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NEWSLETTER

4th International *Bartonella* Conference

August 26-28, Uppsala, Sweden

Evelyn E. Zuckerman, Editor **Fall 2004** **Vol. 3, Number 4**

In This Issue:

The fall 2004 issue of the NVL Newsletter will cover the feline and canine papers presented at the 4th International *Bartonella* Conference that was held August 26-28 at The Evolutionary Biology Centre, Uppsala University in Uppsala Sweden. The human *Bartonella* reports and pathogenesis papers will be covered in the next issue of our Newsletter.

The Conference:

The conference was attended by about 100 scientists from around the world: Japan, Russia, France, Germany, Sweden, Italy, Israel, Switzerland, United Kingdom, Peru, South Korea, and the United States. Two elegant conference dinners were given, one in the Saluhallen (marketplace) and the other at the elegant Orangeriet, Linnaeus Garden. The Orangeriet, Linnaeus is the home of the noted Swedish scientist Carolus Linnaeus. The setting was historic, elegant and the food was excellent.

The Orangeriet, Linnaeus
The home of the Swedish scientist
Carolus Linnaeus

Carolus Linnaeus (1707-1778) was Sweden's most famous biologist. In 1744 he suggested the centigrade scale which perfected the thermometer, reversing the temperature scale of Anders Celsius so that 0 represented the freezing point of water and 100 represented the boiling point. Linnaeus also invented the practice of naming all species by 2 names (binomial) a *genus* name followed by a *species* name (*Bartonella henselae*) and began the practice of grouping species hierarchically into orders, classes and kingdoms. It was fascinating to have been able to stand in his beautiful home library and examine the preserved specimens that he used in his work.

The Scientific Sessions:

The scientific sessions were comprised of 17 oral presentations and 17 posters during the 3-day meeting. Six papers covered feline *Bartonella* whereas 2 papers described canine *Bartonella*. Two abstracts from our Laboratory were accepted for inclusion in the meeting. Dr. Hardy gave a 45 minute presentation on feline *Bartonella* other inflammatory diseases, with emphasis on ocular diseases, and *Bartonella* therapy (see abstracts in this Newsletter). *Bartonella* infection in humans, sheep, cattle, woodland rodents, insects, and the mechanisms of *Bartonella* pathogenesis and genome analysis comprised the remaining presentations.

Canine and Feline Papers:

Bartonella-Induced Ocular Inflammatory Diseases of Cats.

Hardy, WD, Jr.[1], Zuckerman, E[1], Ketring, K.[2], Fischer, C.[3] and Mineo, M.[3]
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Background: *Bartonella* have a predilection to inflame vascular tissues in all host species. The eye is a very vascular organ that readily shows evidence of inflammation. There are numerous reports of human ocular diseases caused by *Bartonella* infection obtained from pet cats (Perinaud's oculoglandular syndrome, chorioretinitis, uveitis, retinal detachment, blepharitis, unifocal helioid choroiditis, disciform keratitis, orbital abscess). However, there are only several reports of *Bartonella*-induced ocular diseases in cats. **Methods:** 47,962 cats from throughout the United States (1,653 veterinary hospitals and 2 ophthalmology board-certified veterinarians, KK and CF) were serologically tested for *Bartonella* antibody, by a western immunoblot (WB). 5,711 (11.9%) of these cats had ocular diseases. Treatment of *Bartonella*-infected cats consisted of azithromycin or rifampin at 10mg/kg orally once daily for 10-21 days. Clinical therapeutic evaluations of 170 cats with ocular diseases were obtained and 70 (40%) of these were diagnosed, treated, and evaluated by the 2 board certified veterinary ophthalmologists (KK and CF). Post therapy WB titrations were done on 91 cats, 6 months after the end of therapy, to determine titer reductions indicating that *Bartonella* was eliminated. **Results:** 170 of 840 (20%) healthy cats, with no reported risk factors for *Bartonella* infection (flea exposure, etc.) were positive by WB. This group served as the base line *Bartonella* prevalence (X) for comparison with the *Bartonella* incidence in cats with ocular inflammatory diseases. *Bartonella* infection was found in a total of 2,772 of 5,711 (48.5%, 2.45X) cats with inflammatory ocular diseases: conjunctivitis 2,259 of 4,750 (47.6%), uveitis 364 of 667 (54.6%), corneal ulcer 53 of 98 (54.1%), keratitis 42 of 97 (43.3%), chorioretinitis 18 of 32 (56.3%), epiphora 13 of 27 (48.2%), glaucoma 16 of 21 (76.2%), and blepharitis 7 of 19 (36.8%). Clinical improvements after therapy were evaluated as follows: excellent 80-100%, good 60-79%, fair 50-59% and failure <50% improvement. There were 170 cats with conjunctivitis (111) and uveitis (59) available for clinical evaluation of therapy. Therapy results were: conjunctivitis- excellent 82 (74%), good 9 (8%), fair 5 (5%), and failure 15 (13%): uveitis- excellent 43 (73%), good 5 (9%), fair 3 (5%), failure 7 (12%), and worse 1 (1%). Thus, clinical improvement, due to *Bartonella* antibiotic therapy, occurred in 147 of the 170 (87%) cats. Therapy titration tests were done for 91 of the 170 cats that were clinically evaluated. A reduction in antibody titer occurred in 79 of the 91 (87%) treated cats indicating successful anti-*Bartonella* therapy. There were reductions in *Bartonella* antibody titers in 63 of 68 (93%) cats with improved clinical outcomes whereas 12 of 17 (71%) cats who did not improve clinically had titer reductions. Reductions in *Bartonella* antibody titers occurred in 4 of 6 (66.7%) cats where no clinical evaluation was available. **Conclusion:** *Bartonella* appears to cause a significant portion of ocular inflammatory diseases in cats and *Bartonella* antibiotic therapy was clinically effective in 87% of infected cats, even many who had been non-responsive to previous ophthalmologic therapies and some who were co-infected with other infectious agents, *Herpesvirus* and *Toxoplasma gondii*, known to cause ocular diseases in cats.

