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BARTONELLA CAUSING DISEASE IN CATS, DOGS AND HUMAN PATIENTS

Edward B. Breitschwerdt, DVM, Diplomate ACVIM

College of Veterinary Medicine
North Carolina State University, Raleigh, NC, USA

Bartonella species are fastidious gram-negative bacteria that are highly adapted to a mammalian reservoir host and within which the bacteria usually cause a long-lasting intraerythrocytic bacteremia (1-3). These facts are of particular importance to veterinarians and physicians, as an increasing number of animal reservoir hosts have been identified for various Bartonella species. Among numerous other examples, Bartonella henselae has co-evolved with cats, Bartonella vinsonii subsp. berkhoffii has co-evolved with dogs and wild canines, and Bartonella bovis has co-evolved with cattle(1-2). Importantly, the list of reservoir-adapted Bartonella species, including a large number of rodent species that might serve as “pocket pets,” continues to grow exponentially, as new Bartonella spp. are discovered. Prior to 1990, there were only two named Bartonella species, whereas there are now at least 24 named and numerous unnamed or candidatus species.

FELINE BARTONELLOSIS

The extent to which members of the genus Bartonella are pathogenic for cats remains to be clarified. Bartonella henselae bacteremia can be documented in 25 to 41% of healthy cats in different regions throughout the world. Self-limiting febrile illness of 48 to 72 hours duration, mild to moderate transient anemia, and transient neurologic dysfunction was reported in cats experimentally infected with B. henselae by blood transfusion. Self-limiting fever can also occur in B. henselae bacteremic cats following minor surgical procedures. Although unproven, it is likely that stress, such as surgery or trauma, can induce transient disease manifestations in cats, including self-limiting fever, mild anemia and neurological dysfunction. Seroepidemiologic studies have generated contrasting results, as to whether fever, lymphadenopathy, stomatitis and gingivitis are caused by B. henselae. Bartonella henselae DNA and intrathecal antibody production has been demonstrated in cats with neurological disease. Granulomatous myocarditis and endocarditis have been associated with B. henselae infection. Recurrent osteomyelitis in a cat was caused by B. vinsonii subsp. berkoffii. Immunosupression associated with FeLV appears to increase the pathogenicity of B. henselae infection in cats.

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CANINE BARTONELLOSIS

Bartonella vinsonii (berkhoffii) was isolated from a dog with endocarditis in our laboratory in 1993. Subsequently, Bartonella vinsonii (berkhoffii) seroprevalence was 3.6% in 1,920 sick dogs from North Carolina evaluated at NCSU-CVM veterinary teaching hospital. Risk factors associated with seroreactivity included: heavy tick exposure (Odds ratio 14.2), cattle exposure (OR 9.3), rural vs. urban environment (OR 7.1) and heavy flea exposure (OR 5.6). In addition, 36% of serum samples derived from dogs naturally infected with E. canis were reactive to B. vinsonii antigens. As E. canis is transmitted by Rhipicephalus sanguineous, this tick may be involved in the transmission of B. vinsonii. Current data indicates that exposure to B. vinsonii (berkhoffii) can be found throughout much of the United States and most tropical and subtropical regions of the world. B. henselae, the most common infecting species, was amplified and sequenced from the liver of a dog with peliosis hepatis, a unique pathological lesion that is induced only by B. henselae infection in people. B. henselae DNA was amplified from a dog with granulomatous hepatitis, a histopathological lesion that is reported with some frequency in children infected with B. henselae. Similarly, B. claridgeae DNA has been amplified and sequenced from the liver of a Doberman pincher with copper storage disease and from the aortic valve of a dog with vegetative valvular endocarditis(2). Bartonella elizabethae, a species that infects rodents, was PCR amplified and sequenced from blood from a dog that had experienced chronic weight loss culminating in sudden unexplained death. Endocarditis, associated with B. vinsonii (berkhoffii) occurs in large breed dogs with a potential predisposition for aortic valve involvement(2). In some dogs, intermittent lameness, bone pain or fever of unknown origin can precede the diagnosis of endocarditis for several months, whereas other dogs will present with an acute history of cardiopulmonary decompensation. Cardiac arrhythmias secondary to myocarditis can be detected in cats and dogs without echocardiographic evidence of endocarditis. Bartonella-induced granulomatous lymphadenitis, hepatitis and panniculitis have been reported in dogs. B. vinsonii (berkhoffii) can contribute to cutaneous vasculitis, anterior uveitis, polyarthritis, meningoencephalitis or hemolytic anemia (1).

