Acute Lyme Arthritis

The young adult dog in exam 2 has an acute onset of left front leg lameness, swelling of the carpis, a temperature of 103.9°F, swollen left prescapular lymph node, is clinically depressed and refused to eat this morning. He is a recently adopted stray with no vaccine history. The owners reported that he was covered with ticks when they found him. After completing your physical examination you suggested differential diagnoses and placed canine Lyme arthritis high on your list. The dog’s owners readily agree to run an Abaxis lateral flow Lyme test for a quick determination of his infection status with *Borrelia burgdorferi*, the causative agent of canine Lyme disease.

The diagnosis of canine Lyme arthritis is a clinical process based on identification of appropriate clinical signs, rule-out of alternate diagnoses, epidemiologic data supporting exposure to infected vector ticks, an appropriate response to antibiotic therapy known to be effective in treating infection with the etiologic agent and confirmation of infection with *B. burgdorferi*. The availability of a patient-side assay like the Abaxis lateral flow Lyme test makes the completion of the diagnostic paradigm fast and inexpensive and allows immediate initiation of appropriate antibiotic therapy.

You have a high degree of clinical suspicion of a diagnosis of canine Lyme arthritis. You discuss tick exposure and explain that *Ixodes scapularis*, the vector of *B. burgdorferi* is commonly referred to as the deer tick and while many people think it is very small, the adult tick likes to parasitize dogs and blood fed females can be large enough to see very easily. As you are watching the Lyme test flow across the kit, you discuss antibiotic therapy and that a rapid response to treatment will essentially confirm your clinical diagnosis. Knowing that most tick-borne diseases of
dogs respond to doxycycline, you are mentally multiplying the dog’s weight in pounds by 4 to get an effective dose that will be unlikely to upset his stomach when given with food. As fast as you can come up with the answer, you have a positive test result and the nagging suspicion that there is something your office manager said about trouble ordering doxy. A quick trip to the pharmacy shelf and a stop at the office manager’s desk confirms it, doxy is back ordered and when it comes back in stock it is going to cost a lot more than it used to. Now what?

The good news is that *B. burgdorferi* is responsive to therapy with antibiotics (see table 1) other than tetracyclines (doxycycline, tetracycline, minocycline)\(^1,2\). In fact, in acutely ill dogs with severe Lyme arthritis there is often marked anorexia making administration of oral doxycycline contraindicated due to its tendency to induce gastric irritation, vomiting, and worsening anorexia. Therapy for dogs with clinical episodes of Lyme arthritis should be initiated with an injection of penicillin and then followed by 14 days of oral amoxicillin\(^3,4,5\). Dogs with episodes of Lyme arthritis should be observed for clinical response. Most dogs will show improvement within 24 to 72 hours. Dogs with worsening signs should be reexamined and alternative diagnoses and further testing should be considered. Dogs with satisfactory response should be returned for a recheck on the last day (day 14) of the oral antibiotic therapy. If they are clinically normal, they should continue antibiotic therapy for a second 14 day period and I suggest that a Lyme disease vaccine series with a multiantigen whole-cell vaccine be started within 24 to 72 hours. Dogs with worsening signs should be reexamined and alternative diagnoses and further testing should be considered. Dogs with satisfactory response should be returned for a recheck on the last day (day 14) of the oral antibiotic therapy. If they are clinically normal, they should continue antibiotic therapy for a second 14 day period and I suggest that a Lyme disease vaccine series with a multiantigen whole-cell vaccine be started with the first dose on the day of recheck (day 14) and the second dose on the last day (day 28) of antibiotic therapy.

Table 1

<table>
<thead>
<tr>
<th>Alternative Antimicrobials to Treat <em>Borrelia Burgdorferi</em> in Dogs</th>
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<tr>
<td><strong>For anorexic dogs, to start therapy prior to oral medication:</strong></td>
</tr>
<tr>
<td><strong>Penicillin</strong></td>
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<tr>
<td><strong>Amoxicillin</strong></td>
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<td><strong>Amoxicillin Clavuronate</strong></td>
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*The above may cause diarrhea. I recommend that they be given with food and a probiotic. While there is controversy about efficacy of various probiotics I have had success with nonfat yogurt with active cultures and am sure to warn clients never to give any product with artificial sweeteners.*

**Asymptomatic Lyme Positive Dogs**

If you are in a practice area where *B. burgdorferi* is expanding but you have not yet begun to appreciate its impact on your patient population, now is the perfect time to start a serosurvey of your canine population. Annual wellness visits are a great time to link disease prevention through vaccination and tick-control to detection of emerging risk of infection with a broad based serosurveillance program based on testing. The Abaxis lateral flow Lyme test is the ideal rapid test to inexpensively survey a large patient population in an area of Lyme emergence. It can be added to the annual wellness visit for a very reasonable fee and it is both supported by and supports the discussion of proper ectoparasite control using veterinarian dispensed acaracidal products. A negative test gives you a chance to praise an owner for a job well done, to issue a cautionary statement based on the results from other dogs from the same neighborhood, and the opportunity to support a continued trend of tick control through your education and dispensing of tick control products. It is also the ideal time to begin a discussion of infection prevention through immunization.

