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NEWSLETTER

Bartonella and the Musculoskeletal System: Where is the Cat?©

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In This Issue:

The Summer 2018 NVL Newsletter will review the effects of *Bartonella* in the musculoskeletal system of animals and humans. The musculoskeletal system is comprised of 3 basic components: 1) bones, 2) muscles, and 3) joints where *Bartonella* are rare, but significant pathogens. This issue was stimulated by a case of a mother, whose daughter recovered from classical cat-scratch disease (CSD), only to develop chronic arthralgia and myositis. We tested the family's cat who was FeBart® western blot (WB) +4 seropositive.¹

Introduction:

The musculoskeletal system (MSS) provides form, support, stability, and movement to the body. It is made up of the bones, muscles, and joints. Twenty percent of the human adult skeleton is replaced each year. Moderate amounts of physical activity and weight-bearing activities are essential to stimulate bone maintenance and to maintain adequate bone strength. Similar bone physiology probably occurs in animals.

There are 206 bones in the adult human body. The bones of people and animals perform five main functions for the body: 1) support: bones support for the entire body. Some allow for the attachment of soft tissues and organs. Bones store minerals and lipids. Calcium is the most abundant mineral in the body and 99% of the body's calcium is stored in bones. The bones also store energy reserves as lipids (fats) in areas filled with yellow marrow in adult animals. Bones harbor cells that produce blood cells: RBCs, WBCs, and platelets are produced in the red marrow, which fills the internal cavities of many bones. Bones protect body organs and provide leverage and movement for the body in conjunction with muscles and joints.

Musculoskeletal Diseases:

All 3 main anatomical areas of the musculoskeletal system are targets for *Bartonella* inflammatory diseases, the names of which often end in "itis."

Common Musculoskeletal Disease Terms:

Arthropathy: A general term for any disease of the joints.

Osteoarthritis: Occurs when the articular cartilage wears down exposing bone.

Rheumatism: (Rheumatic) various conditions characterized by inflammation or pain in muscles, joints, or fibrous tissue.

Musculoskeletal Diseases (MSD):

- Bone:** Osteomyelitis
Osteoarthritis
Osteitis
- Muscle:** Myalgia
Myositis
Polymyositis
Fibromyalgia
Polymyalgia Rheumatica
- Joints:** Arthropathies
Arthritis
Juvenile Arthritis
Reactive Arthritis
Rheumatoid Arthritis
Arthralgia
Bursitis
Spondylitis
Ankylosing Spondylitis
Tendonitis

Feline:

There continues to be controversy regarding whether *Bartonella* cause diseases in cats despite numerous publications to the contrary, some published as long as 19 years ago.



Those early publications, of experimental studies, documented numerous diseases, some of which were musculoskeletal diseases. O'Reilly and her colleagues reported fever, lymphadenopathy, and **myalgia** in 13 of 17 cats.² Their second study found **myositis** in 3 of 9 kittens.³ More recently, 5 of 13 (38.5%) cats with *Bartonella*-induced infective endocarditis also showed signs of inflammatory **arthritis**, (lameness), a MSD clinical sign.⁴ Another clinical report described pyogranulomatous myocarditis and diaphragmatic **myositis** in 2 young cats.⁵

Finally, in another study, 33 of 94 (35.1%) pet cats with painful degenerative joint disease were positive by IFA for *Bartonella* spp.⁶ Measurement of pain scores for both groups found that the *Bartonella* positive cats had less pain than the uninfected cats. No antibiotic therapy of infected cats was described; thus, the etiology of

the arthritis was not ascertained. This study does not elucidate any new information regarding the *Bartonella* etiology of MSD in cats. MSD are uncommon *Bartonella*-induced diseases in cats.

Our FeBart® cat *Bartonella* western blot (WB) seroprevalence data from 1999 through 2005 is presented in **Table 1**. We also found that *Bartonella* infections are more prevalent in cats than in dogs from all areas of the country, even in households where dogs were living with *Bartonella*-infected cats and likely sharing the cat flea, *Ctenocephalides felis*. MSD are not common in cats and the *Bartonella* incidence in MSD cats is approximately the same as healthy cats with no risk factors for infection. However, most of the *Bartonella*-infected cats responded promptly to azithromycin therapy indicating that *Bartonella* was most likely the cause of these uncommon MSDs.⁷

Table 1 *Bartonella* Infected Cats with Musculoskeletal Diseases- NVL 2005

Disease	# Tested/ # +	% +	X
Healthy- No Risk Factors	6,912/2,054	30%	X
Lameness	115/45	39%	1.3X
Myositis/ Myopathy	104/29	28%	0.9X
Arthritis/Polyarthritis	297/72	24%	0.8X
Totals	516/146	28%	0.9X

Canine:

Even though *Bartonella* infection is much less common in dogs than cats, MSD occur more frequently in dogs than in cats. One of the largest studies of the *Bartonella* spp sero-prevalence found 102 of 3,417 (3%) dogs seropositive for one or more *Bartonella* spp (*B. vinsonii* subsp *berkhoffii*, *B. clarridgeiae*, or *B. henselae*).⁸ Seropositive dogs were more likely to be lame or have arthritis-related lameness (polyarthritis, osteoarthritis, cervical spondylosis and myelopathy). Larger sporting breeds were more often positive compared to smaller breeds.



