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### Tick Associated Diseases Vetspeak - May/June 1999, Linda Aronson, DVM

Springtime is an appropriate time to address the diseases associated with ticks. The best known of these is undoubtedly Lyme Disease. Given that no one knew anything about Lyme Disease, or Borreliosis as it's also known, until 1975, this is quite remarkable. Since then it has been reported in at least 47 states, Europe, Asia and Australia, and seems to be creeping insidiously into us our dogs, horses and other wild and domestic species. Cats can theoretically get the disease, although they do so only very rarely. Dogs on the other hand seem to be 50% more susceptible to Lyme Disease than humans.

Lyme disease is caused by a spiral-shaped bacterium (or spirochete) called *Borrelia burgdorferi*. The normal hosts for this pathogen are small mammals, most frequently mice. Ticks feeding on the mice' blood pick up the bacteria and then pass it on to the next animal on which they dine. Because mice and ticks generally are less active in winter, more Lyme will appear in the spring, summer and fall. 94% of the cases of human Lyme Disease are reported from California, Connecticut, Massachusetts, Minnesota, New Jersey, New York, Pennsylvania and Wisconsin. Free testing in Maine, which is not thought to be a hot bed for the disease, showed that 1 of every 9.5 dogs tested positive for Lyme Disease. Only 5% of dogs which test positive in endemic areas develop Lyme disease, however.

The blood test detects antibodies against the bacteria and only indicates that the dog has been exposed to the disease and mounted an immune response; it does not indicate infection. Some infected dogs show no measurable immune response at all, particularly in the early stages of the disease. Dogs who have been vaccinated against Lyme Disease should also test positive. It is not practical to isolate the bacterium from the blood. A Lyme antigen (ELISA) test detects bacterial proteins in the blood, but unfortunately other types of proteins will also be detected leading to many false positives. New tests are being developed all the time.

The tick most likely to transmit Lyme Disease here in the Northeast as well as in the Midwest is the "deer" or "black-legged" tick *Ixodes scapularis*. These ticks live about 2 years and only have 3 meals in that time - first as larvae, then as nymphs and finally as adults. Larvae feed on a variety of



## Library Article

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rodents and rabbits, but favor the common white-footed mouse, also popular with *Borrelia burgdorferi*. The ticks molt and move onto their next meal ticket, which may again be a white-footed mouse, but they may chose deer, squirrels, birds, cows, dogs or humans based on availability. The latter are then infected with spirochetes. Adult ticks generally set their sights on larger animals, deer, horses, cows, dogs and humans. Nymphs probably pose the greatest risk because they are smaller and therefore less easy to detect than adults. Because nymphal tick activity is greatest from May to September, this is the most dangerous period for heading unprotected into the woods. It should be remembered however, that not all ticks are infected. The deer tick is about the size of a period before and the size of a pin head after it is gorged on blood making it hard to spot, especially amidst a Beardie's hair. Many other kinds of ticks, including the common dog tick, have also been found to transmit Lyme disease.

Symptoms which occur usually within a few weeks of the tick bite include: fever (102.5 - 106oF), loss of appetite, acute lameness - sometimes shifting from leg to leg, stiffness and very warm, painful joints with no history of accident or injury are the most common signs. One needs to remember that dogs limp for a great many other reasons than Lyme Disease, that the symptoms may appear long after the bite, and that few bites ( 30% in people and a lot less in dogs) are accompanied by the "characteristic" bull's eye or donut shaped rash (i.e., a rash with a clear center). Over subsequent weeks and months (2-5 in the lab), if the dog goes untreated he may develop recurring lameness, swollen lymph nodes, inflammation of the kidneys and myocarditis. Lyme disease may also affect the brain - seizures, facial paralysis and behavioral changes may occur, although these as well as heart and kidney problems are relatively rare. It is unclear whether arthritis results from the spirochetes themselves, or from antibody-antigen immune complexes lodging in the joints.

