Canine Brucellosis (*Brucella canis*)

Agent: Canine brucellosis is caused by the intracellular bacterium *Brucella canis*--a small, gram-negative coccobacilli or short rod. The disease is found worldwide, but is especially common in Central and South America and in the Southeastern United States. Canine Brucellosis has been diagnosed in commercial and research breeding kennels in several other countries including Japan.

Brief Description: Clinical signs vary from asymptomatic infertility to overt abortion. The dog may show no signs of clinical infection before having a sudden onset of infertility or abortion. Approximately 75% of infected females abort after 45-55 days gestation. A prolonged period of vaginal discharge follows abortion. Early embryonic death and resorption or undetected abortion 10 - 20 days after breeding may result in observed conception failure. If undiagnosed, affected females may abort repeatedly.

In male dogs, *Brucella* organisms infect the prostate, testicles, and epididymis for several months. Epididymitis of one or both testes, testicular atrophy or orchitis, scrotal dermatitis, prostatitis, and infertility are observed. Bacteria are disseminated in the seminal fluids and occasionally urine. Abnormal sperm morphology and inflammatory cells are seen in semen samples, especially in the first 3 months following infection. Semen evaluation of chronically infected males may show aspermia (no sperm), head to head agglutination of sperm, or reduced numbers of immature sperm.

Nonspecific signs in both sexes include lethargy, loss of libido, unwillingness to breed, premature aging, and generalized lymphadenitis. *B. canis* has been associated with diskospondylitis and recurrent uveitis. Prevalence estimates of 7 - 8% among stray dogs have been reported in the southern United States and Japan. In affected kennels, a 75% reduction in numbers of weaned puppies may be seen. True prevalence rates among breeding dogs and facilities are unknown, and much of canine brucellosis epidemiology remains unclear.

Mode of Transmission: Transmission occurs after ingestion or contact with the organism through mucous membranes or broken skin following exposure to contaminated placenta, aborted fetuses or fetal fluids, or vaginal discharges from infected bitches during heat, breeding, abortion, or full term parturition. Infected males may shed low numbers of *B. canis* in the urine unless urine is contaminated with seminal or prostatic fluids, in which case bacterial numbers may be higher. *Brucella* can be aerosolized in animal pens or microbiology laboratories or spread by fomites under conditions of high humidity, low temperatures, and no sunlight. Organisms are shed for several weeks or intermittently for months after an abortion.

Incubation Period: Variable, from 2 weeks to several months. Most dogs can be positively detected by serologic testing methods within 8-12 weeks after infection.

Diagnosis: Serology, blood culture, tissue culture, and histopathology are valid modalities for detecting *Brucella canis* infection. Appropriate protective gear should be used when extracting specimens for laboratory submission to reduce exposure to potentially infectious material. In Georgia, the Tifton Veterinary Diagnostic and Investigational Laboratory is the reference laboratory for diagnostic testing of canine brucellosis. The laboratory must be notified prior to sample submission at http://www.vet.uga.edu/dlab/tifton/index.php or 229-386-3340.

Serology: Serum samples should be submitted on ice packs and via courier (ex. FedEx, UPS) within 24 hours of collection. Samples should be kept cold, but not frozen. Screening tests include the tube agglutination test (TAT), indirect fluorescent antibody (IFA), rapid slide agglutination test (RAST) and agar gel immunodiffusion using cell wall antigens (AGIDcwa). Serologic screening tests are

sensitive but are associated with high rates of false positive results. Consequently, a positive screening test is followed by confirmation using a more specific test. More specific tests used for confirmation include the AGID using cytoplasmic protein antigens (AGIDcpa) and serial blood cultures.

Blood Culture: Over 50% of dogs are bacteremic for at least a year following infection; however, a single negative blood culture should not be used to rule out disease. A series of 3 blood cultures collected consecutively, at least 24 hours apart, should be submitted for diagnosis. Blood cultures are submitted in heparinized tubes (green-topped blood collection tubes) or aerobically prepared special blood culture media. All blood specimens should be shipped on ice packs within 24 hours of collection.

Pathology and Culture of Tissues*:* Stomach contents of spontaneously aborted fetuses, fetal tissues, and placentas are the best samples for isolating *Brucella canis.* Other samples include lymph nodes, spleen, liver, reproductive tissues and semen. Both chemically fixed samples for histopathology and fresh tissues for culture should be submitted.

