Canine Bartonellosis

*Bartonella* was discovered in 1909 by a scientist in Peru, A. L. Barton, who recognized and described organisms that parasitized erythrocytes in the blood of infected humans. The organism, first named *Bartonia*, was later renamed *Bartonella bacilliformis*, now recognized as the type species for the genus. For many years, this organism was the only member of the group. However, in 1993, a similar group, *Rochalimaea*, was combined with *Bartonella*, and organisms were renamed *B. quintana*, *B. henselae*, *B. vinsonii*, and *B. elizabethae*. The genus now includes over 20 species & subspecies. In addition, direct transmission can occur through the bite or scratch from an infected / carrier cat. This is of particular importance to veterinarians and veterinary health care workers who are considered an at risk group for contraction of infection with *Bartonella* spp.

*Bartonella* are gram negative hemotropic bacteria that invade erythrocytes and endothelial cells, macrophages, microglia and CD34 Positive cells (stem cells) of a variety of mammalian hosts. The organisms are well adapted to their hosts resulting in persistent infections and long-lasting bacteremia. Based on current knowledge, it is suspected that *B. vinsonii* subsp. *berkhoffii* is the species that most frequently causes disease in dogs. However, it is clear that other *Bartonella* spp. can infect dogs and at least two other species have been reported to cause clinical disease. It is widely accepted that the organism is vector transmitted and there is good evidence that multiple tick species and fleas can transmit the organism. Other vectors include the body louse and sand flies.

*Bartonella* spp. infect erythrocytes and endothelial cells of the mammalian host and cause chronic infections that may be well-tolerated by the animals for months to years. The factors that might result in disease manifestation are not completely understood, but it is suspected, as with other tick-borne pathogens, that stress factors, parturition, and coinfection with other pathogens are likely explanations. Experimental inoculation of SPF dogs with *B. vinsonii* subsp. *berkhoffii* results in immune-suppression with a reduction in circulating CD8+ lymphocytes and increase in CD4+ lymphocytes. The role of Bartonella infection in the manifestation of disease caused by other tick-borne pathogens is one of great interest. Serological surveys testing for antibodies to *B. vinsonii* subsp. *berkhoffii* have resulted in varied results ranging from approximately 3.6% to 36% of animals with previous exposure or potential chronic infection. Seropositivity in a population of 1920 dogs from North Carolina and surrounding states was on the lower end, 3.6%. In the southeastern US, seropositivity to infection with *B. henselae* was 10% in healthy dog and 26% in sick dogs, indicating a more frequent exposure to *B. henselae* than to *B. vinsonii* in the southeastern part of the country. In general, higher seropositivity is seen in groups of dogs that either have heavy tick exposure, cattle exposure or live in more rural areas. The seropositivity to Bartonella also appears to be higher in sick animals and animals that are seropositive for other tick-borne diseases such as Ehrlichiosis, Anaplasmosis, Babesiosis and Lyme disease. All of these pathogens have the ability to establish long-term (months to years), subclinical infections in the dog, complicating the ability of the clinician to establish a cause and effect association in animals presenting with clinical illness.
Clinical Findings
The clinical findings associated with canine Bartonellosis can be varied and can also be determined by the presence or absence of coinfection. One of the first recognized disease stated induced by Bartonella infection was endocarditis. This presentation may be more frequently encountered in large breed dogs, with Boxer dogs being particularly susceptible. Fever of unknown origin, lameness and possible bone pain may be seen intermittently in these animals for some time prior to diagnosis. Other disease syndromes associated with Bartonella infection include polyarthropathy, lymphadenopathy (granulomatous lymphadenitis), cutaneous vasculitis, rhinitis, epistaxis, immune-mediated hemolytic anemia, hemoglobinuria, splenomegaly or hepatic disease (peliosis hepatitis). It is important to note that animals coinfected with other tick-borne pathogens may not experience resolution of clinical signs until both diseases are treated.

Laboratory Findings
The laboratory findings associated with clinical Bartonellosis are those frequently encountered in many hemoparasitic diseases in dogs. Thrombocytopenia, anemia and leukocytosis are common hematologic abnormalities in these animals. Thrombocytopenia is seen in about half of the dogs with clinical Bartonellosis and about 1/3 of the animals have an eosinophilia. Hemoglobinuria without an accompanying hematuria can be seen in animals with intravascular hemolysis. Few, if any, abnormalities are observed on biochemical profiles.

Suspeciton of canine Bartonellosis is initially observed in animals presenting with the above mentioned clinical and hematological abnormalities. Infection can be confirmed by blood or tissue culture, serological evaluation and PCR analysis. The most reliable method of diagnosis is enrichment PCR (ePCR) which is a method involving culture and PCR analysis. This assay is performed by Galaxy diagnostic labs (www.galaxydx.com). In acute cases of granulomatous lymphadenitis tissue specimens stained with Warthin-Starry silver stain allowed visualization of the organism, however, in chronic cases the organisms are in low numbers and not readily visible
by light microscopy. Using serology, a titer of 1:64 or greater would indicate exposure or active infection. Recent studies suggest that coinfection in dogs is much more prevalent than previously realized. Therefore, it is advisable to test animals for multiple tick-borne pathogens, particularly in dogs where clinical signs do not completely subside after appropriate antimicrobial therapy.

**Treatment**
Currently, the recommended treatment for canine Bartonellosis is azithromycin at a dose of 10 mg/kg PO, once daily for one week then EOD for 4 to 6 weeks. This may be used in combination with Rifampin at a dose of 5 mg/kg Q 24 hours for 6 weeks. Doxycycline is probably not effective in treating infected animals. If therapy is effective in clearing the organism, antibody titers will rapidly decline within 3 to 6 months, and eventually, animals cleared of infection will seroconvert to a negative status. Persistent antibody titers may indicate an incomplete response to antimicrobial therapy. Testing for other tick-borne agents should be performed in animals that have clinical evidence of disease despite appropriate therapy.

**Zoonosis**
Transmission of *B. henselae* from cats or possibly dogs to people via scratch or bite wounds has been a problem especially for veterinarians and veterinary health care workers. These infections can cause chronic recurrent disease manifestations which include, but are not limited to joint and muscle pain, headaches, photophobia, neurological disease including cognitive disorders and insomnia. In addition, people can become infected with *B. vinsonii* subsp. *berkhoffii*. However, the extent to which the canine can serve as a reservoir for infection in people is not well characterized.