



## The Golden Retriever Club of America, Inc.

---

### Vector-Borne Diseases: Questions and Answers

Edward Breitschwerdt DVM, Professor of Medicine and Infectious Diseases, Vector Borne Diseases Diagnostic Laboratory, North Carolina State University College of Veterinary Medicine, is the author of more than 150 scientific publications, predominantly in the field of vector-borne diseases. He is principal investigator on two active Canine Health Foundation grants: *Molecular Approach to Determine the Spectrum of Rickettsial Disease in Dogs* and *Molecular Epidemiology of Ehrlichia and Bartonella spp. Infection in Golden Retrievers with Lymphoma*. While all questions and specifics of treatment for individual dogs should be discussed with the attending veterinarian, we asked Dr. Breitschwerdt a few general questions about vector-borne diseases and traveling to unfamiliar areas with competition dogs.

#### **1. Are there circumstances where owners should use a Lyme disease vaccination on dogs that travel to areas with a high risk of Lyme disease transmission?**

Although not a popular stance, I have maintained for years that industry provided Lyme vaccines before clinicians and researchers understood Lyme Disease in dogs. This was not a fault of vaccine companies, as there was a tremendous demand by the public to protect dogs from *Borrelia burgdorferi* infection in Lyme endemic areas. Unfortunately, we still do not understand many clinically relevant aspects of infection with the Lyme disease organism. As commercially available vaccines appear to be safe and reasonably effective, I would support routine vaccination of puppies to prevent *B. burgdorferi* infection in Lyme endemic regions. As we reported in *Vector Borne and Zoonotic Diseases* (September, 2004), *B. burgdorferi* transmission to dogs is very rare in many regions of the US, including North Carolina. I would not vaccinate our family's English Setter or Golden Retriever for Lyme Disease unless visiting a Lyme endemic region of the north eastern or north central United States.

#### **2. Are there important differences between the different categories of Lyme disease vaccines (e.g. recombinant vaccines versus bacterin vaccines)?**

There are several obvious differences in recombinant and bacterin based vaccine technology. I am frequently asked the question: Which vaccine is best? Both vaccine types seem to have similar safety and efficacy profiles. As the bacterin based vaccines predated the recombinant vaccines, there is more field data related to their use. I would feel comfortable leaving the selection of canine Lyme vaccines up to the individual veterinarian. Although there are differences, companies are not allowed to sell vaccines that are not proven to be safe and effective.

**3. When dogs travel to areas where the owner either does not know the status of vector borne diseases or where a vector-borne disease (such as Lyme disease) is common, how soon before traveling, and how frequently should the drop-on medications be used on a traveling dog?**

It has become very clear that ticks and fleas are capable of transmitting a spectrum of bacterial, protozoal and in some instances viral pathogens to dogs. It is also clear that this transmission cycle has occurred for several million years, suggesting that dogs and many other animals are able to “immunologically manage” many tick transmitted organisms for protracted periods of time. Disease expression with these organisms is complex and almost always multifactorial. Clearly one of the emphases in our research and diagnostic laboratories is the molecular detection of polymicrobial tick borne infections. I can only state that products should be administered according to the manufacturers’ recommendations. When working a dog in a tick favoring environment (brush, high grass, edges of forests and road sides) it is definitely advisable to use acaricide products. For hunting or working dogs, I frequently recommend the use of both a topical application and a collar which would be removed while working and reapply when not in the field.

**4. What vector-borne diseases are common in dogs in the United States and Canada?**

Far too many. Dogs can be infected with Anaplasma, Bartonella, Babesia, Borrelia, Ehrlichia, Hepatozoon, Rickettsia species and perhaps other organisms that have yet to be identified. Some of these organisms only cause acute infections that can be eliminated by the dog’s immune response or more effectively eliminated in conjunction with appropriate antibiotic or antiprotozoal treatments. Most tick transmitted organisms induce chronic infections in the blood or tissues of the dog so as to facilitate subsequent transmission from the dog to a tick and from that tick to another animal. This evolutionary process facilitates the perpetuation of these microbial organisms, many of which can only live in a tick cell or in an animal cell. This intracellular life style creates a dependency upon a reservoir host, a blood meal for the tick and efficient transmission by the microorganism.

**5. What are the symptoms of some of the more common vector-borne diseases of dogs?**

This is a difficult question as the clinical and hematological abnormalities associated with both acute and chronic tick borne infections can be highly variable. This variability in the expression of disease manifestations is influenced by the infectious dose (how many organisms are transmitted), the intensity of the dog’s immunological response, the age of the dog, the simultaneous transmission of more than one pathogen (polymicrobial infection) and a variety of other factors. Chronic weight loss, fever, lethargy, lameness, bleeding tendencies, testicular swelling (orchitis), bone marrow suppression and spectrum of ocular abnormalities can be found in dogs with various tick borne infections. One area of research that has been greatly neglected is the potential influences of tick borne organisms on the reproductive performance of male and female dogs.

