

BRUCELLOSIS IN DOGS (CANINE BRUCELLOSIS)

I. DESCRIPTION AND EPIDEMIOLOGY

A. Overview

Canine brucellosis is a disease in dogs caused by the gram-negative aerobic intracellular coccobacillus *Brucella canis*. The genus *Brucella* contains nine or more “classical” species and more than 30 atypical strains. *B. abortus*, *B. melitensis*, and *B. suis* are classical species and cause an estimated 99% of brucellosis infections in people. Dogs also can rarely be infected with these *Brucella* spp., but no species other than dogs are known to be susceptible to *B. canis* infection. *B. canis* has zoonotic potential, but the incidence in people is likely underestimated due to the absence of reliable serologic assays for humans.

Canine brucellosis is endemic in the Americas, Asia, and Africa. Serologic studies of dogs in South America, Asia, and Africa reported a seroprevalence of 6 – 35%. Limited data estimate seroprevalence to be 1 – 8% among U.S. dogs, compared to 20 – 30% in dogs from Mexico, Central America, and South America. Infection occurs more commonly in Southern U.S. states, in stray dogs, and in commercial kennels.

B. Canine Brucellosis in California

No studies have been conducted to estimate seroprevalence of *B. canis* in dogs in California. Infection with *B. canis* in dogs is not mandated reportable by either California public health (Title 17) or animal health (Title 3) regulations. Nonetheless, detections of *B. canis* may come to the attention of public health officials when veterinary diagnostic laboratories forward presumptive *B. canis* isolates to LRN-B reference labs for confirmation, per LRN protocol. The CDPH Veterinary Public Health Section (VPHS) occasionally receives reports of *B. canis* in dogs in California, most of which are for dogs imported from other states or countries. However, CDPH-VPHS may not receive all reports of dogs that test positive in California, and the true incidence of canine brucellosis is undetermined.

C. Symptoms and Clinical Signs

B. canis is the most common cause of reproductive failure in dogs. Infection in male dogs can cause epididymitis, prostatitis, and orchitis, leading to testicular atrophy and infertility. Female dogs can abort in late gestation and have vaginal discharge. Congenital transmission from infected bitches can result in litters that include dead, infected, and apparently healthy puppies. Dogs can also develop diskospondylitis, ocular signs such as uveitis, or non-specific signs such as lethargy, decreased appetite,

and lymphadenopathy. Some dogs have no obvious clinical signs and serve as subclinical carriers and reservoirs of infection for other dogs.

D. Transmission

In infected dogs, *B. canis* is present in highest concentration in vaginal discharges (especially following abortion), semen, and other reproductive fluids and tissues. Urine, blood, saliva, and feces are also infectious. Fomites, such as veterinary/husbandry equipment and clothes/shoes, can become contaminated and spread the bacteria.

B. canis is transmitted by contact between infected material and mucous membranes or open skin wounds. Dogs are usually infected via sexual contact or oronasal contact with secretions. Transmission to humans usually occurs through contact of a person's mucous membrane with aborted fetuses or reproductive fluids from infected dogs. Professionals who frequently handle infected animals or their tissues, such as veterinarians, dog breeders, and laboratory workers, are at elevated risk of exposure.

Infected bitches shed *B. canis* for up to six weeks after an abortion and during estrus. Infected male dogs shed *B. canis* in semen most profusely for the first six to eight weeks after infection but can intermittently shed the bacteria in semen for one to two years. Bacteria can also be detected in urine for at least three months after infection.

E. Incubation Period

The incubation period in dogs is variable, and bacteremia usually occurs after one to four weeks. Infected bitches typically abort in late gestation, and signs in males often occur after five or more weeks.

F. Clinical Management

There is no cure for canine brucellosis, and dogs are considered infected for life. Owners of infected dogs should consult with their veterinarian to discuss options for management and risk reduction. Surgical sterilization (neutering or spaying), followed by antimicrobial treatment, does not reliably eliminate infection, and relapses often occur. It is recommended that infected dogs be euthanized due to the lifelong health risk they pose to people and other dogs.

II. CASE DEFINITION – ANIMAL

Clinical Definition: A confirmed case of canine brucellosis is defined as:

- Culture of *Brucella* sp. and confirmation as *B. canis* at a LRN public health laboratory, **OR**

- Culture of *Brucella* sp. from relevant tissue of a dog and positive result on an agar gel immunodiffusion test (AGID; See [Laboratory Resources](#).)

