

# Failure of pregnancy in dogs and cats



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## Abstract

Failure of pregnancy in dogs and cats is approached as a diagnostic investigation of an individual animal. It begins with a preliminary discussion on zoonotic disease and expectations (seldom is the case) of evaluation. General approach from a pathology point of view is to identify potential infectious causes of pregnancy failure and to correlate these observations with lesions. Potential infectious agents include eubacteria, fungi, viruses and protists. When infectious causes have been ruled out, the focus is then on noninfectious causes and particularly those with lesions. Maternal evaluation, including endometrial biopsy after uterine involution, is part of the investigation. Special effort should be made to collect umbilical arteries and lungs of fetus, and fetal membranes around the marginal hematoma. Failure of pregnancy due to noninfectious causes without lesions contributes to a large percentage of cases, suggesting maternal, paternal, molecular, nutritional, or toxic causes.

**Keywords:** Dogs and cats, pregnancy, abortion, stillbirth, embryonic mortality

## Introduction

There are 2 parts to the general approach to investigate failure of pregnancy in any species, particularly, in dogs and cats: a preliminary discussion with owners to ensure safety, expectations, and thoroughness of the evaluation and second, the diagnostic process.

## Preliminary discussion

Begin discussions before the diagnostic process and include a discussion on public health and safety issues, identifying the problem, performing a cost-benefit analysis of investigation and diagnosis, and considering isolation of affected dams. Zoonotic pathogens in dogs and cats include the eubacteria *Salmonella* spp. and *Campylobacter* spp. and in dogs *Brucella canis*. Appropriate precautions and personal protective equipment are essential. In cats, *Coxiella burnetii* is an important consideration.<sup>1-4</sup> Abortion and stillbirth are rare; however, placenta may harbor large numbers of organisms that spread during cesarian section or parturition. A thorough risk assessment should therefore be conducted along with appropriate precautions. Because dogs and cat submissions are not usually subsidized in government laboratories, failure of pregnancy investigation can be a costly process and is usually only attempted when there is a public health risk in breeding kennels and catteries, or when the owner is prepared for the costs involved. Reproductive performance and kitten mortality rates are known<sup>5</sup> but the diagnostic success rate for failure of pregnancy investigation is unknown. Often postmortem and subsequent histological evaluation for lesions are performed before additional testing is used to verify the presence of an

infectious agent or to verify that the organism recovered is responsible for pregnancy failure.

## Diagnostic process

It is similar to other disease investigation and involves determining signalment, history, macroscopic evaluation and collection and laboratory evaluation of samples from dam, fetus and fetal membranes, a tentative diagnosis. Complete investigation includes careful examination of fetus and fetal membranes, umbilical cord, and collection of appropriate samples as outlined by a particular diagnostic laboratory. It is preferential to submit whole puppies and placentas, however to reduce costs, sampling of the fetal membranes to include the labyrinth, marginal hematoma and nonlabyrinthine portion is critical. Reporting findings and lesions is made easier now by taking photographs with a mobile phone.

There are few normal structures in dog and cat fetal membranes that may be mistaken for lesions. Most are aware of the presence of a marginal hematoma. Puppies in particular, are often autolyzed and thus have watery bloody fluid in their subcutis and body cavities. True hemorrhage had blood clots or is a fluid with a normal or near normal erythrocyte content.

## Infectious causes of failure of pregnancy

Various infectious agents are reported to cause pregnancy failure. They include viruses, bacteria, and protozoa. Many case reports, reviews and conference proceedings listed bacteria recovered from cases of infectious abortion or stillbirth.<sup>6-8</sup>

Many eubacteria are responsible for failure of pregnancy<sup>6</sup> including *Streptococci*<sup>9</sup> but there are some that are of greater importance, particularly, those with public health implications. *Salmonella* spp. and *Campylobacter* spp. are particularly important in dogs and cats.<sup>7,10-14</sup> *Brucella canis* is increasing its geographical range and continues to be important in causing failure of pregnancy.<sup>15-17</sup> As with many bacteria, there are usually few or no postmortem changes either in the fetus or placenta. Diagnosis is suspected when histopathology identifies neutrophilic placentitis or when *Salmonella* spp. or *Campylobacter* spp. is identified by culture of the placenta and/or fetus. Although there is initially a maternal infection, clinical signs in the mother may not be apparent. Case studies of infection in a kennel and kennel workers demonstrates the public health importance.<sup>10</sup>

Failure of pregnancy caused by *Coxiella burnetii* in dogs and cats is extremely unusual. Infection of the placenta of cats, however, is particularly important because of a lack of awareness of infection in outdoor cats. From a public health perspective, it is very important, particularly for veterinarians and veterinary practices.<sup>1-4</sup> A risk assessment should always be performed when dealing with a cat that is queening or undergoing a cesarian section.

