



NATIONAL VETERINARY LABORATORY

P.O. Box 239, 1Tice Road
Franklin Lakes, NJ 07417
877-NVL-LABS (877-685-5227)
www.natvetlab.com

NEWSLETTER Dogs and *Bartonella* Summer 2007

Evelyn E. Zuckerman, Editor

Vol. 6, Number 3

In This Issue:

The Summer 2007 issue of the NVL Newsletter is the first of several Newsletters that will give an overview of *Bartonella* infection in healthy and sick dogs. This is especially relevant as summer is the height of the tick and flea season in many parts of the country. Subsequent Newsletters will cover canine *Bartonella* testing and diseases in more detail.

Dogs Background:



Dogs cannot relax when it comes to *Bartonella*.

Yes dogs, like cats, are susceptible to infection with *Bartonella* but they are less likely to transmit the bacteria to humans than are cats. However, dogs appear to be exposed less or are less susceptible to infection by *Bartonella*. Dogs are infected much less often (~4 times less) than cats living in the same geographical areas.

Bartonella Species Found in Dogs:

Early studies found that dogs were mainly infected with *Bartonella vinsonii* whereas cats were mainly infected with *Bartonella henselae*.¹⁻² Subsequent studies have found that dogs are infected with 6 *Bartonella* species (*B. henselae*, *vinsonii*, *clarridgeiae*, *elizabethae*, *woshensis*, and *quintanna*) and like cats, they are more often infected with *Bartonella henselae*.²⁻¹⁶

Both cat and dog fleas carry and transmit *Bartonella*, but ticks appear to transmit *Bartonella* among dogs more often than do fleas.¹⁴



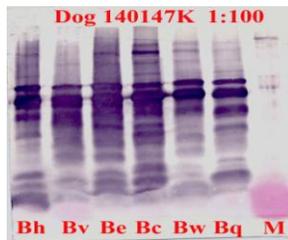
Like cats, dogs have the same risk factors for *Bartonella* infection: flea or tick infestation or a history of infestation, stray or shelter origin, living in multi dog or cat households, living with a *Bartonella*-infected cat or dog, and living in hot and humid climates. In this regard, field dogs or

dogs kept outdoors are more likely to be exposed to ticks than dogs kept indoors most of the time.

Western Blot *Bartonella* Test:

As with cats, we utilize the WB technique for serologic testing of dogs for *Bartonella* infection (Figure 1). The WB technique is more specific and more sensitive than IFA or ELISA tests and is used as the confirmatory serological method for many pathogen serologic assays.

Figure 1



Western Immunoblot of a seropositive dog showing cross-reactivity to 6 *Bartonella* species: *B. henselae*, *B. vinsonii*, *B. elizabethae*, *B. clarridgeiae*, *B. weissii* (*bovis*), and *B. quintanna* (M= molecular weight markers).

Similar to cats, *Bartonella* infection in dogs is also correlated with hot and humid climates (Table 1) and we have mapped the prevalence of infected healthy dogs by the first number of their zip codes (Figure 2). The overall infection in healthy dogs, with no reported risk factors, is only 5% compared to 20% in cats with no reported risk factors (Table 2). Healthy dogs who have risk factors for exposure to fleas and ticks compared to dogs with no reported risk factors are 3 times (17% versus 5%) more likely to be infected.

Figure 2
NVL Geographic Prevalence* of *Bartonella* Infection in Healthy Dogs Based on First Number of Zip Code



Healthy dogs infected in: Zip 0: 6/63= 10%; Zip 1: 32/616= 5%; Zip 2: 2/9= 22%; Zip 3: 2/8= 25%; Zip 4: 0/27= 0%; Zip 5: 2/7= 29%; Zip 6: 0/2= 0%; Zip 7: 7/22= 32%; Zip 8: 0/1= 0%; Zip 9: 7/42= 17%

*Based on *Bartonella* western blot antibody test.

Table 1

Geographic Occurrence of *Bartonella* in Dogs

Geographic Area	Percent Infected
New Jersey- NVL	4%
North Carolina/Virginia	3.6%
Southeast- US Healthy	10%
Sick	27%
Southwest- US Army Dogs	9%
California	3%
Israel	10%

We have tested 3,665 dogs for *Bartonella* infection by western immunoblot (WB) (Figures 1 & 2, Tables 2 & 3).

Table 2

NVL Occurrence of *Bartonella* in Dogs

Status	Number Tested	Number Positive	% Positive
Healthy	802	58	7%
1) No RFs**	641	31	5%
2) With RFs*	161	27	17%
Diseased Dogs	2,730	404	15%
Not Specified***	133	25	19%
Totals	3,665	487	13%

* RFs= risk factors for *Bartonella* infection- flea & tick exposure.

