

Common problems during pregnancy in the bitch

Kara A. Kolster

Springfield Veterinary Center, Glen Allen, VA

Introduction

Achieving pregnancy through proper breeding or artificial insemination at the appropriate time is the first step in producing a healthy litter of puppies. The next hurdle is keeping the dam and conceptuses healthy through full-term gestation. This review will discuss signs, treatment, and prevention of common complications in canine pregnancy for which breeders and clinicians should be aware.

Keywords: canine, pregnancy, infectious, herpesvirus, nutrition, eclampsia

Bacterial infection

Infection is a potential complication during pregnancy and a common concern of breeders. Bacterial infection may ascend through the cervix, spread hematogenously, or through oronasal contact. Exposure can occur at the time of breeding or at any point during gestation.

Bacterial infection with *Brucella canis* is a significant concern in all breeding dogs. Infection causes abortion in the female, and epididymitis and orchitis leading to sterility in the male. There is no effective treatment for *B. canis* in the dog. It is highly contagious and is spread through most body fluids, including semen, vaginal secretions, urine, nasal secretions, and saliva.¹ Most breeders are aware that *B. canis* is transmitted through sexual contact, however many do not realize it is also spread through artificial insemination and non-reproductive routes. All breeding stock should be tested regularly for *B. canis*: females prior to each breeding, and males ideally prior to each breeding or at least twice yearly. Positive results on a screening test, such as the rapid card agglutination test (RCAT), must be confirmed by a more specific test (agar gel immunodiffusion, polymerase chain reaction, or blood culture) as false positives occur.² If *B. canis* is identified in a kennel, the recommended treatment is euthanasia of affected dogs, and monthly testing of all individuals until negative results are achieved in the kennel for three consecutive months.^{2,3} Antibiotic treatment of affected individuals can lead to improvement in clinical signs and negative serologic test results, but does not effectively eradicate the organism. Once infected, a dog is a persistent carrier and can revert to shedding of organisms at any time.³ *B. canis* is transmissible to humans, particularly immunocompromised individuals, and causes recurrent fever and flu-like signs.^{1,2}

Bacterial infection with a variety of other organisms can affect pregnancy in the bitch. The most commonly isolated organisms from the cranial vagina are *Escherichia coli*, *Streptococcus* species, *Pasteurella* species, and *Staphylococcus* species.¹ Any of these normal flora can cause opportunistic infection. *Campylobacter* and *Salmonella* species have also been implicated in canine fetal loss.^{1,3} Elevated progesterone levels during diestrus and pregnancy maintain closure of the cervix and also cause immune system suppression. Bacteria introduced during estrus and breeding should be cleared from the uterus prior to cervical closure. If bacteria remain within the uterus or gain entrance through the cervix during pregnancy, infection can occur due to diminished immune reaction. Bacteria may attack the placenta and fetus, or cause systemic disease in the dam which leads to fetal loss. Necropsy of aborted or stillborn fetuses may show characteristic lesions depending on the causative organism and is often the best diagnostic tool. Culture of placental tissue or fetuses may also identify a bacterial cause. Tissue should be refrigerated, not frozen, for best results. Signs of bacterial infection during pregnancy can include vaginitis, mucopurulent or hemorrhagic vulvar discharge, lethargy, inappetance, abortion or premature labor. Diagnostic workup of the bitch with a suspected intrauterine infection should include thorough physical examination, abdominal ultrasound to evaluate fetal viability and abnormal uterine contents, complete blood count, progesterone level, guarded-swab aerobic vaginal culture, vaginal cytology, and *Mycoplasma* culture if indicated. Treatment is initially with broad spectrum antibiotics pending culture and sensitivity results. Certain antibiotics, such as fluoroquinolones and tetracyclines, are contraindicated during pregnancy due to potential negative effects on fetuses.

Treatment success, as measured by the ability of the bitch to carry the litter to term and deliver viable puppies, is dependent upon the stage of gestation when infection is first identified, severity of infection, presence of dead or macerated fetuses in the uterus, premature drop in progesterone levels due to local prostaglandin release, and ability to quickly institute appropriate antibiotic therapy.

Viral infection

Viral transmission is typically through oronasal exposure. The most significant virus in canine reproduction is herpesvirus. Exposure of a naïve bitch during the last three weeks of gestation will cause stillbirth or neonatal loss. Exposure to neonates during the first three weeks of life also results in near 100% fetal mortality. Herpesvirus causes mild, if any, clinical signs in otherwise healthy adult dogs. Transient upper respiratory signs and vesicles on the penis or vagina may be seen.⁴ Herpesvirus complications can be prevented by exposing the bitch prior to breeding, isolating dam and neonates during the susceptible period, and by providing proper heat sources to neonates. Maintaining body temperature at 98-100 degrees F will help prevent viral replication. Treatment of neonates infected with herpesvirus is generally unrewarding. Some individuals may be saved with temperature regulation, prevention of secondary bacterial infection, and supportive care. However, significant neurologic and renal complications are reported in dogs that have survived neonatal herpesvirus.