Canine Musculoskeletal System

Table 2 shows our data of *Bartonella* association in dogs with MSD. Our canine WB *Bartonella* seroprevalence was highest in the southern gulf states of Alabama, Texas and Florida. One of the

most common systems for *Bartonella* diseases in dogs is the MSS along with lymphadenopathy and heart disease.

Table 2 *Bartonella* Infected Dogs with Musculoskeletal Diseases- NVL 2005

Disease	# Tested/ # +	% +	X
Healthy- No Risk Factors	641/31	5%	X
Lameness	53/13	25%	5X
Myositis/ Myopathy	68/26	38%	8X
Arthritis/Polyarthritis	214/71	33%	7X
Totals	335/109	33%	7X

Human Musculoskeletal Disease:

Bartonella infection in humans can vary greatly from the classical cat-scratch disease to the more severe systemic manifestations in any organ.



Human Musculoskeletal System

The former human *Bartonella* paradigm stated that *Bartonella* caused CSD, a self-limiting condition, occurring mostly in children, is characterized by fever, a papule at the scratch site and regional lymphadenopathy. Most cases resolved without antibiotic therapy although there can be systemic involvement in major organs. In the new paradigm, bartonellosis consists of CSD and more clinically significant, and even rarely life-threatening, pathology in major organ systems including the musculoskeletal system. Often human MSDs will remain as chronic, sometimes debilitating, diseases.

Giladi and his colleagues have published 2 excellent large clinical studies of MSD associated with CSD (bartonellosis).^{9,10} In their 11-year studies, all clinical diagnostic specimens were sent to the Israel National Reference Laboratory, the Bernard Pridan Laboratory for Molecular Biology and Infectious Diseases in Tel-Aviv. The first study followed 841 CSD patients and the second followed 913 patients who developed MSD.



Joints often affected in CSD associated MSD

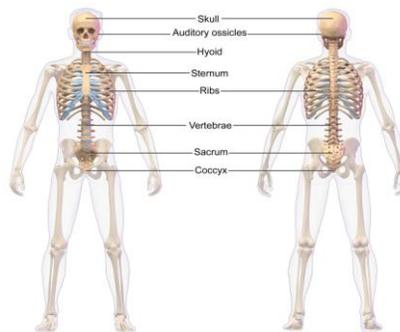
The first study followed 841 CSD patients, 24 (2.9%) who had rheumatoid factor-negative arthropathy and all had lymphadenopathy.⁹

Females, older than 20 years of age, comprised 67% of the cases. Knee, wrist, ankle and elbow joints were most often affected. Ten patients (42%) developed severe arthropathy in their weight-bearing joints which limited their ability to walk. Four patients required hospitalization. Nineteen patients (79.2%) recovered after a median duration of 6 weeks, but 5 (20.8%) developed chronic debility persisting from 16 to 53 months. Their conclusion was that CSD associated MSD is often severe and disabling and may become chronic.



***Bartonella*-associated MSD can be chronically debilitating**

Their second study, 2 years later, of 913 patients, found that 96 (10.5%) developed MSD.¹⁰ Myalgia was the most frequent manifestation in this group occurring in 53 patients (5.8%) and was often severe lasting from 1-26 weeks. Arthritis or arthralgia occurred in 50 patients (5.5%). These localized in the medium and large joints and was moderate to severe in 26 patients lasting from 1-240 weeks. Signs lasted more than a year in 7 patients and 5 developed chronic disease. This group concluded that MSDs are more common sequelae than previously thought and affect 10% of people who develop classical CSD. Osteomyelitis, the best-known MSD associated with CSD, is in fact the rarest. However, there are numerous case reports of inflammatory and lytic bone lesions induced by *Bartonella*. Osteolytic *Bartonella* lesions occur often in the axillary skeleton of children.^{11,12,13}



The Axial Skeleton

Blaussen.com staff (2014). "Medical gallery of Blaussen Medical 2014". WikiJournal of Medicine 1 (2). DOI:10.15347/wjm/2014.010. ISSN 2002-4436. - Own work, CC BY 3.0, <https://commons.wikimedia.org/w/index.php?curid=27796925>

Most pediatric and adult patients recovered from their *Bartonella* inflammatory bone lesions without complication, although some required long-term antibiotic therapy.

On a lighter note, there is an unusual report of a young man with CSD who showed signs of fever, bone pain and dysautonomy characterized by erectile dysfunction. He was successfully treated, we assume also for his erectile dysfunction, with 3 weeks of tetracyclines.¹⁴

In our studies, over the past 19 years, of cases of human bartonellosis occurring in households from

which we tested cats for *Bartonella* infections, many people reported mild MSDs associated with their infections.^{15,16} However, some reported being so debilitated that they were unable to work or go to school for significant periods of time.

Summary:

MSDs are uncommon sequelae of *Bartonella* infections in cats, dogs and people. In reviewing dozens of articles on this topic, we noted that most cases were confirmed by positive *Bartonella* serologic tests and many were treated with antibiotics which improved or cured their diseases. Finally, numerous cases that resolved with therapy, also showed a corresponding decrease or elimination of *Bartonella* antibody titers. This laboratory was the first to introduce *Bartonella* testing for veterinarians and we have been espousing these principles, techniques and recommendations, in our *Bartonella* testing and research, over the past 19 years.

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***Bartonella* references can be obtained at:**

www.nlm.nih.gov/or/natvetlab.com
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