In the early stages of the disease, treatment with antibiotics - doxycycline or amoxicillin - is effective. Pain and lameness usually resolve within the first 24 hours although it is important to continue the antibiotics for at least 2 - 4 weeks. If you do not see an improvement in this time, the chances are Lyme Disease was not the culprit. For chronic cases, antibiotics are less effective as other organs and the joints have sustained permanent damage. Therapy to address these effects must also be administered. Chronic weight loss and abortion have been reported in cows and horses, and it is possible that bitches may also abort. The homeopathic, Ledum in a 1M potency has



## Library Article

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been reported effective both subjectively and objectively (Lyme titers fall after treatment). One pellet is given three times a day for three days. Ledum is reported to be effective in both new and chronic infections, and whether or not antibiotic treatment has been given. When the kidneys are affected the disease is usually fatal.

Prevention is clearly important. Avoid areas where ticks are common, and remove the tick promptly - it takes 36-48 hours to transmit sufficient spirochetes to cause a problem. Make sure you get the tick's mouthpieces. The easiest way to remove a tick is to grasp it as close to the skin as possible using tweezers or one of those little spoons with a V shaped nick in them (Ticked Off), and pulling the tick straight out from the skin. Apply antiseptic to the bite area, and preserve the tick in alcohol and date its removal, so that it can be identified if symptoms develop later. Do not try to burn the tick off, or put lighter fluid, alcohol or any of the other substances people suggest aid in removal.

Some owners feel happier if they put one of the new products like Frontline, which kills ticks as well as fleas, on their dog. Watch closely for adverse reactions if you do so. Some Beardies do not tolerate these products, especially if their immune systems aren't up to snuff. Other owners test their dogs twice a year for Lyme Disease, but be aware that the information from the tests is not always accurate (see above), although newer tests are always being developed. I do not recommend the vaccine against Lyme Disease because both efficacy (about 30%) and safety are questionable and dogs have died from the vaccine. Borrelia burgdorferi 60X nosode (a homeopathic preparation which is sometimes likened to a vaccine) has been used as a preventative for Lyme Disease. Given orally daily for a week, then weekly for a month and then every 6 months, Steve Tobin DVM of Connecticut, who lives in an area of very high Lyme Disease incidence reports 2 cases in more than 500 treated dogs. In many of these cases, owners had experienced annual outbreaks of the disease in their kennels prior to employing the nosode. Other treatments which may help support dogs with Lyme Disease include Vitamins C, E and A, fish oil and Perna mussel.

Puppies and young dogs seem to be at greater risk than older dogs, but this may be more due to their proclivity for playing in tick infested areas than their age per se. It has been suggested that certain breeds are more susceptible to infection than others, and a genetic basis for infection has



## Library Article

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been established in mice. In general, dogs with compromised immune systems are probably at greatest risk. Although humans can get Lyme disease, they don't get it from their dogs (unless they let ticks bite them which have already bitten their dog). The risk factors are the same for both species.

While by no means all ticks carry Lyme disease, some ticks carry more than one disease, and dogs can develop more than one illness from a single tick bite, Concurrent infection with Lyme and ehrlichiosis is being reported. There are three important organisms involved in ehrlichiosis. Ehrlichia canis which causes ehrlichiosis, circulates in white blood cells. Ehrlichia platys causes infectious cyclic thrombocytopenia (low platelet count) and circulates in the platelets. Sometime Ehrlichia equi, which causes Potomac fever and equine granulocytic ehrlichiosis, can be found in neutrophils, a kind of white blood cell, in dogs, and make them ill too.