III. CASE SURVEILLANCE, INVESTIGATION, AND REPORTING

A. Purpose of Reporting and Surveillance

Infection with *B. canis* in dogs is not reportable to CDFA (California Food and Agricultural Code §9101) or CDPH (Title 17 California Code of Regulations §2500). However, voluntary reporting enables local and state public health officials to implement measures to reduce the risk that infected dogs pose to people and other dogs.

Brucellosis in human patients is a CDPH reportable condition (Title 17 California Code of Regulations §2500). Reported cases of *B. canis* in humans should be investigated to identify the dog(s) that might have been the source of infection.

B. Local Health Jurisdiction General Investigation Guidelines

Local public health officials should initiate a follow-up investigation for any confirmed cases of canine brucellosis. Comprehensive investigations include trace backs and trace forwards of persons and other dogs that had contact with the infected dog, then conduct risk assessment and provide infection control guidance to veterinary staff, owners, and contacts. Limited information on the dog and the dog's owner may accompany the confirmatory laboratory report. The laboratory may need to prompt the submitting veterinarian to provide local public health officials with the information necessary to facilitate follow-up. Local public health officials can contact the CDPH-VPHS (email VetPH@cdph.ca.gov, phone 916-552-9740) for assistance and additional resources to support these investigations.

Trace Back/Forward

- Trace back: Identify all locations where the infected dog resided during the three months prior to the date of collection of the specimen.
- Trace forward: Identify dogs and people that regularly or temporarily resided with the dog and had contact with any of its secretions, excretions, or periparturient or reproductive fluids or tissues.
- Notify CDPH-VPHS of any dogs, people, or locations identified during the trace back or trace forward that are outside the local health jurisdiction of the infected dog. CDPH-VPHS will coordinate with appropriate local public health authorities to conduct necessary site visits in other jurisdictions.

Management of Index Case and Contacts

- Index Case (Infected Dog):
 - Provide veterinarians with the “Guidance for Veterinarians for Dogs Diagnosed with Canine Brucellosis” document ([Appendix A](#)). The guidance document includes testing protocols for monitoring the dog’s response to treatment, if the owner elects treatment over euthanasia. The infected dog is monitored with serial cultures with three consecutive negative cultures required before the dog can resume its normal activities.
- Contacts – Dogs:
 - Provide veterinarians with the “Guidance for Veterinarians for Dogs Diagnosed with Canine Brucellosis” document ([Appendix A](#)). The guidance document includes testing protocols for any dogs residing in the same household or kennel as the infected dog or any dogs that had intimate contact with the infected dog.
- Contacts – People:
 - Persons who had contact with the infected dog, including any veterinary staff, should be assessed as to their risk of exposure. A questionnaire (“*Brucella canis* Exposure Assessment Form”) to assess risk factors for brucellosis transmission from dogs is available by request from CDPH-VPHS (email VetPH@cdph.ca.gov, phone 916-552-9740). The checklist can help determine if the person had a high risk or low risk exposure, based on answers to the exposure questionnaire.
 - People should work with their health care providers to discuss the appropriate follow-up actions, which may include post-exposure prophylaxis and symptom monitoring. A symptom monitoring form has been developed by the CDC and can be found in the [CDC Brucellosis Reference Guide: Exposures, Testing, and Prevention](#).
 - The veterinary laboratory at which the initial culture was performed should be contacted and staff assessed as to adherence to proper biosafety protocols for handling *Brucella* in culture. LHDs should follow the guidelines for investigating *Brucella* laboratory exposures included in the general Brucellosis section of the CD Manual.

C. Local Health Jurisdiction Reporting

CDPH-VPHS is available to provide guidance to LHDs and coordinate response activities that cross jurisdictional boundaries. LHDs and diagnostic laboratories should notify CDPH-VPHS of any cases of *B. canis* to support surveillance and initiate prevention and control response (email VetPH@cdph.ca.gov, phone 916-552-9740).

Special Considerations

Per [LRN protocols](#) for select agents, a private diagnostic laboratory must forward a presumptive *Brucella* sp. isolate (or primary specimen if an isolate is not available) to an LRN-B reference laboratory in the following cases for confirmation:

- Specimen tests positive for *B. canis* using culture, PCR, DFA, or other similar assays (not serological test).
- Specimen tests positive for *Brucella*, but the species cannot be determined (*B. canis* cannot be ruled out).

