

ANIMAL AND HUMAN HEALTH PREVENTION OPPORTUNITIES

Brucella canis

Brucella canis (*B. canis*) is a bacterial agent that has been diagnosed in dogs throughout Montana. Within the past year, the Department of Livestock (DOL) has introduced a surveillance requirement for high-risk populations in response to an increased number of cases reported to our office. In dogs, the disease is considered to be a lifelong infection with multiple health and welfare effects. Importantly, the disease is also a potential zoonotic disease. In this issue of *Montana One Health*, we will discuss the animal and human health implications of this disease as well as the diagnostic testing options.

Animal Health

The *B. canis* bacterium is mainly transmitted by mucous membrane contact with vaginal discharge or birthing fluids from an infected female. Semen, urine, feces, and nasal/ocular secretions can also be risks for transmission and puppies can become infected from their mother during pregnancy.

The infection can cause abortion and infertility, as well as lethargy, lymph node enlargement and lameness/back pain due to discospondylitis. Like other *Brucella species*, this bacterium can sequester in areas such as the prostate in male dogs, making it difficult for antibiotics to penetrate and eliminate the organism. For this reason, recrudescence may be observed when administration of antibiotics is discontinued. This results in long-term treatment with a combination of medically important antibiotics. DOL recommends that *B. canis* positive animals be euthanized though many dogs that are diagnosed are euthanized at the decision of the owner.

Sterilization (if intact) and quarantine, with or without antibiotic treatment and routine testing are offered as an alternative management option for owners who choose not to euthanize their animal. Owners of infected dogs should implement mitigation measures to reduce exposure of the organism to other dogs or people. Infected dogs should not be taken to public use areas including parks, beaches, pet stores or jogging paths and the dog's contacts should be limited to as few people as possible. Individuals should prevent infected dogs from licking or "mouthing" them and always practice good hygiene when interacting with the dog and its environment. This includes wearing gloves when cleaning up areas that are potentially contaminated by dog feces or urine and washing hands thoroughly when done. Properly dispose of dog waste, and launder potentially contaminated clothing or dog blankets regularly. Contaminated wet areas can be dried and disinfected with a 1% bleach solution.

Canine Diagnostics

Diagnostic testing options for *B. canis* in dogs are limited. Typically, screening of dogs for suspected *B. canis* infection is performed by using one or more serological methods to detect the presence of antibodies to rough-type brucella. These tests have varying levels of diagnostic sensitivity (Sn) and specificity (Sp) and include the rapid slide agglutination test (RSAT) (Sn = 70-75%, Sp = 83-85%), 2-mercaptoethanol (2ME)-RSAT (Sn = 30-35%, Sp = 99-100%), agar gel immunodiffusion test (AGID) (Sn ≈ 53%, Sp ≈ 100%), and enzyme linked immunosorbent assay (ELISA) (Sn = 95-97%, Sp ≈ 99%).

The Montana Veterinary Diagnostic Lab (MVDL) has historically performed the RSAT/2ME-RSAT for serological screening of *B. canis* suspect animals. One of the most well-known screening tools, this test can be performed quickly and offers same-day test results for the cost of \$26 per sample; however, its moderate diagnostic Sn/Sp means that some false negatives or false positives are possible. In an effort to improve diagnostic screening options for clients, MVDL has developed the capability to perform an in-house *B. canis* ELISA test with much improved sensitivity and specificity. Internal verifications and parallel testing have shown excellent agreement between this ELISA and patient culture results, and MVDL is now pleased to offer this test as a primary screening method. The *B. canis* ELISA is typically performed on Mondays and costs \$9 per sample.

Subsequent testing is recommended for all dogs that screen positive. Secondary screening tests may include another serology test performed at the same time as the initial screening test and/or a second serological test 30-60 days after the initial test. Agreement between in sequence tests increases the level of confidence in a positive result. Confirmatory testing is limited to culture or PCR of blood, reproductive fluids/tissues, semen, and urine. Although serial blood culture is the gold standard for confirmatory *B. canis* testing, and detection of live agent provides definitive diagnosis, a negative culture may not definitively rule out infection in a serologically positive animal.

Canine Diagnostics (continued)

Brucella can become sequestered in tissue, may only be detected in blood during periods of intermittent bacteremia, and samples may only contain very small quantities of this slow-growing organism; thus, false negative results are possible. The use of PCR has improved sensitivity for confirmatory testing, as PCR can detect genetic material from brucellae even when present in extremely small quantities. Limitations of PCR are similar to culture though, and not all available assays are validated depending on the lab performing them so negative results should be interpreted with caution.

Human Health

B. canis infections in humans is poorly understood. Persons at-risk for an infection include dog breeders, veterinarians, veterinary technicians, in some instances laboratory workers, and any other individuals in contact with potentially infected dogs. Activities associated with the greatest risk of infection are whelping and any activity that brings a person in contact with birthing fluids, canine abortion products, or vaginal discharges from an infected dog. Several reports also highlight pet ownership in general as a likely risk factor leading to infection in otherwise healthy people.

Transmission to humans usually occurs by ingestion of the organism or via contamination of mucus membranes and abraded skin. *B. canis* infections in the literature have been described after close contact with infected dogs, especially animals that recently aborted or gave birth, and after exposure to the organism in a laboratory setting. No information about human-to-human transmission of *B. canis* exists; however, other *Brucella* species are not transmitted between people by casual contact and transmission by other routes of infection is unusual.

The incubation period for *B. canis* is unknown, however for other *Brucella* species symptoms usually occur within two weeks of exposure but can be as long as three months after exposure. Human *B. canis* infections, like other *Brucella* genus infections, typically have non-specific flu-like symptoms including a fever which is often intermittent, fatigue, headache, weakness, malaise, chills, sweats, weight loss, hepatomegaly, splenomegaly, and lymphadenopathy. Serious complications of an infection have been reported including septic arthritis, aortic valve vegetations, osteomyelitis, epidural abscess, pleural effusions, oral lesions, lower extremity aneurysms, and culture negative endocarditis.

Diagnosis is complicated because of non-specific clinical signs and a low index of suspicion by physicians. Culture is the only test available for diagnosing *B. canis* in humans; however, confirmation is difficult because of low-level intermittent bacteremia. Additionally, the antibody tests will not detect antibodies against *B. canis* specifically. Because of these testing difficulties, human disease is likely significantly underdiagnosed and under-reported.

Prevention of human infections includes proper personal protective equipment and good hand hygiene when handling a potentially infected dog or working in a *B. canis* infected kennel. Other prevention measures include annual *B. canis* testing for all breeding dogs, testing all dogs introduced for breeding, only breeding noninfected dogs, and purchasing dogs only from reputable kennels. For infected pet dogs, measures exist that owners can take to reduce the risk of infection for humans and other dogs. However, no measure short of euthanasia should be considered absolutely effective.

***B. canis* Key Points**

- In dogs, the disease is considered to be a lifelong infection with multiple health and welfare effects. DOL recommends that *B. canis* positive animals be euthanized.
- Despite antibiotic therapy, disease recrudescence may be observed in dogs when administration of medication is discontinued.
- MVDL has developed the capability to perform an in-house *B. canis* ELISA test with much improved sensitivity and specificity.
- Confirmatory testing is limited to culture or PCR though the bacteria may only be detected using these methods during periods of intermittent bacteremia, so false negative test results are possible.
- Diagnosis of *B. canis* in people is complicated because of non-specific clinical signs and a low index of suspicion by physicians.
- Prevention of human infections includes proper personal protective equipment and good hand hygiene.

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