** No risk factors reported by veterinarian.

*** No diagnosis given.

Dog *Bartonella* Diseases:

There have been numerous publications documenting the diseases caused by *Bartonella* in dogs.¹⁻¹⁶ The *Bartonella* inflammatory-granulomatous disease spectrum in dogs is quite different from those of cats. Canine *Bartonella* diseases include: heart disease- endocarditis, myocarditis, vegetative valvulitis, and arrhythmias, liver disease- peliosis hepatis, and granulomatous hepatitis, ocular disease- uveitis and chorioretinitis, lymphadenopathy (itis), granulomatous rhinitis, thrombocytopenia and anemia.¹⁻¹⁶

In addition to the published canine *Bartonella* diseases, we have found *Bartonella* spp. associated with myositis, arthritis, polyarthritis (opathy), neurological disease and fever of unknown origin (Table 3). In collaboration with Dr. Charla Jones, Board Certified Veterinary Cardiologist at Veterinary Cardiology & Medicine Service, Austin, Texas, we have found *Bartonella* associated with heart diseases in both cats and dogs. Texas is a high *Bartonella* incidence state.

Table 3

**Bartonella Infected Dogs with
Inflammatory Diseases- NVL Data**

Disease	# Tested/ # +	% +	X
Healthy- No RFs	641/31	5%	X
Myositis/ Myopathy	104/29	28%	5X
Arthritis/Polyarthritis	297/72	24%	5X
Heart Disease	183/34	19%	4X
Anemia	115/19	17%	3X
Lymphadenopathy	265/40	16%	3X
Neurological Disease	167/26	16%	3X
Fever	374/57	15%	3X
Ocular Disease	606/82	14%	3X
Liver Disease	182/23	13%	2X
Thrombocytopenia	156/17	11%	2X
Respiratory Disease	207/21	10%	2X
Oral Disease	578/33	6%	X
Totals	2,963/ 417	14%	3X

Case Reports:

Morales SF, Breitschwerdt EB, Washabau RJ, et al. Detection of *Bartonella henselae* DNA in two dogs with pyogranulomatous lymphadenitis. J Am Vet Med Assoc 230:681-685, 2007.

This publication describes 2 cases of canine pyogranulomatous lymphadenitis seen at the Department of Clinical Sciences, College of Veterinary Medicine, University of Minnesota.

Case 1: A 6 year-old neutered male Golden Retriever from Massachusetts was seen for anorexia and lameness of the left hind leg. Cytology of multiple joint aspirates revealed neutrophilic arthritis consistent with an immune-mediated polyarthropathy. Bacterial cultures of the joint fluid were sterile for bacteria and a tick serology panel was also negative. IFA serology for *Bartonella henselae* and *vinsonii* was also negative at the Vector Borne Disease Diagnostic Laboratory at NC State University. However, quantitative PCR for *Bartonella* spp was positive from a lymph node biopsy. The dog was treated with doxycycline (5mg/kg PO BID for 6 weeks) and made a complete recovery. NVL did not test this dog for *Bartonella* by western blot.

Case 2: 6 year-old neutered male English Springer Spaniel was evaluated for fever (105°F), anorexia, and lymphadenopathy of 2 weeks duration. CBC showed a mild thrombocytopenia and there was pyogranulomatous lymphadenitis on histology of a lymph node excision. Serology was negative for antibodies against *Aspergillus* spp, *Blastomyces dermatitidis*, *Coccidioides immitis*, and *Histoplasma capsulatum*. However, we found the dog +3 (infected) by the WB test for *Bartonella* spp. Because of the WB result the dog was discharged on enrofloxacin 8 mg/kg, PO, q 24 h and carprofen 2 mg/kg, PO, q 12 h for 7 days. Clinical signs resolved within 7 days. However, 4 months later the dog's signs recurred with fever and generalized lymphadenopathy. Tick serology was negative at this time and the dog was now treated specifically for the *Bartonella* infection with doxycycline for 4 weeks duration. An IFA test for *Bartonella henselae* and *vinsonii* antibodies on serum collected on day 130 was negative. However, PCR for *Bartonella henselae* was positive from a lymph node biopsy. IFA serology and PCR were

performed at NC State University. Antibiotic therapy did not resolve the clinical signs but the addition of an immunosuppressive dosage of prednisone resolved all signs. The authors concluded that "In dogs with pyogranulomatous lymphadenitis, serologic testing may not detect antibodies against *B henselae*."

Editor's Comment:

This conclusion was made despite the fact that the dog in case #2, tested by WB for *Bartonella* antibodies at this lab at the initial presentation, was positive (+3 infected). Our studies show that the IFA test is less sensitive and less specific than the WB test for detection of antibodies against *Bartonella*. We find that WB serologic testing of dogs for *Bartonella* infection is a valid diagnostic procedure.

Conclusion:

Dogs, like cats, are susceptible to *Bartonella* infection and the subsequent development of chronic inflammatory diseases. Although dogs can be infected, they rarely transmit the bacteria to people and thus we do not recommend routine testing of healthy dogs due to the relatively low prevalence of infection.¹⁹⁻²⁰ However, healthy dogs that are exposed to frequent tick or flea infestations and dogs with chronic illnesses (Table 3) may benefit from *Bartonella* testing.

