Bartonella Infection: An Underrecognized Threat

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Bartonella infection is a potential zoonotic threat to anyone who has contact with a cat. Immunocompromised, young, or elderly people—and especially veterinary technicians and assistants—have a higher risk for contracting the bacterial disease frequently called cat-scratch disease (CSD), which is caused by the Bartonella henselae bacterium. My knowledge of Bartonella infection had not been much beyond the words of the song “Cat Scratch Fever,” so when a client’s physician recommended testing her cat for Bartonella spp, I decided to educate myself. I share this information with hope that other veterinary technicians and assistants will help to increase public awareness of the health threat posed by Bartonella spp.

Since 1889, Bartonella infection, resulting in various degrees of illness, has been documented in humans.1 B. henselae was recently extracted from the dental pulp of a cat that lived over 800 years ago, showing that infection with Bartonella spp is not new but has been underrecognized.2 Currently, 16 Bartonella spp have been identified, but many more species have not been named. This article focuses on B. henselae.

Prevalence
Studies of feline exposure to Bartonella spp have been conducted worldwide. Infections have been documented in Africa, Australia, and Eastern and Western Europe.3 In the United States, the prevalence of Bartonella infection is higher in warm, humid areas and in cats that have, or have had, flea infestation. In the United States, 5% to 40% of cats are infected with B. henselae, depending on the geographic region.3 Although other mammals may carry B. henselae, domestic cats are the primary reservoir responsible for human infection.3

Transmission
Bartonella bacteria have tiny surface structures that allow them to adhere to red blood cells and endothelial tissue and thereby infect a wide variety of tissues—most commonly respiratory and oral mucosa, skin, lymph nodes, and ocular, splenic, liver, and gastrointestinal tissue.1 Cat fleas (Ctenocephalides felis) are known to transmit Bartonella spp between cats, but these bacteria have also been found in biting flies and ticks, which should be considered potential vectors.2 Uninfected fleas can pick up the bacteria from an infected cat during feeding. The bacteria thrive in the flea hindgut and are passed in flea feces, where they can survive for up to 9 days.2 Cats become infected when they ingest infected flea waste while grooming. One study tested the flea-excrement route of transmission. B. henselae was experimentally transmitted to cats by putting infected flea waste on them without the cats having direct flea contact. These cats later tested positive for Bartonella spp. To prove these findings, cats that had not been exposed to Bartonella spp were exposed to Bartonella-infected fleas for feeding but not to flea excrement. These cats did not develop Bartonella infection, suggesting that flea excrement, not saliva, is key to transmission.3

Bartonella spp are transmitted from cats to humans mainly by scratches from cat claws that have become contaminated with the bacteria while grooming. An open wound on a person may become contaminated if a cat licks the wound and has the bacteria in its mouth due to recent grooming.4 Humans can also contract the disease if infected flea excrement directly contacts an open wound.

Bartonella Infection in Humans
The most recognized human disease due to Bartonella infection is CSD. Recent studies have shown that more than half of cases involve people older than 21 years.1 The most disconcerting information regarding human Bartonella infection is that it is currently the most common zoonotic disease in the United States.1
alone, there are 22,000 cases of CSD each year, resulting in 2000 hospitalizations. Of these affected humans, 90% had contact with a cat, 57% to 83% had a cat scratch, and 4% had contact only with dogs. Most cases occur in summer and fall, corresponding with peak arthropod seasons. These data represent only a portion of CSD cases because most infections are self-limiting and, therefore, are not reported.1

Initial symptoms may occur within 3 to 10 days of exposure to the organism. A reddened nodule may appear at the inoculation site. Between 12 and 50 days after exposure, there may be drainage from the inoculation site and enlargement of lymph nodes near the affected area. Thirty percent of patients experience low-grade fever and general malaise for a few days. More severe symptoms (e.g., enlargement of the liver, bone lesions, nervous system involvement, conjunctivitis) are less common (except in immunocompromised patients). The syndrome may last 2 to 4 months and usually ends with spontaneous remission.1

Veterinary professionals are at very high risk of exposure to Bartonella spp and infection with CSD. (After preparing this article, I was tested for exposure to Bartonella spp and was not surprised to learn that I had antibodies to six Bartonella spp.)

