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NEWSLETTER

Feline *Bartonella* Have Some Nerve! Neurologic Diseases Caused by Feline *Bartonella*® Summer 2006

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In This Issue:

The Summer 2006 issue of the NVL Newsletter will review the neurologic diseases caused by feline *Bartonella* in cats and people. Once again we are learning from the human experience with feline *Bartonella*-caused neurologic diseases and thus looking for corollary diseases in cats. We think we have found some!

Neurologic *Bartonella* Diseases of Cats and People:

Introduction:

Once again the occurrence of human diseases of the nervous system, caused by feline *Bartonella*, have given veterinarians clues as to possible corollary diseases in cats, the bacteria's natural reservoir host. There are many publications on human neurologic diseases caused by feline *Bartonella*. We will concentrate on diseases of the central nervous system and exclude retinitis and optic nerve neuritis, which were discussed in the last issue of our Newsletter.

There are 3 possible mechanisms by which any bacterium may damage a tissue: 1) direct effect such as invading cells and causing damage or cell death, 2) secreting a bacterial toxin which causes cell damage, or 3) by inducing inflammation resulting in space-occupying granulomas or by inflaming the vasculature supplying the tissues-vasculitis or arteritis.

Human Neurologic Diseases:

Although most physicians are familiar with the classical Cat Scratch Disease (CSD) where the prodrome is a papule at the scratch or bite site, fever, and regional lymphadenopathy proximal to the papule, many are not familiar with the sequelae or complications that can occur. It has been estimated from the medical literature that sequelae occur in 5% to 13% of CSD patients.¹ The sequelae include skin disease, major organ involvement, ocular disease and neurological diseases. Approximately 2% of the 22,000 annual cases of CSD in the United States develop neurologic complications.^{2,3} In one study, 25% of the 36 patients with CSD who were hospitalized had neurologic complications, and the majority experienced lengthy hospital stays.³ The various

neurologic diseases caused by feline *Bartonella* in humans are listed in Table 1.

Table 1

Human Neurologic Diseases Caused by Feline *Bartonella*

- Encephalitis
- Encephalopathy- Granulomas
- AIDS Encephalopathy
- Meningitis
- Seizures
- Status Epilepticus
- Coma
- Dementia
- Aggression- Combativeness
- Headaches- Encephalalgia
- Hemiparesis

Encephalitis:

Encephalitis, inflammation of the brain, is a common neurological sequelae of CSD (*Bartonella* infection) in people. There are numerous causes of encephalitis: viruses (*Herpes viruses*, *Arboviruses*, *Rabies*, and *Enteroviruses*), bacteria (*Borrelia burgdorferi*, *Bartonella*, *rickettsia*, and *Mycoplasma pneumoniae*), fungi (*Coccidioides immitis* and *Histoplasma capsulatum*), parasites (*Amebae* and *Helminths*), and noninfectious causes (autoimmune diseases, cardiovascular diseases and cancer). However, in many cases (32%-75%) of encephalitis the etiology is unknown.

There are numerous reports of feline *Bartonella* induced encephalitis in people.^{2,3,4} Many of the encephalitis patients present with seizures, severe headaches and altered mental status (combativeness, dementia).⁴ One recent case of meningitis and encephalitis was fatal in a 4-year-old girl from Tennessee.⁵

In a 2 year study of the etiology of encephalitis, 7 (2%) of 334 cases were caused by feline *Bartonella*.² Four of the 7 cases occurred in children 7 years of age or younger.

Encephalopathy:

Encephalopathy, any disease of the brain, is the most common neurologic sequelae of CSD (*Bartonella* infection) in people.^{3,8} In the medical literature encephalopathy is usually used to refer to granulomatous lesions of the brain.

A severe case of encephalopathy occurred in a 10-year-old girl who had a 3 week history of pain in the left ear, fever, and malaise.⁶ CT and MR imaging showed a mass in the left middle cranial fossa (arrow Figure 1) and liver lesions.

Figure 1



Roebuck, DJ *Am J Neuroradiol* 19:1294, 1998.

The imaging appearances were consistent with meningioma, lymphoma, or other neoplasms, and a liver biopsy and craniotomy were performed. The craniotomy revealed a granuloma at the left trigeminal nerve. The Warthin-Starry stain of the mass demonstrated *Bartonella* organisms and serology showed a rising IgG titer to 1:1,024 to *Bartonella henselae*. The girl recovered completely after therapy.

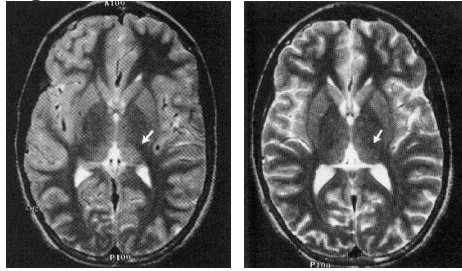
Seizures- Status Epilepticus:

Many of the *Bartonella* infected patients with neurologic complications have seizures and/or status epilepticus. Status epilepticus is defined as repeated seizures or a seizure lasting more than 30 minutes. At one hospital in Virginia, status epilepticus occurred in 6 school children after they recovered from classical CSD. A review of the hospital's records found that 5 of 6 children, with status epilepticus of unknown etiology, were serologically positive for *Bartonella henselae*.⁹

Seizures are likely the result of *Bartonella* granulomas that often localize in the thalamus, which plays an important role in the generation of seizures.⁷ An 11-year-old boy living with his parents and 2 kittens was hospitalized unconscious due to seizures.¹⁰ The EMT found the boy confused, combative, and unresponsive to verbal stimuli. He had been well until the day he had the seizures. There was no CSD prodrome and the blood cultures

were sterile. The MRI showed increased signal intensity in the pulvinar of the left thalamus, Figure 2. The boy was IgG positive for *Bartonella henselae* and recovered fully with antibiotic therapy.