Bitches may be exposed to numerous other viral agents that cause pregnancy complications. The best prevention is maintaining strict biosecurity practices: do not expose pregnant bitches to public areas such as dog shows, isolate pregnant bitches and puppies from other dogs that have been outside the home environment, and maintain clean hands, clothes, and shoes for caretakers and visitors when handling pregnant bitches and puppies.

Premature labor

Any process in the bitch that causes prostaglandin release and decrease in serum progesterone can lead to premature labor and delivery of puppies. These causes can include infection, trauma, primary hypoluteodism or other hormonal aberrations. Accurate gestational aging is necessary, as frequently the lack of precise ovulation timing makes determining due date difficult and the bitch may actually be in labor with full-term puppies. Treatment of pre-term labor should be directed at the primary cause, if known. Options include the use of tocolytics, progesterone monitoring and supplementation, and uterine contractility monitoring.

Inadequate nutrition

Nutrition of the pregnant bitch is an important factor in producing a healthy litter. Current recommendations for feeding the pregnant bitch are to provide increased (28-30%) protein, increased fatty acids, and moderate levels of carbohydrates.^{5,6} Inadequate nutrition during pregnancy can result in the birth of small weak pups and increased neonatal mortality. Appropriate nutrient balance should be provided from breeding through weaning, however caloric needs do not increase until the last three weeks of gestation when the fetuses are growing significantly in size. Prior to this, organogenesis and development are occurring, which do not require increased caloric intake for the dam. Increasing calories too soon can lead to obesity, which has a negative impact on whelping ease and increases the risk of dystocia and cesarean section. Changing to a higher protein food during pregnancy may require a decrease in total amount fed to maintain steady caloric intake. Caloric requirements during late gestation increase to approximately 150-200% of maintenance levels, depending upon breed size and litter size. More frequent smaller meals (e.g. three to four times daily) are useful when the distending uterus pressures the stomach. Supplementation with appropriate levels of omega-3 and omega-6 fatty acids can improve litter health and puppy trainability.⁷ Many other supplements may actually be detrimental to an otherwise balanced diet and are therefore not routinely recommended.

Trauma

Injury may occur due to everyday accidents and physical limitations of late pregnancy. Increased abdominal size and change in weight distribution can make previously routine activities dangerous for the pregnant bitch. Blunt trauma to the abdomen, such as a fall or hit-by-car, can cause placental abruption or uterine rupture. Consequences of acute trauma to the dam can also cause prostaglandin release and luteolysis. Penetrating abdominal wounds can cause direct trauma to the uterus and fetuses. Most other types of physical injuries do not directly affect fetal health. However, potential risk to the fetuses should be considered when treating the bitch with anesthetics, antibiotics, or analgesics.

Hypocalcemia

Also known as eclampsia or puerperal tetany in the dog, hypocalcemia most commonly occurs during the first few weeks postpartum but may occur prior to whelping.¹ Small breed dogs with large litters are at increased risk.⁸ Initial signs of restlessness, stiffness, trembling, behavior changes, and facial pruritis progress to tetany and convulsions within minutes to hours. Clinical hypocalcemia should be treated as an emergency. Puppies typically must be weaned or supplemented with bottle-feeding to reduce strain on the dam after she is stable. Dietary imbalance of calcium and phosphorus during pregnancy predisposes a bitch to develop hypocalcemia. A diet with calcium:phosphorus ratio ranging from 1:1 to 1.2 :1 is reportedly suitable for pregnancy.^{1,8} Additional calcium supplements should not be added to the diet during pregnancy, however they may be helpful during heavy lactation in bitches prone to developing hypocalcemia.

Conclusions

While many canine pregnancies are routine and uneventful, the potential for pregnancy complications in the bitch exists from many causes. Many problems can be prevented with proper knowledge and husbandry practices. It is important for breeders and clinicians to be aware of risks, warning signs and treatment strategies when complications occur.

References

1. Johnson SD, Kustritz MVR, Olson PNS: Canine and feline theriogenology. Philadelphia: Saunders; 2001.
2. Hollett RB: Update on canine brucellosis. *Theriogenology* 2009;1:287-925.
3. Pretzer SD: Bacterial and protozoal causes of pregnancy loss in the bitch and queen. *Theriogenology* 2008;70:320-326.
4. Verstegen J, Dhaliwal G, Verstegen-Onclin K: Canine and feline pregnancy loss due to viral and non-infectious causes: a review. *Theriogenology* 2008;70:304-319.
5. Kelley RL: Nutritional management of the bitch: pre-breeding to whelping. *Proc Canine Reprod Breed* 2001. p. 14-17.
6. Rosmos DR, Palmer HJ, Muiruri KL, et al: Influence of a low carbohydrate diet on performance of pregnant and lactating dogs. *J Nutr* 1981;111:678-689.
7. Kelley RL, Lepine AJ: Improving puppy trainability through nutrition. *Proc Iams Canine Pediatr Symp* 2005. p. 30-34.
8. Drobatz KJ, Casey KK: Eclampsia in dogs: 31 cases (1995-1998). *J Am Vet Med Assoc* 2000;217:216-219.

