

Educating clients on diagnostic testing, treatment of tick-borne diseases

Comprehensive approach to discussion arms client to make informed decision

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Determination of the significance of the presence of antibodies to *B. burgdorferi* is complicated by the cross-reactivity of antibodies induced by vaccination with those produced by infection when whole-cell ELISA and

IFA are the basis for testing. The introduction of an in-office test kit based on the C₆ ELISA (SNAP[®]3Dx, IDEXX Laboratories) detects a unique antibody produced by infection with *B. burgdorferi* and presents new opportunities as well as new challenges for the veterinarian. Additionally, dogs infected by *B. burgdorferi* have the potential to be co-infected by *E. equi*. Finally, screening dogs annually with the in-office kit for determination of Lyme infection will also give veterinarians information on the dogs' status for infection by *E. canis*, the agent of canine ehrlichiosis, as well as *Dirofilaria immitis*, the canine heartworm.

Table 1: Justification for annual testing: kit detects multiple vector-borne infections

Surveillance

- Status of infection in individual dogs and also the hospital population may be tracked.

Efficacy of prophylactic programs for vector-borne infections

- Various vaccines with varying efficacies are available for prevention of canine Lyme disease
- Various tick control products with varying efficacies are available
- Various heartworm preventive products are available
- Owner compliance may be a factor
 - Administration of monthly heartworm preventive
 - Return for semi-annual heartworm preventive injections
 - Application of tick control collars or spot-ons

Diagnosis of infection by various pathogens

- In sick dogs, therapy is indicated
- In healthy positive dogs
 - Prophylactic antibiotic therapy may be attempted for *B. burgdorferi* positive dogs
 - Prophylactic antibiotic therapy may be attempted for *E. canis* positive dogs
 - Detection of antigen of *Dirofilaria immitis* requires evaluation for therapy to remove the adult heartworms

■ Significance of test results

Borrelia burgdorferi antibodies: Whole-cell ELISA or IFA: indicates exposure to *B. burgdorferi* antigens but does not define infection. Positive results require accurate knowledge of a dog's vaccine history to rule-out vaccine-induced antibodies and conclude that seropositivity is due to infection. Alternatively, the sample must undergo a second test, Western immuno-blotting, which requires additional time, expense and interpretation by a laboratory-based technician.

C₆ ELISA: indicates infection by *B. burgdorferi*. This test does not cross-react with vaccine-induced antibodies. No further testing is required. The SNAP[®]3Dx (IDEXX Laboratories) is the only in-office kit which detects C₆ antibodies.

When dogs have been infected by *B. burgdorferi* (as evidenced by C₆ ELISA or the two-step process of whole-cell ELISA or IFA and WB) veterinarians may choose to follow the Durham Veterinary Hospital protocol for doxycycline therapy and immunization (see related story, p. 9).

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Ehrlichia canis antibodies: Antibodies produced in response to *E. canis* exposure indicate infection by the organism. The SNAP 3Dx (IDEXX Laboratories) is the only in-office kit which detects *E. canis* antibodies.

Detection of any antibody directed against *E. canis* indicates exposure to the organism and is considered to be evidence of infection. Severity of disease induced by *E. canis* is an indication for proactive therapy with doxycycline at the same dose and interval as for *B. burgdorferi* infection listed in the article on p. 14.

Ehrlichia equi antibodies: Detection of antibodies to *E. equi* must be performed at a reference laboratory. There are no in-office kits for diagnosis of infection with this organism.

Detection of any antibody directed against *E. equi* indicates exposure to the organism and is considered to be evidence of infection. While there is no in-office kit for detection of antibodies directed against *E. equi*, dogs with positive tests for *B. burgdorferi* must be considered to be at high risk for infection with this second organism vectored by the same tick. The potential for disease induced by *E. equi* and the possibility of co-infection with *B. burgdorferi* are indications for proactive therapy with doxycycline at the same dose and interval as for *B. burgdorferi* infection.

Suggested reading

- Liang FT, Jacobson RH, Straubinger RK et al. Characterization of a Borrelia burgdorferi VlsE Invariable Region Useful in Canine Lyme Disease Serodiagnosis by Enzyme-Linked Immunosorbent Assay. J Clin Micro, 2000;38:4160-4166.
- Magnarelli LA, Ijdo JW, Anderson JF, et al. Antibodies to Ehrlichia equi in dogs from northeastern United States. J Am Vet Med Assn, 1997;211:1134-1137.

- Philipp MT, Bowers LC, Fawcett PT, et al. Antibody response to IR6, a conserved immunodominant region of the VlsE lipoprotein, wanes rapidly after antibiotic treatment of Borrelia burgdorferi infection in experimental animals and humans. Accepted for publication 2002.



■ Communicating with owners

Owners should be counseled that dogs which have pre-existing infections may develop Lyme disease in spite of vaccination and antibiotic therapy. Testing of all other dogs in the family should be conducted (see Table 1, p. 19. Tick control should be emphasized for dogs that have proof of tick parasitism, as well as for other pets in the family. Further, owners should be educated that the risk of exposure to *Borrelia burgdorferi* is present for human family members who are living in the same tick infested environment as their dogs. See Table 2). In our practice, we find it very helpful to show the dog owner the SNAP kit both before sample is added and after it has incubated. This aids in our explanation of results, risk factors, tick control,

antibiotic therapy and immunization. It is vitally important to read the SNAP®3Dx kit at precisely eight minutes because longer incubation periods may lead to a false-positive result due to non-specific color change in the test well.

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Table 2: Components of a program for integrated management of tick-borne diseases



Awareness

- Regional distribution of tick species- what ticks are active in your practice area.
- Seasonality of tick parasitism and latent period for signs of disease- when are ticks active in your practice area and when signs of tick-borne infections may be expected to develop.
- Vector competence of tick species- what pathogens are transmitted by each individual tick species.

Diagnosis of tick-borne diseases of dogs

Signs of disease

- Primary and secondary signs of disease

Laboratory testing

- Blood chemistry and CBC
- Serology
- Other laboratory tests

Treatment

- Specific therapy vs. etiologic agent
- Treatment of secondary signs of infection

Prevention of tick-borne diseases

- Tick avoidance
- Tick control and tick bite prevention
- Prophylactic antibiotic therapy
- Immunization