Figure 2 NEJM 338:112, Jan. 8, 1998



Increased signal intensity in the pulvinar of left thalamus (arrow). One month after treatment: resolution of abnormal signal

Psychotic Disorders:

The August 2005 issue of National Geographic Magazine had a news item entitled “Who Knew? Your Cat Could Make You Crazy.” In the article it reported that some infectious agents,



Toxoplasma gondii and *Borrelia burgdorferi* can cause psychotic disorders in humans. We feel that *Bartonella* should be added to this list. In this regard, we have studied 2 people who were hospitalized due to psychoses who recovered after therapy for their *Bartonella* infections. Several case histories reported psychotic disorders, dementia, and aggression in people with neurologic disorders caused by feline *Bartonella*.^{10, 11}

disorders, dementia, and aggression in people with neurologic disorders caused by feline *Bartonella*.^{10, 11}

Feline Neurologic Diseases:

Experimental *Bartonella* Diseases:

Several studies found that experimentally infected cats developed neurologic disease characterized by: aggression, unusual sensitivity to touch and noise, and reduced responsiveness to external stimuli during their infections.^{13,14}

Pet Cats:

We have collected data from numerous practitioners who have submitted *Bartonella* tests from cats with neurologic diseases (Table 2).¹⁵

Table 2 *Bartonella*-Infection in Cats with Neurologic Diseases*

Disease	# Tested	# Infected	%	/X
Healthy no risk factors	840	170	20%	X
Seizures	176	67	38%	1.9X
Aggression	174	71	41%	2.1X
Excessive Grooming	50	26	52%	2.6X
Not Specified	286	120	42%	2.1X
Totals:	686	284	42%	2.1X

* Many cats had multiple signs of neurologic diseases, thus totals in Table exceed the total number of cats tested.

Therapy:

There was clinical improvement of 50% or greater, in 30 of the 38 cats (79%), and complete resolution of disease in 42% of these cats treated for *Bartonella* (Table 3).¹⁶ We have received numerous clinical observations from practitioners that, along with a good clinical response to an inflammatory disease, Azithromycin therapy also improved the “personality” of the cat, making it more sociable with the family. In addition, some aggressive cats became non-aggressive or “mellow” after antibiotic therapy.

Table 3
Therapy of *Bartonella*-Infected Cats with Neurologic Diseases

Clinical Improvement	Number of Cats	%	
Unknown	2	5%	
None	<50%	6	16%
Fair	50-59%	1	3%
Good	60-79%	8	21%
Excellent			
	80-99%	5	13%
	100%	16	42%
Totals:	38	100%	

Dr. Jan White

Renton Veterinary Hospital:

Aggression:

Dr. Jan White, owner of the Renton Veterinary Hospital, Renton, Washington, has been interested in the association of *Bartonella* and aggression in cats. We asked her to give a short summary of her observations:

I (Dr. White) became interested in aggression in cats after reading several studies that found kittens and cats, experimentally infected with *Bartonella henselae*, became aggressive and excitable.^{13,14} My own kitten became aggressive in her first year of life, and when tested for *Bartonella* was positive. She was so aggressive that I did not think I would be able to treat her without caging her. However, with each dose of Azithromycin, she became easier to catch and treat. After treatment, she was much easier to handle and was friendlier. As a result of this experience, I began testing aggressive cats for *Bartonella*. In addition, my dog became one of those “biting Cocker Spaniels,” tested positive, but has not bitten me since being treated. I have since tested 5 aggressive dogs, 3 of which were positive.

In veterinary practice, there are a significant number of cats that present as “fractious” and are difficult to medicate or even examine. I began to ask owners if their cats had “short tempers” at home or took a whack at people who attempted to pet them. I correlated this information with a history of fleas during or before the time the aggressive behaviors began and started to do *Bartonella* tests based on this information. I have now tested 49 aggressive cats and 27 (55%) were *Bartonella* positive. At the annual exams of these cats following their treatment, I asked about the aggression and owners commonly commented that their cats were friendlier and even more surprisingly, they were thrilled to see that their cats began to play like kittens again, even in cats age 14 and over.

Aggression or just being “plain mean” can be a presenting reason for euthanasia and such behaviors can break the companion animal bond with some owners. A cat in my practice was recently relinquished because “it was never really nice to me and when I acquired a new puppy, it routinely attacked it for no good reason.” Our hospital adopted this cat and found it to be *Bartonella* positive. After treatment the aggression improved and we are now looking for a new forever home for this 13 year old cat. It can literally be life-saving to identify *Bartonella* infected aggressive cats/kittens and intervene prior to their being presented for euthanasia. We have seen improvement in the aggression in about 40% of the *Bartonella* infected cats that we have treated. It is important for veterinarians to listen to their clients and think of *Bartonella* when they see fractious cats in the hospital, since human love is not unconditional.

Summary: *Bartonella* should be considered as a possible etiology for cats with neurologic diseases and aggression.

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