D. Microbial Diseases Laboratory (MDL) and Other Laboratory Resources

CDPH MDL serves as an LRN-B reference laboratory that can perform primary cultures and confirmatory testing for *B. canis*.

Private diagnostic laboratories can test canine specimens using serology, PCR, and culture, but confirmatory testing via culture must be performed at an LRN-B reference laboratory. Private veterinary laboratories in California include:

- [Antech](https://www.antechdiagnostics.com/laboratory-diagnostics/test-guide): (800) 872-1001; <https://www.antechdiagnostics.com/laboratory-diagnostics/test-guide>
- [IDEXX](https://www.idexx.com/en/veterinary/reference-laboratories/tests-and-services/): (888) 433-9987; <https://www.idexx.com/en/veterinary/reference-laboratories/tests-and-services/>
- [Zoetis](https://diagnostics.zoetis.com/species/canine/brucella-canis/brucella-canis.aspx): (888) 963-8471; <https://diagnostics.zoetis.com/species/canine/brucella-canis/brucella-canis.aspx>
- [Zoologix](https://www.zoologix.com/dogcat/Datasheets/BrucellaCanis.htm): (818) 717-8880; <https://www.zoologix.com/dogcat/Datasheets/BrucellaCanis.htm>

IV. MANAGEMENT AND CONTROL MEASURES

Outbreaks of canine brucellosis are more likely to occur in kennels than households, but the same infection prevention and control principles should be applied to households.

If a kennel is suspected or confirmed to have a case of canine brucellosis, owners and/or kennel employees should receive additional education on the disease and methods to prevent spreading the bacteria and exposing themselves. Information on the zoonotic potential of *B. canis* and biosecurity recommendations can be found in the “Recommendations for People Exposed to Domestic Dogs with Canine Brucellosis: Dog Owners, Kennel Operators, and Breeders” document ([Appendix B](#)) and USDA [Best Practices for *Brucella canis* Prevention and Control in Dog Breeding Facilities](#).

A. Management of Cases

Refer to Section III-B “Local Health Jurisdiction General Investigation Guidelines”.

B. Management of Contacts

Refer to Section III-B “Local Health Jurisdiction General Investigation Guidelines”.

C. Infection Control Measures

- Large numbers of infectious bacteria are shed into the environment after abortions or through vaginal or seminal secretions. Therefore, proper cleaning and disinfection are necessary to remove fomites from the environment. Potentially contaminated surfaces should be first scrubbed with soap and water, followed by application of a disinfectant.
- *B. canis* is quickly killed by most disinfectants including 1% sodium hypochlorite (household bleach), quaternary ammonium disinfectants (e.g., Roccal™), phenolic compounds (e.g., Lysol™), 70% ethanol, glutaraldehyde, and formaldehyde. The minimum contact time for the disinfectants is 10 minutes.
- Veterinary instruments and equipment can be decontaminated by autoclaving at 121°C for at least 15 minutes or by dry heat at 160–170°C for at least one hour. Boiling for 10 minutes also inactivates *Brucella*.

V. APPLICABLE STATE STATUTES

There are no applicable state statutes regarding reporting cases of *B. canis* in dogs. Diagnostic laboratories adhere to the American Society for Microbiology guidelines, which require laboratories to refer isolates presumptively identified as *Brucella* sp. to the LRN-B regional reference laboratory for confirmation (refer to Section III-C “Local Health Jurisdiction Reporting”).

VI. ADDITIONAL RESOURCES

- Centers for Disease Control and Prevention. [Brucellosis Reference Guide: Exposures, Testing, and Prevention](https://www.cdc.gov/brucellosis/pdf/brucellosis-reference-guide.pdf). Available at: <https://www.cdc.gov/brucellosis/pdf/brucellosis-reference-guide.pdf>
- Cosford KL. [Brucella canis: An update on research and clinical management](https://pubmed.ncbi.nlm.nih.gov/29302106/). Can Vet J. 2018;59(1):74-81. Available at: <https://pubmed.ncbi.nlm.nih.gov/29302106/>

