

# Important Pathogens in Canine Reproduction

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There are essentially two pathogens that create the majority of reproductive losses due to infectious agents in canine reproduction: canine herpesvirus and *Brucella canis*. Other viruses and bacteria may also contribute to reproductive losses to a lesser extent, and will be mentioned, as well.

## Canine herpesvirus

Canine herpesvirus is nearly ubiquitous in the canine population, with some estimates at 80% of dogs in the general population having been exposed. Most of these animals do not show any clinical signs of infection. As with other herpesviruses, canine herpesvirus spends most of the time dormant within the cells of the body. On occasion, often in relation to stressful events, the virus will recrudesce and be shed from the body. Even during these times, clinical signs are usually absent. If present, in a non-pregnant animal, lesions are usually restricted to vesicular lesions on some mucosal areas. The only important deleterious consequence of canine herpesvirus infection happens in pregnant bitches or in neonates.

Canine herpesvirus shows a predilection for reproductive tissues and can cross the placenta to infect fetuses *in utero*. This may lead to pregnancy losses in the form of embryonic death and resorption, fetal mummification, or abortion. Canine herpesvirus also may be highly prevalent in vaginal secretions and therefore infect newborns as they pass through the vaginal canal during parturition. As neonates do not have mature immune systems, they are unable to control the spread and replication of the virus as a more mature animal would be able to do. Consequently, infection of a neonate with canine herpesvirus can be fatal.

Canine herpesvirus replicates best at temperatures greater than 99° F (37° C). Neonates are poikilothermic and therefore unable to regulate their body temperature independent of their environment. If neonates are housed in a cool, or merely room-temperature, environment, and are infected with canine herpesvirus, the virus will quickly replicate and affect most body systems of the neonate. The affected neonates will begin showing clinical signs a couple of days after infection, and usually die within a day or two of clinical signs.

Clinical signs of infection of a neonate with canine herpesvirus fall under the description of “Fading Puppy Syndrome” and include restlessness, lack of nursing, painful abdomen, crying, lethargy, inappetance, diarrhea, and depression. Once these clinical signs have manifest, there is usually nothing that can be done to save that individual animal. Affected animals should be separated from those not yet showing clinical signs in the hope that the non-clinical neonates have not been exposed yet.

Prevention of clinical signs is best attained by keeping the environment in the whelping box warmer (between 101° and 104° F) than is normally recommended for nesting boxes (between 85° to 90° F). This may be accomplished by placing a heat lamp suspended over the nesting box. Ceramic heat bulbs work well for this. Bright red lights, often used for keeping food warm, are often too hot. Monitoring the temperature with a thermometer is important to make sure that the target temperature range is being maintained.

Diagnosis of canine herpesvirus may be attempted by submitting paired serum samples from the dam for antibody titers. Results should be interpreted with caution, since most animals have been exposed at one time or another. Very high titers during a time of pregnancy losses, however, are suggestive of herpesvirus-related losses. Submitting deceased fetuses for necropsy evaluation may be diagnostic if inclusion bodies are detected.

Prevention of exposure is not practical in adult dogs. Clinical signs, however, seem to be most profound during the first exposure, so it makes sense to keep a naïve, maiden, pregnant bitch away from other dogs during her pregnancy and early nursing period.

Prevention of exposure in neonates may be accomplished through an elective C-section to avoid exposure to vaginal secretions.

Vaccination is not available in the United States.

## Brucella canis

While canine brucellosis may also be a causative factor in fading puppy syndrome, more often it causes *in utero* losses. Once thought to be regional and uncommon, more and more cases of canine brucellosis are being reported. Often these cases are associated with outbreaks in kennels, but cases in individual dogs belonging to casual breeders are also reported with seemingly increasing frequency.

*Brucella canis* is an intracellular bacteria that favors white-blood cells and the tissues of the reproductive system. As such, it is very difficult to treat with antibiotics. Most often, antibiotic therapy does not completely clear the animal of the organism, but simply reduces clinical signs temporarily. The best defense against canine brucellosis is to avoid exposure.

Once infected, clinical signs in an adult male dog include orchitis and epididymitis. Adult females usually only show clinical signs during pregnancy, when brucellosis will cause early resorption or later abortion. Abortions are accompanied by a dark, fetid discharge. This discharge is heavily laden with bacteria and easily spreads to other dogs that come to investigate the malodorous material, as dogs always will. Other routes of infection include exposure during mating.

Treatment is not practical, though some antibiotic regimes have been published. None of them reliably clear the bacteria. Spaying or neutering will not clear the body of the bacteria and it is still shed in the urine. The bacteria are zoonotic and cause serious

discomfort in humans who contract the disease. It may cause infertility in young people exposed to it. With these considerations in mind, euthanasia of affected animals may seem the wise choice. In some states, euthanasia is required by law. This is never an easy decision, as these animals may otherwise appear perfectly healthy.

Vaccination is not available for canine brucellosis. Prevention of exposure is the only line of defense. It is recommended that dogs in breeding programs, or around pregnant females, be tested every 6 months for *B. canis*. Multiple screening tests are available. The RSAT and AGID tests commonly used as screening tests have a high sensitivity but lower specificity for *B. canis* and so it is recommended that dogs testing positive have serum samples sent for a confirmatory test to Cornell University where a more specific AGID test (based on cytoplasmic proteins) is available. An ELISA is also available. A PCR-based test is under development and may soon come into wider use. Blood cultures may be performed by state labs, but are most accurate only in the first 30 days after exposure.

### **Other pathogens**

Any disease that affects a pregnant bitch systemically can cause pregnancy losses. These may include viral diseases such as distemper or influenza, or bacterial sepsis or endometritis. Mycoplasma has occasionally been implicated in pregnancy losses. Environmental bacteria rarely seem to cause pregnancy losses in the bitch.