DIAGNOSIS OF BARTONELLOSIS

Thrombocytopenia, anemia, which frequently can be immune-mediated, and neutropenia or neutrophilic leukocytosis are the most commonly detected hematological abnormalities in dogs. Thrombocytopenia is found in approximately half of the dogs with disease manifestations. Eosinophilia is also found in approximately one third of infected dogs. Monocytosis can also occur in B. vinsonii-infected dogs, particularly those with endocarditis. Hemoglobinuria, generally unaccompanied by hematuria, is a frequent finding, particularly in dogs with immune-mediated hemolytic anemia. Serum biochemical abnormalities are usually very mild or nonexistent.

As antibodies to B. vinsonii (berkhoffii) antigens are infrequently detected (<4%) in sick or healthy (<1%) dog populations in endemic regions, detection of B. vinsonii (berkhoffii) antibodies in a sick dog provides strong clinical evidence for prior exposure and potentially active infection. Unfortunately, approximately 50% of B. vinsonii (berkhoffii) or B. henselae infected dogs lack a detectable antibody response. Recently, the development of a more sensitive isolation approach, using BAPGM (Bartonella alpha Proteobacteria growth medium) followed by real time PCR has greatly facilitated the molecular detection or isolation of Bartonella species from cats, dogs and human beings. Diagnostic testing for Bartonella species (serology, PCR and BAPGM Blood Culture/PCR combination testing) is available through Galaxy Diagnostics (www.galaxydx.com).
THERAPY

To date, an optimal protocol has not been established for the treatment of Bartonella infections in cats, dogs, or people (1). Regardless of the antibiotic(s) that is used for treatment, a long duration of antibiotic administration (6 weeks) may be necessary to eliminate the infection. Fluoroquinolones alone, or in combination with doxycycline, have elicited a positive therapeutic response in dogs, which is accompanied by a progressive decrease in B. vinsonii antibody titers. Newer macrolides that attain high intracellular concentrations would be preferred. B. henselae rapidly develops rapid resistance to azithromycin, therefore this antibiotic should not be used as a sole treatment. If antibodies are detectable pre-treatment, serum antibody titers decrease rapidly (within 3-6 months) and are generally no longer detectable in dogs that recover following antimicrobial therapy. Therefore, post-treatment serology may be a useful adjunct to BAPGM/PCR to determine if therapeutic elimination of Bartonella infections has been achieved. Evidence from human infections indicates that bartonellosis can be a challenging infection to treat.

PREVENTION

Minimizing or eliminating flea and tick exposure is perhaps of greater veterinary and public health importance today, than during any previous time in history. When rigorous flea and tick control measures are instituted, it is highly probable that transmission of Bartonella species will be greatly reduced or eliminated.

PUBLIC HEALTH CONSIDERATIONS

Due to extensive contact with a spectrum of animal species, veterinary professionals appear to have an occupational risk of infection because of frequent exposure to Bartonella spp., therefore these individuals should exercise increased precautions to avoid arthropod bites, arthropod feces (i.e. fleas and lice), animal bites or scratches and direct contact with bodily fluids from sick animals. As Bartonella spp. have been isolated from cat, dog or human blood, cerebrospinal fluid, joint fluid, aqueous fluid, seroma fluid and from pleural, pericardial and abdominal effusions, a substantial number of diagnostic biological samples collected on a daily basis in veterinary practices could contain viable bacteria. Personal protective equipment, frequent hand washing and avoiding cuts and needle sticks are important to prevent infection. Physicians should be educated as to the large number of Bartonella spp. in nature, the extensive spectrum of animal reservoir hosts, the diversity of confirmed and potential arthropod vectors, and current limitations associated with diagnosis and treatment.

References