- Hensel ME, Negron M, Arenas-Gamboa AM. [Brucellosis in Dogs and Public Health Risk](#). Emerg Infect Dis. 2018;24(8):1401-1406. <https://doi.org/10.3201/eid2408.171171>
- Iowa State University Center for Food Security & Public Health. [Brucellosis: Brucella canis](#). 2018. Available at: https://www.cfsph.iastate.edu/Factsheets/pdfs/brucellosis_canis.pdf
- National Association of State Public Health Veterinarians. [Public Health Implications of Brucella canis Infections in Humans](#). Available at: <http://www.nasphv.org/Documents/BrucellaCanisInHumans.pdf>
- New Jersey Department of Health. [Animal Surveillance Case Definition – Brucellosis](#). Available at: https://www.nj.gov/health/cd/documents/casedef/brucellosis_ascd.pdf
- Santos RL, et al. [Canine Brucellosis: An Update](#). Front Vet Sci. 2021;8;594291. <https://doi.org/10.3389/fvets.2021.594291>
- United States Department of Agriculture. [Best Practices for Brucella canis Prevention and Control in Dog Breeding Facilities](#). 2015. Available at: https://www.aphis.usda.gov/animal_welfare/downloads/brucella_canis_prevention.pdf

Appendix A

Guidance for Veterinarians for Dogs Diagnosed with Canine Brucellosis

These guidelines are provided to assist veterinarians in the management of domestic dogs diagnosed with *Brucella canis* infection. Active infection with *B. canis* is typically detected by culture of *B. canis* from blood or other tissue, or culture of *Brucella* sp. and a positive result on AGID serologic assay.

Management of Infected Dog

- Euthanasia is **strongly recommended** as the most humane and practical disposition of an infected dog. Latent infection and periodic shedding of bacteria often persist despite long-term, expensive antimicrobial treatment. Infected dogs pose a lifelong health risk to people and other dogs.
- If euthanasia is not pursued, infected dogs should be neutered/spayed and then treated with antibiotics. Various options for antibiotic regimens have been published (see References), but no protocol has proven 100% reliable in clearing infection. Protocols consisting of a tetracycline and an aminoglycoside appear to offer the best rate of success.
- Veterinarians should advise owners that, during treatment, the infected dog should be isolated from other dogs (e.g., no trips to dog parks, kennels, doggy day care).
- Veterinarians should monitor the dog's response to treatment through serial cultures. Antibiotic treatment should continue until at least 3 consecutive negative cultures are obtained from blood samples collected 1 month apart.
- Although the 3 negative cultures provide supportive evidence that bacteria are no longer present in the bloodstream, bacteria may persist within immunoprivileged parts of the body (e.g., prostate, eye, joints). The dog may resume its normal activity with caution, and the owner should understand that infection may persist and relapses are common.
- The owner should be advised that any immunocompromised person who has potential contact with a *B. canis*-infected dog should consult with her/his personal health care provider about additional actions she/he can take to reduce risk of exposure.

Management of Dog Contacts

- Any dog residing in the same household or kennel as the infected dog or any dog that had intimate contact with the infected dog should be quarantined and should undergo screening with serological tests. Three consecutive negative serological tests should be performed with samples collected 1 month apart. Any positive results for serological tests should be followed by a culture (blood or tissue) for confirmation.

- Contact dogs should not be sold or used for breeding until 3 consecutive negative tests are obtained.

Infection Prevention and Control Measures

- Proper cleaning and disinfection are necessary to remove fomites from the home and clinic environments. Potentially contaminated surfaces should be first scrubbed with soap and water, followed by application of a disinfectant for at least 10 minutes.
- *B. canis* is quickly killed by most disinfectants including 1% sodium hypochlorite (household bleach), quaternary ammonium disinfectants (e.g., Roccal™), phenolic compounds (e.g., Lysol™), 70% ethanol, glutaraldehyde, and formaldehyde.
- Veterinary instruments and equipment can be decontaminated by autoclaving at 121°C for at least 15 minutes or by dry heat at 160–170°C for at least 1 hour. Boiling for 10 minutes also inactivates *Brucella*.
- Veterinary staff should use barrier protection (gloves, masks, eye protection) when handling the dog, its tissues, or excreta. All areas where the dog was present should be cleaned and disinfected.
- Veterinary staff who develop flu-like symptoms one to several weeks after contact with the dog should consult with their health care providers and indicate their possible exposure to *B. canis*.