*E. Canis* is usually transmitted by the brown dog tick - Rhipicephalus sanguineus - and is found world wide. Ehrlichiosis can occur at any time of the year, although is more common in the warm months. There is usually a 1-3 week incubation period, but it's generally more than 2 months before dogs are presented for signs of illness. There are three stages of infection. In the acute phase the organism - a rickettsial - spreads from the site of the bite to the spleen, liver and lymph nodes, causing them to enlarge. Blood vessels become inflamed and platelet survival time is reduced. There is a reduction in the white blood cell count and often mild anemia too. In the subclinical stage the antibody production against the organism increases, but thrombocytopenia continues. In the chronic stage the bone marrow is affected and few blood cells are produced. Dogs present with a history of lethargy, fever, depression, and anorexia resulting in weight loss. Spontaneous bleeding is often first reported as nose bleeds following sneezes. Petechiae (small red blood blisters) are seen, particularly on mucous membranes. Respiratory distress (coughing) and neurological signs - head tilt, difficulty walking, and painful eyes (may herald uveitis and retinal hemorrhage and detachment in chronic cases), may also be reported. Edematous swelling of the legs and scrotum may also be seen. In the chronic stage occasionally arthritis and seizures may occur. Concurrent infection with some of the other tick borne diseases - babesia, Hepatozoon canis or E. Platys will worsen the symptoms of *E. Canis*. Fortunately, the first two rarely occur in the northeast.



## Library Article

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Diagnosis. Ehrlichia can usually be diagnosed by serological blood test, although sometimes a bone marrow aspirate is used to confirm diagnosis. The major rule-outs are: (1) Rocky Mountain Spotted Fever - which is another rickettsial disease which responds to the same treatment; (2) immune mediated thrombocytopenia - which generally doesn't produce a fever of swollen lymph glands; (3) systemic lupus erythematosus; and (4) leukemia. As for Lyme disease, the drug of choice is doxycycline for 2 weeks. Tetracyclines should not be given to puppies under 6 months of age, and for them chloramphenicol is usually used. Blood transfusions may be needed for severely affected dogs. Platelet counts should be repeated every three days until they reach the normal range, and then less frequently. Serological testing for *E. canis* should be repeated in 9 months. In some areas about 50% of the dogs with *E. canis* also have *E. platys*. The two are transmitted by the same ticks. *E. Platys* generally produces a milder disease and may frequently be an incidental finding on serological testing rather than one which causes the owners concern. The treatment is the same for both. While humans can get ehrlichiosis, it appears that the dog tick is not the vector in these cases.

The last tick borne disease which we see in New England is Rocky Mountain Spotted Fever (RMSF) which is caused by the rickettsial *Rickettsia rickettsii*. For some reason, pure bred dogs - especially German Shepherds - seem to be more prone to RMSF than mutts. In this neck of the woods, the tick to watch out for is the American dog tick - *Dermacentor variabilis*. Ticks need to be attached for 5-20 hours to infect the dog, and the incubation period is 2 days to 2 weeks. In the host the organism reproduces in the lining of blood vessels causing inflammation and hemorrhage in the smallest vessels. Vessels become blocked, platelets clump and organs swell as fluid is lost from the blood vessels into the surrounding tissues. Blood pressure drops and eventually shock results. If untreated just about every system becomes involved in time. Fever occurs 2-3 days after the tick attached, followed by lethargy, depression and anorexia. Lips, ears, extremities, prepuce and scrotum swell. Joint pain results in stiff gait (as does swelling of those nether organs). Spontaneous bleeding - especially nose bleeds - occurs. Conjunctivitis and reddening of the eyes is seen, as is respiratory distress - difficulty breathing and coughing, and neurological signs - seizures, head tilt, difficulty walking, neck pain and coma. In some cases, heart arrhythmias and sudden death from shock may result if the dog is left untreated. Serological testing will eventually render diagnosis, but titers take 2-3 weeks to rise. As the treatment is the same as for the other two conditions we've



## Library Article

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discussed, it should be initiated before definitive diagnosis. Unlike the other two conditions, dogs with RMSF are usually hospitalized until their condition has stabilized.

Fortunately, RMSF is far less common than Lyme Disease and ehrlichia. Overall 2% of American dog ticks carry the disease, but the incidence varies with region, and is probably even lower here in New England. Having had one of these tick borne diseases does not protect the dog from getting them again, so we will always need to be vigilant. Because it takes time for the organisms to become injected in sufficient quantities into the dog's blood stream we have time to remove the ticks before infection occurs. Such low doses may even help prime the dog's immune system, at least in the short term, against the disease. On the other hand, if you suspect your dog has one of these infections the sooner it is treated the better the prognosis - so don't delay.