Every positive test should be marked on a map mounted on the wall of your waiting room with a red push pin. This will get pet owners talking about Lyme risk and promotes testing, immunization, and tick control. On an individual patient basis, a positive test should trigger a discussion of the dog’s history of tick exposure, tick control, behavior, episodes of lameness or illness and current health. I recommend that all asymptomatic, Lyme positive dogs be placed on my Test, Treat, and Vaccinate Protocol (TTV Protocol). (See side bar.) An interesting finding in my own patients and reported to me by dozens of colleagues I have met during speaking engagements is that when we treat and vaccinate an “asymptomatic” Lyme positive dog in a protocol calling for 28 days of antibiotic therapy and multiantigen immunization on treatment day 1 and 2 weeks later, owners often report that by the day of the second vaccination dogs they thought were just acting old are now acting young again. This raises the question of signs of chronic Lyme arthritis being interpreted as aging changes or degenerative joint disease.

**What does a quantitative Lyme test tell us?**

A quantitative Lyme test measures the quantity of an antibody that is specific for infection with *B. burgdorferi*. This antibody is not cross reactive with antibody produced by vaccination. It is produced when the organism infects the spleen of an immunologically competent dog and takes from 3 to 6 weeks to develop. The quantity of this antibody is an indirect indicator of the degree of spirochetal load in the infected dog. High spirochetal burden leads
to high quantitative antibody titer\(^6\). Successful treatment with antibiotics leads to decreased titers 6 months post-therapy\(^5,6\).

Quantitative testing may be used as a measure of success of antibiotic therapy in asymptomatic dogs but if the dogs are not immunized as part of the immediate response to a positive test, then the follow-up titer may reflect either a failure of therapy, a recrudescence of the initial infection, or an infection from a new tick bite. In clinically ill dogs, the dog’s response to therapy is the most important indicator of therapeutic success and will be noted within hours to days of the initiation of therapy while the decrease in the quantitative antibody titer may not be noted for a many months.

If you are unsure if you will want to follow asymptomatic or clinically ill dogs with Abaxis quantitative titters but want to be sure you have a baseline pretreatment value, you may harvest serum on the day of diagnosis and freeze it in a plastic sample tube. This sample may be submitted with a post-treatment sample for a comparative level when evaluating titers in dogs who have not responded as expected to therapy, have had relapses in signs in spite of therapy and immunization or have been treated and immunized as asymptomatic positive individuals and then developed clinical Lyme arthritis signs at a later time. Comparing the Abaxis Lyme quantitative antibody levels at the 2 time points may give valuable insight to the cause of the current clinical episode.

Temporary or extended shortages of various drugs, especially antimicrobials make clinical practice challenging. Now is the time to save your doxycycline for those tick-borne diseases that are not responsive to other antibiotics. Luckily there are alternative choices for treating both asymptomatic *Borrelia burgdorferi* infections and dogs with full-blown episodes of clinical Lyme arthritis.

### Test, Treat, and Vaccinate Protocol for Asymptomatic Lyme Positive Dogs

In 1992 and 1993 I published papers documenting episodes of clinical Lyme disease developing in asymptomatic Lyme positive dogs at the rate of 4.8\(^7\) and 4.7\(^8\) per year. Others have cited rates as high as 10%\(^9\). In dogs that develop Lyme arthritis, morbidity leads to pain, disability, emergency visits to the veterinarian and cost of diagnostics including broad spectrum blood analysis, radiology, and other tests. With the advent of patient-side rapid Lyme tests I realized that I could identify healthy, Lyme infected dogs at risk for developing clinical episodes of Lyme disease when they presented for their annual wellness visits. I had safely immunized thousands of Lyme positive dogs since 1990 and successfully treated hundreds of canine Lyme arthritis patients since the 1980’s\(^4,5,8\). With this experience I decided to combine the modalities of treating and immunization targeting those dogs identified as Lyme infected and healthy.

In its simplest form the TTV Protocol identifies healthy Lyme positive dogs using the Abaxis Lateral flow Lyme test. These dogs are confirmed to be asymptomatic through anamnesis and physical examination. The owners are then educated about the risk of clinical episodes of Lyme developing at a rate of between 5 and 10% per dog each year and that while no therapy can guarantee continuing health the TTV Protocol has been highly successful in thousands of dogs throughout the United States. Dogs were then immunized with a multiantigen, whole cell bacterin and placed on 28 days of antibiotic. In an earlier study I followed 200 dogs on the TTV Protocol between 2001 and 2005 and none of the dogs experienced clinical episodes of Lyme disease\(^10\).

### Citations

3. Clinical findings, Steven A. Levy, VMD
10. Unpublished data, Steven A. Levy, VMD.