Prevention Measures/Control: Breeding dogs should be purchased from brucellosis-free kennels. All newly acquired dogs should be isolated and tested twice at least 4-6 weeks apart before they are incorporated into the breeding group. All breeding dogs in a facility should be tested yearly. Dogs bred intensively outside the facility should be tested 2-4 times per year. Tests should be conducted at least 3 weeks prior to the onset of estrus, so a confirmation test can be conducted if the screening test is positive. Testing is more accurate near or during estrus since bacteremia is heightened under hormonal influence.

Disinfection of Contaminated Premises**:** *Brucella* is susceptible to 1% sodium hypochlorite, 70% ethanol, iodine/alcohol solutions, glutaraldehyde and formaldehyde.

Eradication from Licensed Facilities: Quarantine, testing, and euthanasia of infected dogs are the primary methods necessary to eliminate and prevent the spread of disease in a commercial breeding facility. Reporting of a confirmed laboratory diagnosis in a licensed facility will result in a Georgia Department of Agriculture (GDA) quarantine of the facility. During quarantine, each breeding animal must be maintained in separate housing to avoid further transmission. Movement of dogs shall be in accordance with the requirements of GDA. Report of a "suspicious" result (positive result on screening, negative result on AGIDcpa) will require submission of 3 serial blood cultures collected at least 24 hours apart to determine the true status of the animal. Euthanasia of suspicious dogs is a second option to minimize the time in which the facility is quarantined. The following diagnostic protocols must be followed by licensed facilities in order for the GDA to consider releasing the quarantine:

1) **Identification of Infected Adult Dogs in Facility:** Serum samples must be submitted for screening (RSAT, TAT, IFA, or AGIDcwa) and AGIDcpa confirmation from all dogs over 6 weeks of age in the facility. All tested dogs must not have received antimicrobials within 3 months of sample collection. The reference laboratory in Georgia for submission of these tests is the Tifton Veterinary Diagnostic and Investigational Laboratory. <u>The laboratory must be notified prior to sample submission.</u>
    - **a.** Dogs that have positive test results on both screening and confirmation should be euthanized.
    - **b.** Dogs that are positive on screening and negative on AGIDcpa confirmation ("suspicious result") should be (1) retested every 4 weeks until definitive results are obtained, or (2) have 3 negative blood cultures at least 24 hours apart with the first blood culture being collected no later than 7 days following the original sample date, or (3) be euthanized.
2) **Identification of Infected Puppies:** All puppies born to infected dams or puppies less than 6 weeks of age at the time of initial screening must have 3 negative blood cultures at least 24 hours apart or be euthanized. Puppies with a positive blood culture should be euthanized. Puppies over 6 weeks of age at the time of initial screening should be treated as adults.

3) **Identification of Acutely Infected Adult Dogs:** Four weeks following the identification and euthanasia of infected dogs in a facility, all remaining adult dogs must be tested again by serology. Test results will be interpreted as in 1) above.
4) **Confirmation of Brucella-Free Facility:** All adult dogs (both sexually intact and altered) on the premises should be tested using serology or blood culture at 4 week intervals until all dogs on the premises have tested negative for brucellosis (i.e. negative screening and AGIDcpa or negative serial blood cultures) on two consecutive tests. The minimum period of quarantine therefore should be 8 weeks. The risks of exposure, disease transmission, and epidemiology of the particular circumstances will be taken into consideration when determining the quarantine period.

Zoonotic Risk: Humans can be infected with *B. canis*, although cases are rarely diagnosed or reported even in areas where canine prevalence is relatively high. Individuals who handle breeding dogs in kennels and are exposed to reproductive tissues and fluids are at higher risk of exposure. *B. canis* causes a mild, nonspecific disease in humans. Clinical signs are vague and include prolonged fever and lymphadenopathy. Infections among laboratory workers have been documented.