Epidemiology of Bartonella Infection in Domestic and Wild Carnivores. Bruno Chomel, *et al*. School of Veterinary Medicine, Univ. California, Davis, CA. Dr. Chomel reviewed the epidemiology of canine and feline *Bartonella*. He described a second case of endocarditis in a cat from New York that was originally tested +4 by our laboratory. He reported that *Bartonella* has been found in wild felids including Pumas, bobcats, lions, and cheetahs. He also noted that 3% of dogs in the eastern US and 10% of army dogs were seropositive. Most infected dogs were field dogs exposed to ticks and fleas. The clinical signs were often lameness, arthritis related to lameness, nasal discharge and epistaxis and splenomegaly. *Bartonella*, related to *B. clarridgeiae*, have also been isolated from wild canids, gray foxes and raccoons.

Comparative Medical Features of Canine and Human Bartonelloses. EB Breitschwerdt, *et al*, College of Veterinary Medicine, North Carolina State University, Raleigh, NC. Dr. Breitschwerdt reviewed the similarities of *Bartonella* induced diseases in dogs and humans with emphasis on endocarditis. A significant increase in antinuclear antibodies in dogs infected with *B. vinsonii* (*berkhoffii*) was reported. He also noted that *B. henselae*, the predominant feline *Bartonella*, was found more often in dogs than has been previously described.

Identification of Swedish Bovine and Feline Bartonella Isolates by 16S rDNA Sequencing. Olsson Engvall, *et al*., National Veterinary Institute, Uppsala, Sweden. Dr. Engvall reported a low prevalence (2.9%) of *Bartonella* infected cats in southern Sweden where fleas are endemic. In the colder northern portion of Sweden, where there are no fleas, no *Bartonella* infected cats have been reported. As would be expected, CSD occurs infrequently in Swedish patients.

Identification and Characterization of a Bartonella henselae Strain Isolated in Italy. L. Ciceroni, et al., Istituto Superiore di Sanita, Rome, Italy. Dr. Ciceroni described DNA sequencing of several Italian *Bartonella* isolates. This group concluded that *Bartonella* are able to develop genotypic variability between genetically related strains. This may be significant in the ability to generate pathogenic strains capable of inducing different tissue tropisms and thus diseases in cats and humans. It may also make the development of a vaccine more difficult.

Worldwide Prevalence of *Bartonella* Infection in Cats:

The following is a summary of the worldwide prevalence of *Bartonella* infection in cats based on reports from the 4th International *Bartonella* Conference and a review of the literature:

USA- North- 20% South-60%
Hawaii- 89%
Canada- 20%
Caribbean- 70%
Sweden- South- 3%, North- 0%
United Kingdom- 40%
France- 10-20%
Italy- 20-40%
Africa- 25%
Australia- 15-40%
Philippines- 70%
Indonesia- 55%

Bartonella-Induced Inflammatory Diseases of Cats: An Increasing Spectrum.

