

Bartonellosis

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Tests available at VBDDL: Serology (IFA) and PCR on blood or CSF

There are a growing number of *Bartonella* species associated with disease manifestations in cats, dogs, humans and other less domesticated host species including *Bartonella henselae*, *B. vinsonii* subspecies *berkhoffii*, *B. rochalimae*, *B. clarridgeiae*, and *B. koehlerae*. Genetically unique strains or genotypes are being described within each species. This may affect test interpretation because most laboratories only test for a limited selection of species and serological cross reactivity is not always present. Knowledge of which species are tested for is important for both antibody and DNA testing.

Risk factors:

- History of flea, tick, biting fly, keds, lice, or sandfly exposure

Disease:

- Transient lethargy
- Fever
- Lymphadenopathy
- Gingivitis
- Stomatitis
- Uveitis
- Neurologic dysfunction
- Endocarditis
- Retinal disease

Bartonella henselae – *B. henselae* is a flea-transmitted zoonotic pathogen with the cat identified as a major reservoir for human infection. Fever and bacteremia, endocarditis, lymphadenopathy (cat scratch disease in people), bacillary angiomatosis, neurologic dysfunction and retinal disease can be caused by *B. henselae*, particularly in immunocompromised individuals. Following flea transmission or blood transfusion to cats, *B. henselae* causes a relapsing pattern of bacteremia, persisting for months to years.

Bartonella koehlerae – *B. koehlerae* is a zoonotic bacterium that has but rarely been reported as an infectious cause of disease in dogs or human patients. Cats are considered the primary reservoir host for *B. koehlerae* as with *B. henselae*. *Ctenocephalides felis*, the cat flea, is considered a transmission competent vector for both organisms.

Bartonella vinsonii – *B. vinsonii* is an emerging bacterial pathogen of dogs that has been associated with endocarditis, lymphadenitis, granulomatous lesions, epistaxis, immune-mediated thrombocytopenia, neurologic dysfunction, and potentially polyarthritis. The organism appears to be tick-transmitted by *Rhipicephalus sanguineus* and may be co-transmitted with *Ehrlichia canis* or *Babesia canis*. Concurrent infection with *Bartonella* may interfere with the expected

therapeutic elimination of *E. canis* with doxycycline. Similarly to *Ehrlichia canis*, some healthy dogs can be chronically infected.

Testing:

- IFA: (2mls serum required) *B.henselae* H-1, *B.vinsonii* subspecies *berkhoffii* Type I and *B.koehlerae* obtained originally from feline or canine sources are the antigens currently used in our diagnostic IFA panel. Seroreactivity (antibody titers $\geq 1:64$) is indicative of prior or current infection. Not all host animals mount a detectible antibody response; therefore, a negative IFA test does not rule out exposure or infection with *Bartonella* spp.
- PCR (2mls EDTA blood required) detects DNA at the *Bartonella* genus level with species determination performed to identify *B.henselae*, *B.vinsonii*, *B.koehlerae*, *B.quintana*, *B.rochalimae* and *B.clarridgeiae* DNA in blood. The presence of *Bartonella* DNA is indicative of active bacteremia in the patient. As bacteria levels fluctuate in the blood over days, a negative PCR result may not rule out infection with *Bartonella*.
- Enrichment through the BAPGM platform developed and patented by researchers associated with the VBDDL is no longer offered diagnostically by VBDDL, as an outside company, Galaxy Diagnostics, Inc, now provides this service. (www.galaxydx.com)

Treatment: See separate document on Guidelines for *Bartonella* Treatment.

Insights gained through VBDDL associated research:

- VBDDL associated scientists were first to isolate and characterize *B.vinsonii* subsp. *berkhoffii* in a dog with endocarditis and a history of infection with *Ehrlichia canis*. Published article: Breitschwerdt EB, DL Kordick, DE Malarkey, et al: Endocarditis in a dog due to infection with a novel *Bartonella* subspecies. J Clin Microbiol 33: 154–160, 1995.
- VBDDL scientists were able to overcome the low sensitivity of other testing approaches by combining a **BAPGM enrichment culture** step with PCR amplification of bacterial DNA. As *Bartonella* species have a dividing time of approximately 24 hours, a diagnostic sample that contains one bacterium will contain only 2 after 24 hours, 4 after 48 hours, 8 after 72 hours, etc. On a practical basis, this means that time (at least 7- 10 days) is required to increase the number of bacteria in the patient's BAPGM blood, CSF, joint or effusion culture to a level in which there is enough DNA to be detected by PCR.
- The VBDDL has worked with 5-6 different species or strains by **IFA** to determine which afford the best sensitivity and specificity in natural disease. Published article: Hegarty BC, Bradley JM, Lappin MR, Balakrishnan N, Mascarelli PE, Breitschwerdt EB. 2014. Analysis of Seroreactivity against Cell Culture–Derived *Bartonella* spp. Antigens in Dogs. J Vet Intern Med 28:38-41.
- A study using primers from the ITS, 16S rRNA, *pap31*, and *rpoB* genes reports “*Bartonella rochalimae*” in European dogs, *Bartonella vinsonii* subsp. *berkhoffii* genotypes II and III in dogs in southern Italy and evidence of a potentially new *Bartonella* sp. infecting dogs in Greece and Italy. Published article: Diniz PPVP, Billeter SA, Otranto D, De Caprariis D, Petanides T, Mylonakis ME, Koutinas AF, Breitschwerdt EB. 2009. Molecular Documentation of *Bartonella* Infection in Dogs in Greece and Italy. JCM.47:1565–1567.