References:

- Breitschwerdt EB, Kordick DL, Malarkey DE, et al. Endocarditis in a dog due to infection with a novel *Bartonella* subspecies. J Clin Microbiol 33:154-160, 1995.
- Breitschwerdt EB, Atkins CE, Brown TT, et al. *Bartonella vinsonii* subsp *berkhoffii* and related members of the alpha subdivision of the *Proteobacteria* in dogs with cardiac arrhythmias, endocarditis or myocarditis. J Clin Microbiol 37: 3618-3626, 1999.
- Kitchell BE, Fan TM, Kordick D, et al. Peliosis hepatitis in a dog infected with *Bartonella henselae*. J Am Vet Med Assoc 216: 519-523, 2000.
- Pappalardo BL, Brown T, Gookin JL, et al. Granulomatous disease associated with *Bartonella* infection in 2 dogs. J Vet Intern Med 14: 37-42, 2000.
- Chomel BB, MacDonald KA, Kasten RW, et al. Aortic valve endocarditis in a dog due to *Bartonella clarridgeiae*. J Clin Microbiol 39: 3548-3554, 2001.
- Pappalardo BL, Brown TT, Tompkins M, et al. Immunopathology of *Bartonella vinsonii* (*berkhoffii*) in experimentally infected dogs. Vet Immunol Immunopathol 83:125-147, 2001.
- Mexas AM, Hancock SI, Breitschwerdt EB. *Bartonella henselae* and *Bartonella elizabethae* as potential canine pathogens. J Clin Microbiol 40: 4670-4674, 2002.
- Chomel BB, Kasten RW, Sykes JE, et al. Clinical impact of persistent *Bartonella* bacteremia in humans and animals. Ann NY Acad Sci 990: 267-278, 2003.
- Michau TM, Breitschwerdt EB, Gilger BC, et al. *Bartonella vinsonii* subspecies *berkhoffii* as a possible cause of anterior uveitis and choroiditis in a dog. Vet Ophthalmol 6: 299-403, 2003.
- Gillespie TN, Washabau RJ, Goldschmidt MH, et al. Detection of *Bartonella henselae* and *Bartonella clarridgeiae* DNA in hepatic specimens from two dogs with hepatic disease. J Am Med Assoc 222:47-51, 2003.
- Chomel BB, Wey AC, Kasten RW. Isolation of *Bartonella washoensis* from a dog with mitral valve endocarditis. J Clin Microbiol 41:5327-5332, 2003.
- Solano-Gallego L et al. *Bartonella henselae* IgG antibodies are prevalent in dogs from southeastern

USA. Vet Res 35:585-595, 2004.

- Smarick SD, Jandrey KE, Chomel BB. Aortic valvular endocarditis caused by *Bartonella vinsonii* subsp. *berkhoffii* in 2 dogs presenting for fulminant pulmonary edema. J Vet Emerg Crit Care 14:42-51, 2004.
- MacDonald KA, Chomel BB, Kittleson MD, et al. A prospective study of canine infective endocarditis in northern California (1999-2001): emergence of *Bartonella* as a prevalent etiologic agent. J Vet Intern Med 18: 56-64, 2004.
- Goodman RA, Breitschwerdt EB. Clinicopathologic findings in dogs seroreactive to *Bartonella henselae* antigens. Am J Vet Res 66:2060-2064, 2005.
- Saunders GK, Monroe WE. Systemic granulomatous disease and sialometaplasia in a dog with *Bartonella* infection. Vet Pathol 43:391-391, 2006.
- Kelly P, Rolain JM, Maggi R, et al. *Bartonella quintana* endocarditis in dogs. Emerg Infect Dis 12:1869-1872, 2006.
- Morales SF, Breitschwerdt EB, Washabau RJ, et al. Detection of *Bartonella henselae* DNA in two dogs with pyogranulomatous lymphadenitis. J Am Vet Med Assoc 230:681-685, 2007.
- Tsukahara M, et al. *Bartonella henselae* infection from a dog. Lancet 352:1682, 1998.
- Chen TC, et al. Cat scratch disease from a domestic dog. J Formos Med Assoc 106:S65-68, 2007.

More *Bartonella* references can be obtained at:
www.nlm.nih.gov/

Happy 99th Birthday Mrs. Adeline Shipp



Mrs. Shipp celebrates her 99th birthday
on June 12, 2007



The staff of NVL celebrated Mrs. Shipp's 99th birthday at her home on June 12, 2007. Mrs. Shipp reported all of NVL's FeLV and FIV test results by telephone for 25 years before the widespread acceptance of the fax machine. Her pleasant nature and personality was a client builder for the laboratory for many years. Some hospitals would call just to chat with Addie even when no test results were pending. We were most fortunate to have had such an intelligent, industrious and pleasant person as a member of our staff for 25 years. Mrs. Shipp retired from NVL in 1992 at the age of 90! The NVL staff has a combined 205 years of specialty veterinary testing experience (average 29 years per person). From left to right standing Valerie Sellen 33 years, Mari Bertero 22 years, Gloria Longo 22 years, Dr. Hardy 45 years, Gina Guerriero summer student, Evelyn Zuckerman 33 years. Front Row Mrs. Shipp 25 years (retired at 90 years of age) and Susan Hardy 25 years.