Other human diseases and conditions associated with Bartonella infection include bacillary angiomatosis, bacillary peliosis hepatitis, lebile bacteremia, endocarditis, vegetative valvular disease, uveitis, neurologic disorders, anemia, neuroretinitis, osteomyelitis, AIDS encephalitis, trench fever, and Oroya fever; more recently described associated diseases and conditions include inflammatory bowel disease, mononucleosis-like syndrome, pulmonary infiltrates, meningoencephalitis, lymphadenopathy, arthralgia, juvenile arthritis, cutaneous rash (Henoch-Schönlein purpura), cutaneous granuloma annulare, disciform keratitis, and coinfection with Lyme disease.1

There is no evidence of transmission of any Bartonella disease by person-to-person contact. However, people living in the same household with an infected cat may develop parallel infections due to contact with the cat, not each other.

People with Bartonella infection should discuss treatment with their physicians.

Bartonella Infection in Cats

In cats, Bartonella spp can cause various infections, chronic gingivitis, stomatitis, conjunctivitis, uveitis, skin papules, enlarged lymph nodes, lymphadenitis, fever of unknown origin, malaise, chronic vomiting, chronic diarrhea, endocarditis, valvular murmurs, and lymphadenopathy.1,5

Diagnosis

Confirming feline Bartonella infection can be difficult. Cats with B. henselae infection may have false-negative blood culture and polymerase chain reaction (PCR) test results due to unpredictable increases and decreases in the number of bacteria in blood and affected tissue. Surprisingly, some naturally infected cats have had bacteremia for up to 3 years, with mild, transient signs that most owners do not notice.1 It is important to note that, once infected, cats may always have the bacteria, which may not be numerous enough to cause clinical signs. Even after treatment with antibiotics, it is possible for reinfection to occur if the owners do not practice year-round flea control.3

Extensive studies must be conducted to clearly identify disease processes associated with B. henselae infection in cats. The current testing methods are blood culture, PCR assay, and Western blot; however, none of these testing methods is 100% accurate for diagnosing active Bartonella infection. For accurate diagnosis, veterinarians must evaluate the clinical findings, test results, and response to antibiotic treatment. Bartonella infection is generally treated with broad-spectrum antibiotics.

Blood Culture

Blood culture is currently recommended by the American Association of Feline Practitioners (www.catvets.com) to confirm active Bartonella infection in cats.2 However, a positive blood culture result does not prove that a cat’s illness is due to Bartonella infection.2 To perform a culture, sterile technique should be used to collect blood in a plastic EDTA tube or a lysis centrifugation blood culture tube. If EDTA tubes are used, the sample should be chilled or frozen during shipment. Laboratories that are familiar with culturing Bartonella spp should be used, and sample submission instructions should be obtained before sample collection. This testing method is not definitive because false-negative results may be caused by the following:

- The sample was taken during a bacterial waning period.
- The number of organisms was below the sensitivity limit of the assay.
- Organisms died in transit.
- The organism was not given enough time to grow in culture medium.
- The patient had already eliminated the organism.
- The sample was improperly collected or handled.

Polymerase Chain Reaction Assay

DNA collected from feline blood, tissues, or fluids can be used for PCR testing. PCR assays must be conducted in lab-
oratories that specialize in this type of testing and institute strict quality-control measures to avoid inaccurate results. Test results from different laboratories may conflict because of the current lack of standardized PCR testing among laboratories. PCR assay provides results faster than blood culture but does not prove that the organism is alive or that active illness is due to Bartonella infection. PCR assay may produce false-negative results because of the following:

- Intermittent bacteremia
- Previous use of antibiotics
- Lack of microbial DNA in the sample
- Inhibitory or interfering substances within the sample

**Immunoblotting**

Immunoblotting is the most cost-effective testing available. The Western blot immunoassay recognizes the antibodies that are produced in response to immunodominant antigens of Bartonella spp. This testing method produces results quickly but lacks a standardized protocol in the United States. A positive test result only proves that a cat has been exposed to a Bartonella sp, not that the cat is currently infected.