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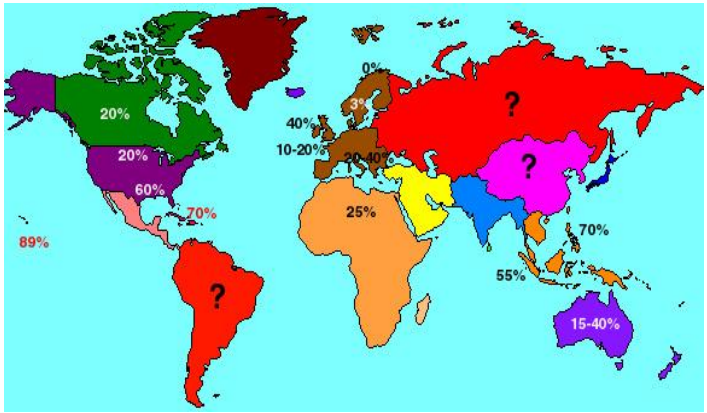
Background: *Bartonella* species induce chronic inflammation in any tissue due to their tendency to adhere to vascular endothelium. The chronic *Bartonella* bacteremia in cats leads to the probability that many tissues will be inflamed. Our previous findings indicated that, as in humans, *Bartonella* cause inflammatory diseases in a wide variety of tissues in cats. We have continued to survey pet cats for *Bartonella* infection and have compiled data from cats treated for *Bartonella*-associated inflammatory diseases. **Methods:** 47,962 cats were serologically tested for *Bartonella* antibody, by a western immunoblot (WB), from throughout the United States (1,653 veterinary hospitals). Treatment of *Bartonella*-infected cats consisted of azithromycin or rifampin at 10mg/kg orally once daily for 10-21 days. Clinical evaluations of the therapy of 1,344 cats were obtained by collaborating veterinarians and post therapy WB titration tests, 6 months after the end of therapy, were done for 1,139 of these cats to determine the success of the *Bartonella* therapy. **Results:** 170 of 840 (20%) healthy cats, with no reported risk factors for *Bartonella* infection (flea exposure, etc.), were positive by WB. This group served as the base line prevalence of infection (X) for comparison with the occurrence of *Bartonella* in cats with inflammatory diseases. **Diseases:** A high incidence of *Bartonella* infection was found in cats with the following diseases: **Oral diseases**: 14,466 of 29,126 (49.7% 2.5X) cats, gingivitis 10,593 of 22,072 (48.0% 2.4X), stomatitis 2,905 of 5,285 (55.0% 2.75X), oral ulcers 968 of 1,769 (54.7% 2.75X); **Respiratory diseases**: 3,737 of 7,453 (50.1% 2.5X) cats, URI 3,266 of 6,567 (49.8% 2.5X), rhinitis 266 of 490 (54.3% 2.7X), sinusitis 205 of 396 (50.1% 2.5X); **Ocular diseases**: 2,772 of 5,711 (48.5% 2.45X) cats, conjunctivitis 2,259 of 4,750 (47.6% 2.4X), uveitis 364 of 667 (54.6% 2.75X), corneal ulcer 53 of 98 (54.1% 2.7X), keratitis 42 of 97 (43.3% 2.15X), chorioretinitis 18 of 32 (56.3% 2.8X), epiphora 13 of 27 (48.2% 2.4X), glaucoma 16 of 21 (76.2% 3.8X), and blepharitis 7 of 19 (36.8% 1.85X); **GI diseases**: 1,116 of 2,319 (48.1% 2.4X) cats, inflammatory bowel disease 243 of 487 (49.9% 2.5X), chronic diarrhea 460 of 952 (48.3% 2.4X), chronic vomiting 413 of 880 (46.9% 2.35X); **Other diseases**: lymphadenopathy 628 of 1,265 (49.6% 2.5X), fever of unknown origin 835 of 1,785 (46.8% 2.4X), liver disease 70 of 167 (41.9% 2.1X), heart disease 203 of 374 (54.3% 2.7X), neurological disease 43 of 105 (41.0% 2.0X), and diabetes mellitus 222 of 482 (46.1% 2.3X). **Therapy**: Clinical improvements were evaluated in 1,344 cats as follows: excellent 80-100%, good 60-79%, fair 50-59% and failure <50% improvement. Complete disease resolution occurred in 542 cats (40.3%), 90% improvement in 216 cats (16.1%), 80% improvement in 111 cats (8.3%), good 60-79% improvement occurred in 144 cats (10.7%), fair 50-59% improvement in 102 cats (7.6%), whereas there was no improvement (<50%) in 220 cats (16.4%) and the disease became worse in 9 cats (0.6%). Thus, 83% of the treated diseased cats improved >50%, while 64.7% improved 80% or greater. Many of these cats had failed previous empirical antibiotic and steroid therapy. Interestingly 10 of the 85 diabetic cats, that were evaluated, no longer required insulin maintenance and an additional 10 cats required significantly less insulin after *Bartonella* therapy. Overall, 936 of 1,139 (82.1%) of treated diseased cats had a 2 fold or greater reduction in their *Bartonella* antibody titers. *Bartonella* antibody titers decreased after therapy as follows: excellent improvement 663 of 722 (91.8%), good improvement 107 of 121 (88.4%), fair improvement 66 of 93 (71.0%), no improvement 96 of 194 (49.5%), and cats that became worse 3 of 9 (33.3%). **Conclusion:** *Bartonella* appears to cause a significant portion of chronic inflammatory diseases in various tissues in cats. Diseases similar to most of these feline *Bartonella*-associated diseases were first reported in humans and were caused by *Bartonella* transmitted from cats. *Bartonella* antibiotic therapy was clinically effective in 83% of these cats, even many who had been non-responsive to previous therapies and some who were co-infected with other infectious agents. In some cats, *Bartonella* appears to be one component of a polymicrobial disease process.

Feline *Bartonella* Prevalence