**Viruses** responsible for pregnancy failure in dogs and cats are the classical and well-known viruses of each particular species<sup>7</sup> including; in dogs, *Canid alphaherpesvirus 1*,<sup>18,19</sup> *Carnivore bocaparvovirus one* (canine minute virus),<sup>20</sup> and *Canine distemper virus*;<sup>21,22</sup> and in cats, *Felid alphaherpesvirus*,<sup>18</sup> *Feline immunodeficiency virus*,<sup>23,24</sup> *Alphacoronavirus 1* (feline infectious peritonitis virus), *feline leukemia virus*,<sup>25</sup> and *Carnivore protoparvovirus 1* (Feline parvovirus).<sup>22</sup> Fortunately, molecular diagnostic tests make identifying these agents much easier.

**Protozoa** responsible for failure of pregnancy are *Toxoplasma gondii* in cats<sup>26</sup> and *Neospora caninum* and *Leishmania infantum* in dogs.<sup>27</sup>

## Noninfectious causes of failure of pregnancy

Noninfectious causes of failure of pregnancy represent a substantial number of the overall causes. These causes can be classified into fetal, placental, maternal, fetal – maternal incompatibility and paternal components. Some have identifiable lesions and whereas some do not. Noninfectious causes are classified into those with identifiable lesions and those without lesions. This classification aids in the investigation of the problem at the kennel or cattery level.

**Noninfectious fetal lesions.** Among the reported noninfectious fetal lesions, anomaly rates were very high in dogs and observed up to 10% of puppies born.<sup>28,29</sup> Some lesions are highly visible congenital defects, and include omphalocele, gastroschisis, amelia, anencephaly, anal atresia, fetal hydrops and cleft palate. These do not present a challenge.

More challenging is those with a histologic lesion but no gross lesion. Pulmonary immaturity and dysplasia are frequent, particularly in stillborn pups. Careful evaluation of all organs is thus required for identification.

**Noninfectious placental lesions.** Identification of noninfectious placental lesions is not reported; careful examination of fetal membranes, umbilical cords, and the fetus is necessary. Awareness of conditions such as a single umbilical artery is necessary to find such a lesion!

**Noninfectious causes without lesions.** A diagnosis of ‘idiopathic’ failure of pregnancy is all too common in dogs and cats. Considering the reported high prevalence of congenital abnormalities, it is likely that chromosomal and genetic abnormalities exist. Routine evaluation for these is not available.

**Maternal causes** may be readily identifiable and therefore, samples not sent to diagnostic laboratories. Failure of pregnancy with a maternal basis is seldom included in laboratory statistics as materials are not usually submitted. Dystocia,<sup>5</sup> endometritis, endometrial fibrosis, uterine neoplasia, hypoluteoidism, and hypothyroidism<sup>30</sup> are all possible contributors. Endometrial biopsy to identify endometrial fibrosis or other changes that may result in failure of pregnancy (as opposed to failure to become pregnant) is seldom routinely done and is in its infancy.

**Fetal maternal incompatibility** is an area of investigation that is not pursued in practice. Presence of excessively aggressive trophoblasts<sup>31</sup> and subinvolution of placental sites are reported as postpartum complications in bitches but the influence of the interaction of invasive trophoblasts and the endometrium and maternal fetal immunologic incompatibility awaits further study.

**Paternal causes** of failure of pregnancy have received little attention but are likely present. Pedigree analysis and trial breeding are required to identify such causes.

## Conclusion

Not much has changed in the last 14 years since what was written<sup>8</sup> ‘knowledge of the causes of canine or feline pregnancy loss is limited and the success rate for making a definitive diagnosis is disappointingly low.’ Financial constraints have not changed and until there is a greater emphasis on investigating the failure of pregnancy in dogs and cats, further progress is unlikely. Microbes of the classic diseases of dogs and cats continue to be evaluated in pregnancy failures in these species.

## Conflict of interest

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