**Treatment**

To treat a suspected infection, veterinarians may choose doxycycline (10 to 22 mg/kg PO q12h for 2 to 4 weeks [the dose should be rounded up to the whole capsule or tablet to avoid esophageal irritation]) or azithromycin (10 mg/kg PO q24h for 3 weeks).3

Retesting for infection after treatment is controversial. After antibiotic treatment, a retest using the Western blot method may show a reduced number of antibodies, which indicates successful antibiotic treatment. (National Veterinary Laboratory, Inc [Franklin Lakes, NJ; www.natvetlab.com; William Hardy, Jr, VMD, director] recommends retesting at least 4 months after the initial positive test result.)

**Prevention**

Prevention is the key to stopping the spread of Bartonella infection in humans and cats. Veterinary technicians can play a primary role in prevention. Flea control—the only way to prevent exposure to Bartonella spp—should be at the top of any veterinary technician’s list for client discussion. Veterinary technicians should do the following:

- Evaluate the patient’s and client’s risk of exposure to fleas, other ectoparasites, and endoparasites.
- Assign a dental grade. If gingivitis without obvious dental disease is detected, discuss B. henselae with the client.

(Felv, FIV, herpesvirus infection, and calicivirus infection can also cause gingivitis.)

- If clients agree to have their pets tested for exposure and/or infection, obtain and submit the required samples in the manner recommended by the laboratory as ordered by the attending veterinarian.

**Discussion**

After my research on Bartonella spp, I discussed it with my coworkers. The veterinarians agreed that our usual zoonotic information for clients should include information on Bartonella spp.

We started gathering flea infestation histories from owners, documenting current infestations, and informing clients of the risk of contracting CSD from cats. I was surprised at how receptive our clients were to having their cats tested. (I have also been an advocate for FeLV and FIV testing.) From April 2008 through October 2008, we tested 40 cats (approximately 6% of our feline patients) for Bartonella spp exposure. In my area of the country, the main arthropod infestations occur from June through September. Of the 40 cats that we tested, 13 had positive results on Western blot testing performed by National Veterinary Laboratory, Inc. All of the 13 cats had mild to severe gingivitis, and only a few had previous flea infestation noted in their records. One of the cats that tested positive had also tested positive for FIV for the past 3 years. Nine of the cats that tested positive were currently indoors only and had been acquired a few months to a few years before testing. None of the cats that tested positive had a flea infestation at the time of testing.

Dr. Pierson, our supervising veterinarian, treated all 13 of the cats that tested positive with azithromycin. Only one owner chose to retest after antibiotic treatment, and the test result was negative. After antibiotic treatment, we saw four of the cats, all of which presented with normal mucous membranes or mild gingivitis. However, this was not a clinical study, and we did not draw any conclusion from these results.

Because of my newfound knowledge, I decided to obtain client-friendly reading material on this subject. I discovered that testing for Bartonella spp is not currently recommended by any organization. The Centers for Disease Control and Prevention has a Web page (www.cdc.gov/healthypets/diseases/catscratch.htm) that discusses the symptoms, transmission, and prevention of CSD; however, it does not discuss consulting a veterinarian before adopting a cat or kitten or testing or treatment of Bartonella infection.

I then consulted the American Association of Feline Practitioners (AAFP), which is ambivalent about whether testing and treatment should be recommended to cat owners.
The AAFP 2006 panel report on *Bartonella* infections lists the following advantages to testing for *Bartonella* spp:

- Cats with positive *Bartonella* spp test results can be avoided […] for selection as blood donors or breeding animals.
- Cats with negative *Bartonella* spp test results are less likely to be harboring the organism and so may be a safer pet than a cat with *Bartonella* spp positive test results.
- Testing cats for *Bartonella* spp may allow the veterinarian to avoid claims or litigation.