References

- Cosford KL. [Brucella canis: An update on research and clinical management](https://pubmed.ncbi.nlm.nih.gov/29302106/). Can Vet J. 2018;59(1):74-81. Available at: <https://pubmed.ncbi.nlm.nih.gov/29302106/>
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- National Association of State Public Health Veterinarians. [Public Health Implications of Brucella canis Infections in Humans](http://www.nasphv.org/Documents/BrucellaCanisInHumans.pdf). Available at: <http://www.nasphv.org/Documents/BrucellaCanisInHumans.pdf>
- Santos RL, et al. [Canine Brucellosis: An Update](https://doi.org/10.3389/fvets.2021.594291). Front Vet Sci. 2021;8:594291. <https://doi.org/10.3389/fvets.2021.594291>

Appendix B

Recommendations for People Exposed to Domestic Dogs with Canine Brucellosis: Dog Owners, Kennel Operators, and Breeders

There is no treatment protocol that can reliably cure dogs with canine brucellosis. Spaying/neutering followed by months of antibiotic treatment has been attempted. But even after treatment, infected dogs are likely to relapse and periodically shed infectious bacteria, posing an ongoing risk of disease to both other dogs and people in the household. Because of their persistent animal and human health hazard, it is recommended that dogs with brucellosis be euthanized. If the infected dog's owner and veterinarian choose to attempt treatment, all household members must remain cognizant of the constant disease risk the dog poses and take appropriate precautions to reduce that risk as much as possible. Persons in contact with the dog should consult with their health care provider if they experience onset of any concerning symptoms or if they believe they have been exposed to *B. canis*. Brucellosis can cause a range of symptoms and initially presents as a flu-like illness.

If an owner decides to keep a dog diagnosed with brucellosis, the owner and all household members must abide by the following risk reduction actions for the remainder of the dog's life:

- A dog with brucellosis should not be kept in the same household as someone at high risk for developing serious illness. This includes children under 5 years of age, adults over 65 years of age, pregnant women, and people who are immunocompromised.
- If the ownership of the dog is transferred to another person or organization, those individuals should be informed of the dog's brucellosis diagnosis.
- Owners of dogs that have been in contact with the infected dog should consult their veterinarian about testing. Any contact dogs that show signs of brucellosis (e.g., fever, reproductive problems, eye problems, diskospondylitis) should be presented for veterinary examination and the veterinarian informed that the dog may have been exposed to brucellosis from another dog.
- Persons should avoid contact with the infected dog's blood, urine, feces, and reproductive fluids. They should make sure these materials do not get into mucus membranes or breaks in the skin. Contact surfaces should be cleaned and disinfected using 1% sodium hypochlorite (household bleach), quaternary ammonium disinfectants (e.g., Roccal™), phenolic compounds (e.g., Lysol™), or 70% ethanol. Disinfectants have a minimum contact time of 10 minutes.
- The infected dog should stay confined and isolated on the owner's property unless the dog is receiving veterinary attention. The owner should advise any veterinary clinic, at the time an appointment is made, that the dog has tested positive for brucellosis.

- If the dog is allowed off the property, the dog must be on a secure lead and be under the control of a responsible adult at all times. The dog should not be taken into public areas, such as dog parks, dog clubs, doggy day care, dog shows or trials, boarding kennels, or dog classes.
- The dog should not have contact with any individuals other than veterinary staff and household members.

Additional considerations for dog kennels operators and breeders:

- [Detailed guidance for preventing brucellosis in dog breeding operations](https://www.aphis.usda.gov/animal_welfare/downloads/brucella_canis_prevention.pdf) is available from the U.S. Department of Agriculture:
https://www.aphis.usda.gov/animal_welfare/downloads/brucella_canis_prevention.pdf

For more information about *B. canis* and brucellosis in general:

- [Centers for Disease Control and Prevention. “Brucellosis” webpage](https://www.cdc.gov/brucellosis/). Available at:
<https://www.cdc.gov/brucellosis/>
- [Iowa State University Center for Food Safety and Public Health. “Canine Brucellosis” fact sheet](https://www.cfsph.iastate.edu/FastFacts/pdfs/canine_brucellosis_F.pdf). Available at: https://www.cfsph.iastate.edu/FastFacts/pdfs/canine_brucellosis_F.pdf