrelia* without actually having Lyme disease.⁵ Previous vaccination with any of the licensed Lyme disease products results in antibodies that can cause false-positive results on routine ELISA and IFA (except C₆ testing, as noted earlier).⁴

History & Physical Examination

A positive result on an antibody test (in-clinic or reference laboratory) in a healthy dog without clinical signs indicates only that a tick bite occurred at some point in the past. The patient's history should be reviewed to identify any exposure to ticks or clinical signs of Lyme disease. The physical examination can be repeated, with special attention to palpating lymph nodes and joints for evidence of swelling or discomfort. If no abnormalities are found, it is unlikely that the dog has active Lyme disease, and treatment is not automatically necessary.⁵

Laboratory Analysis

Additional diagnostic tests may be offered, especially to screen for evidence of other tick-borne diseases. A CBC is useful to check for anemia or thrombocytopenia, which are not seen with Lyme disease but may result from rickettsial infection. Due to concerns about Lyme nephritis, screening for proteinuria has been suggested in all dogs testing positive.⁵ However, proteinuria is a nonspecific finding that occurs with many disorders. Studies reported to date have not found a correlation between proteinuria and positive result on ELISA for *Borrelia* exposure.^{7,8}

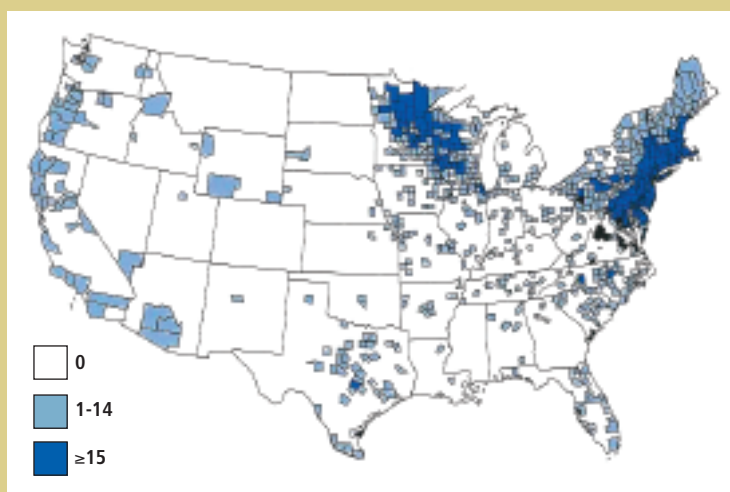
Culture & PCR

Diagnostic tests are available to directly identify *Borrelia* organisms in body fluids and tissues.³ Bacterial culture or PCR may be performed on blood samples or affected tissues. Because the organisms are typically found only in skin (site of tick bite) and joints, obtaining diagnostic specimens is difficult. Joint taps may yield syn-

Incidence & Prevalence

In the U.S., cases in dogs follow the same distribution as human cases with the vast majority occurring in the northeast, upper Midwest, and the far West. However, cases may be seen in any region due to travel. Up to 90% of dogs in endemic areas may be exposed to *B burgdorferi*.

For further information on diagnosis and treatment, check out Dr. Datz's article—*Lyme Disease in Dogs*—that appeared in the May 2007 issue. The article is archived on cliniciansbrief.com and can be found by clicking on the Library tab on the homepage.



Geographic distribution of Lyme disease in humans (2004)

ovial fluid that can be analyzed, evaluated for cytology, and cultured for bacteria. Histopathology has been used to diagnose Lyme nephritis, although actual *Borrelia* organisms have not been found in renal tissue.⁹

Measuring Antibodies

One test provides a numeric measurement of antibodies to *B burgdorferi* (Lyme Quant C₆ Test). However, in the absence of clinical signs, the antibody titer cannot be used to definitively diagnose Lyme disease. Dogs may have positive titers on both quantitative and qualitative antibody tests after exposure, infection, or treatment.⁵

Treatment & Follow-Up

Typical Treatment

If a dog has Lyme disease, treatment usually resolves clinical signs. The recommended antibiotics (doxycycline or amoxicillin) are given for 4 weeks, even though fever, lethargy, and lameness typically resolve within a few

days.^{1,5} However, treatment does not reliably eliminate all *Borrelia* organisms. Persistence of infection has been demonstrated, and antibody production may continue despite antibiotics.¹⁰⁻¹²

Follow-Up Testing

Because positive antibody titers are observed in dogs for weeks to months after exposure, qualitative and quantitative serologic tests may not accurately reflect infection or disease status.⁵ Hence, if antibody tests alone are used as an endpoint for therapy, some dogs would have to take daily antibiotics for months to years before test results turn negative.

Treatment generally reduces the Quant C₆ titer over time, but some dogs maintain high levels even if given antibiotics.¹³ Experimental and clinical studies suggest that antibody levels decrease within 3 to 6 months with treatment but may persist for longer than 1 year.¹⁰⁻¹³

Not for All Dogs

Clinicians may feel pressure to prescribe antibiotics to all dogs testing positive for *Borrelia* antibodies, even when there are no historical or clinical signs indicating Lyme disease. However, published evidence to date has not found any clinical benefit in treating healthy dogs without clinical signs. Follow-up tests after treatment will most likely remain positive, prompting another course of treatment.

Lyme Nephritis

It is unknown how antibiotic treatment influences the clinical course of renal disease associated with *B burgdorferi* infection. Immune complexes that may be involved in the pathogenesis of Lyme nephritis have been shown to decrease with antibiotic treatment.¹⁴

Best Approach

To summarize, dogs testing positive for Lyme disease should be managed differently depend-

ing on whether the history, physical examination, and ancillary diagnostic tests suggest active infection.

Clinically affected dogs should be treated and monitored for resolution of signs. Dogs with no current clinical signs should be carefully observed over the next 6 months. Additional diagnostic tests, such as urinalysis or assays for proteinuria, may be performed. If evidence of Lyme disease is found, then further diagnostics and treatment should be considered.

In either situation, clients should be educated that tick control is important for reducing the risk for Lyme disease and other tick-borne infections. ■

See Aids & Resources, back page, for references, contacts, and appendices.

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practice hotline

NEW PRODUCTS & UPDATES

Weight-Loss Challenge for Pets

Nestlé Purina PetCare (purina.com) has launched the 2009 OM

Weight-Loss Challenge—a program designed to facilitate responsible,

lasting weight loss in dogs and cats. Pets losing at least 5% of their starting body weight between June 1 and November 30, 2009, help their veterinary clinics qualify to win prizes. For more information, visit

purinavets.com/challenge.—Press release 5/2009



Animal Welfare Council Formed

The University of California has established the UC Animal Welfare Advisory Council to review issues of animal welfare related to animal agriculture and promote the development of recommendations to improve welfare of livestock and poultry. The council is composed of veterinarians, animal science professionals, and other experts; the first meeting was held May 4. For further information, contact Pam Kan-Rice, 510-987-0043 or pamela.kan-rice@ucop.edu.