Reporting Requirements:

- **Any person who makes a clinical diagnosis or laboratory confirmation of canine brucellosis in animals residing in or recently purchased from a Georgia Department of Agriculture licensed facility such as an animal shelter, kennel or pet dealer shall report it by the close of the next business day to the State Veterinarian's office at 404 656-3667 in Atlanta or 1-800-282-5852 outside of Atlanta.**

- **Laboratory confirmation of brucellosis in humans is immediately reportable to the Georgia Division of Public Health, Notifiable Disease Section. For more information, or to contact the Georgia Division of Public Health, call (404)-657-2588 or go to** http://health.state.ga.us/epi/disease/index.asp

Georgia Department of Agriculture Program: Animal Protection Division 40-13-13-.05 Control of Disease for Licensed Facilities:
http://agr.georgia.gov/vgn/images/portal/cit_1210/57/1/40697676AP_Anim_Prot_Rules_Amended_091301.pdf

1) In the control, suppression, prevention, and eradication of animal disease, the Commissioner or any duly authorized representative acting under his authority is authorized and may quarantine any animal or animals, premises, or any area when he/she shall determine:
   a. that the animal or animals in such place or places are infected with a contagious or infectious disease;
   b. that the animal (s) has been exposed to any contagious or infectious disease;
   c. that the unsanitary condition of such place or places might cause the spread of such disease;
   d. or that the owner or occupant of such place is not observing sanitary practices prescribed under the authority of this chapter or any other law of this state.
2) The Commissioner or his duly authorized representative is authorized to issue and enforce written or printed stop sale, stop use, or stop movement orders to the owners or custodians of any animals, ordering them to hold such animals at a designated place, when the Commissioner or his duly authorized representative finds such animals:
   a. to be infected with or to have been exposed to any contagious or infectious disease; or
   b. to have been held by persons in violation of this chapter, until such time as the violation has been corrected, and the Commissioner, in writing, has released such animals.

Authority Ga. L. Sec. 4-11-1 et seq.; 4-11-9.1

Disease Consultants:
University of Georgia College of Veterinary Medicine: Dr. Richard Fayrer-Hosken, rfh@vet.uga.edu, and Dr. Bruce Hollett, bhollett@vet.uga.edu. Both Drs. Fayrer-Hosken and Hollett can be reached at the University of Georgia Large Animal Veterinary Teaching Hospital, 706-542-3223.

Tifton Veterinary Diagnostic and Investigational Laboratory is the reference laboratory for diagnostic testing of canine brucellosis. http://www.vet.uga.edu/dlab/tifton/index.php or 229-386-3340.

Cornell College of Veterinary Medicine: The Animal Health Diagnostic Laboratory at the Cornell College of Veterinary Medicine is recognized as the principal diagnostic laboratory in the U.S. Dr. L. Carmichael at the Baker Institute for Animal Health at the College of Veterinary Medicine at Cornell University (e-mail: lec2@cornell.edu) is one of the leading experts in canine brucellosis.

Electronic References:
Center for Food Security and Public Health, Iowa State University College of Veterinary Medicine. Brucellosis.
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http://www.bt.cdc.gov/agent/brucellosis/index.asp

Georgia Department of Agriculture, Animal Industry Division. Chapter 40-13-4: Infectious and Contagious Diseases.
http://agr.georgia.gov/vgn/images/portal/cit_1210/9/34/4124608640-13-4%20Chapter%20Infectious%20and%20Contagious%20Diseases.pdf

Georgia Division of Public Health. Brucellosis Fact Sheet.
http://www.health.state.ga.us/pdfs/epi/notifiable/brucellosis.fs.02.pdf

Georgia Division of Public Health. Brucellosis Q & A.
http://www.health.state.ga.us/pdfs/epi/notifiable/brucellosis.qa.02.pdf

International Veterinary Information Service.
http://www.ivis.org/advances/Infect_Dis_Carmichael/shin/chapter_frm.asp?LA=1

The Merck Veterinary Manual, 50th Anniversary edition.
http://www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/112200.htm

Other References:
Greene CE, Infectious Diseases of the Dog and Cat, 2nd edition, WB Saunders, 2005.

Chin J, ed. Brucellosis. In *Control of Communicable Diseases Manual.* 17th ed. Washington DC: American Public Health Association, 2000: 75-81.

Spickler AR and Roth JA, ed. Emerging and Exotic Diseases of Animals. Iowa State University College of Veterinary Medicine, 2003: 95-97.