The report lists the following disadvantages:

- *Bartonella* spp test results (particularly PCR and serology) can be falsely positive.
- Cats with positive *Bartonella* spp serological test results are often considered dangerous but may have eliminated the infection and may be partially immune to re-infection.
- Detection of negative *Bartonella* spp test results will lead to a false sense of security.
- Cats with negative *Bartonella* spp test results at one point in time may be falsely negative.
- Cats with negative *Bartonella* spp test results at one point in time can be infected and become bacteremic within 2 weeks if preventive measures are not taken.
- Detection of positive *Bartonella* spp test results in some situations may lead to needless euthanasia.
- The expense of *Bartonella* spp testing will lead to some owners avoiding ownership of an individual cat.
- Redistribution of limited funds to cover the expense of *Bartonella* spp testing will result in some owners forgoing other needed and relevant health care like flea control.

In 2002, the US Public Health Service and the Infectious Diseases Society of America issued guidelines for preventing opportunistic infections among HIV-infected people, which state the following:

HIV-infected persons, specifically those who are severely immunosuppressed, are at an unusually high risk for experiencing severe disease caused by infection with *Bartonella*, which can be transmitted from cats. These persons should consider the potential risks of cat ownership. Persons who acquire a cat should adopt or purchase an animal aged >1 year and in good health. Although declawing is not usually advised, HIV-infected persons should avoid rough play with cats and situations in which scratches are likely. Any cat-associated wound should be washed promptly. Cats should not be allowed to lick open wounds or cuts of HIV-infected persons. Care of cats should include flea control. No evidence indicates any benefits to cats or their owners from routine culture or serologic testing of the pet for *Bartonella* infection.

After reading about the various testing methods, inconclusive test results and signs, and treatment options as well as statements made by public-health organizations, I am disappointed with the veterinary profession’s current response to *Bartonella* infection. The results of my hospital’s in-house testing taught me that having some information is better than having no information. We know that the bacteria are more prevalent than is commonly thought. The technician code of ethics states, “We shall promote public health by assisting with the control of zoonotic diseases and informing the public about these diseases. Veterinary technicians shall assume accountability for individual professional actions and judgments.”

I think that technicians must educate other veterinary professionals as well as clients about this zoonotic threat. I urge all support staff of veterinary hospitals to educate themselves, their clients, and, if necessary, even their supervising veterinarians. The chances of a serious infection are low, but what if one person dies of a *Bartonella* infection? Will you feel responsible if you could have educated the person? Veterinary technicians should educate their clients and let them decide how to protect themselves.

**References**

1. The first documented cases of *Bartonella* infection in humans were in
   a. 1700.
   b. 1889.
   c. 1930.
   d. 1989.

2. How many *Bartonella* spp have been identified?
   a. 2
   b. 6
   c. 16
   d. 30

3. Which mammal is the primary reservoir responsible for *Bartonella* infection in humans?
   a. rats
   b. fleas
   c. cats
   d. dogs

4. Which of the following could be a vector(s) for *B. henselae* infection?
   a. biting flies
   b. ticks
   c. lice
   d. a and b

5. Humans can contract *B. henselae* infection through contact with
   a. an infected cat.
   b. infected flea waste.
   c. mosquitoes.
   d. a and b

6. How long after a scratch from an infected cat may symptoms of *Bartonella* infection appear?
   a. 2 days
   b. 3 to 10 days
   c. 3 weeks
   d. 1 month

7. Once a cat has been treated for *B. henselae* infection, the cat can become reinfected through contact with
   a. an infected bat.
   b. an infected human.
   c. contaminated flea feces.
   d. none of the above

8. Why might cats falsely test negative for *B. henselae* infection?
   a. The number of organisms was below the sensitivity of the assay.
   b. The organisms may have died in transit.
   c. The sample was improperly collected or handled.
   d. all of the above

9. Which group of people is most likely to have severe complications from *B. henselae* infection?
   a. children
   b. veterinary personnel
   c. immunocompromised people
   d. senior citizens

10. Which drug(s) is/are recommended for treating *B. henselae* infection in cats?
    a. doxycycline
    b. amoxicillin
    c. azithromycin
    d. a and c