**6. Are there seasons of the year when dogs are safe from vector-borne diseases and are there seasons of the year when there is increased risk?**

Unfortunately, in most regions of North America ( Canada may be the exception) there is no safe time in regard to tick exposure. When temperatures warm in January, ticks are very hungry and aggressively seek a blood meal. Because there are so many different tick species and because the biological and ecological behavior of ticks varies substantially between tick species and even between the same tick in different geographic locations, predictions about safe and unsafe time periods are not practical. Year round protection is recommended by most vector borne diseases experts. Although many dogs are infested with ticks and do not develop infection or disease manifestations for a variety reasons, a single tick can transmit a pathogen that can result in chronic illness (months to years) or death of your dog. As our collective efforts are directed at protecting the individual dog against pathogen transmission, we are forced to recommend year round use of preventive strategies.

**7. Are vector-borne diseases a real risk for dogs that just go for walks on a leash and frequently get groomed or inspected for parasites?**

Certainly vector borne diseases are less of a risk for dogs with more limited tick exposure. Avoiding tick infested areas and routinely removing ticks before or shortly after attachment are among the best strategies to prevent tick borne infections. However, keeping a young, healthy medium to large breed dog out of brush and high grass is difficult, if not impossible. It may also not be fair to the dog.

**8. Some reference laboratories have the ability to conduct PCR studies that test for the genetic material of vector-borne diseases rather than just antibodies (generally reflecting exposure). Is there a list of reference laboratories for vector-borne diseases?**

Yes, there are lists in Greene's Infectious Diseases of the Dog and Cat and in some review articles on the subject. PCR detection of organism specific DNA has substantially improved our ability to assess the importance of tick borne infections in both individual dogs and in animal and human populations. The Intracellular Pathogens Research Laboratory which I direct has been very actively involved in the development of sensitive and specific PCR assays for the detection of Anaplasma, Babesia, Bartonella, Ehrlichia, and Rickettsia species. Once developed and validated on a research basis, these assays are transferred to the NCSU-CVM Vector Borne Diseases Diagnostic Laboratory, which I co-direct with Dr. Michael Levy a parasitologist and *Ehrlichia* and *Babesia* researcher. The VBDDL performs PCR testing on samples submitted by veterinarians from all over the world.

**9. Is there a risk of vector-borne diseases being transmitted from bitches to their offspring or venereal transmission during breeding?**

As I alluded to this question in an above response, there is very limited data on this subject. Because of differences in placentation, data generated on in utero transmission in one species (the mouse or human beings) can not be directly extrapolated to other species (i.e. canines or

felines). Some existing data, such as *Borrelia burgdorferi* transmission from the bitch to pups has provided conflicting results. It is probable that some tick transmitted organisms can be transmitted during pregnancy. Venereal transmission is much less likely, but not impossible if bleeding occurs during mating. For the past decade we have invested considerable time, money and research effort investigating *Bartonella* species as pathogens in dogs. It is increasingly obvious that *Bartonella* species can be transmitted by ticks as well as fleas and other insect vectors. As these organisms can colonize red blood cells and endothelial cells, they would be good candidates for both transplacental and venereal transmission. It is also possible, as we have shown for the transmission of *Babesia gibsoni*, that *Bartonella* species might be transmitted by bites during a dog fight.

**10. Is there a risk of taking a dog to a high risk area for vector-borne diseases and having that dog become infected and possibly exposing the home dogs by new ticks biting the recently infected dog?**

Yes and no, as is the answer for many complex questions related to the transmission of these bacteria and protozoa. Some of these organisms have a highly developed relationship with a single tick species, whereas other organisms can be transmitted by more than one tick species. If for example the dog in question was exposed to the brown dog tick, *Rhipicephalus sanguineus*, *E. canis*, *B. canis* or *B. vinsonii berkhoffii* could be transferred to the dog during the blood meal. That dog could become a carrier of one or all 3 of these organisms. The brown dog tick is referred to as the “kennel tick” because the dog is the preferred host for all 3 stages of tick development. The brown dog tick can be found in kennels and parks throughout most of North America. Clearly, an owner could introduce these 3 organisms into the kennel environment by transport or introduction of a single dog. This dog could serve as the infectious reservoir for other dogs, if the kennel were to experience a brown dog tick infestation. It is important to realize: The goal of the tick is to obtain blood for nutrition and to reproduce its species. The goal of the microorganism is to use the ticks reproductive and blood seeking capabilities to ensure transmission and to perpetuate its species. This emphasizes the importance of preventing tick infestation in dogs.

**11. Many dogs travel to competitions throughout the country. It is not uncommon for these dogs to be in many different states in a single year. Do you have any additional advice on preventing vector-borne diseases in these dogs?**

Although safe and much more effective than historical products, we will never have products that ensure 100% efficacy against the transmission of tick borne pathogens. Recent experimental transmission studies clearly indicate that these products can markedly decrease or totally prevent the transmission of *B. burgdorferi* and *E. canis*. Avoidance of tick infested areas and twice daily tick checks in conjunction with acaricide use provide the best protection. When a dog develops an acute or chronic illness in conjunction with a history of tick exposure, diagnostic evaluation by a veterinarian is advised.