



## Infertility In Male Dogs

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### Introduction

Impaired fertility may lead to no or lower number of puppies, emotional disappointments of breeders and potential puppy buyers and substantial financial losses for breeders. Very little is known about male infertility in the dog. Regarding human male infertility, the cause remains unknown in 70% to 74 % of cases (Johnston et al., 2001). In the area of human medicine, when the semen is of poor quality, most of the time assisted reproduction techniques are utilized such as in vitro Fertilization (IVF) or Intra-Cytoplasmic Sperm Injection (ICSI). These techniques are not routinely available to the dog, but may be used in the future (England et al., 2001) therefore, the prognosis of infertility often remains very poor. However, some infertility causes can be partially or totally cured if the veterinarian is consulted early enough. A complete clinical survey of the dog is very often important as some diseases may begin by causing infertility and thereafter creating a more general health problem. But in only 10% of dogs presented with infertility may fertility be restored after diagnosis and appropriate treatment (Johnston et al., 2001).

### Different Causes of Infertility in Male Dogs

#### Anatomical Abnormalities

##### A. Congenital Defects

1. Hermaphroditism or pseudo hermaphroditism – **Sterility**
2. Testicular Hypoplasia, Epididymal Segmental Aplasia, Agenesis of The Vas Deferens, Congenital Bending of The Penis Bone, Hypospadias or Epispadias, Bilateral Cryptorchidism - **azoospermia or incapacity to mate**

##### B. Acquired anatomical abnormalities

- Spermatocele or sperm granulomas, stenosis or obstruction of the genital ducts - after an infection for example - or inguinal or scrotal hernia - **azoospermia or aspermia**
- Orthopedic problems - **prevent the male from mounting the female**
- strictures after surgery or injuries and penis bone fractures



## Low Quality Semen

### 1. Prostatic Problems

- Decreasing the volume of the ejaculate - anti-androgenic treatment
- Altering sperm motility (ciliostasis)
- Killing sperm in situ, or making it unable to progress in the female genital tract
- May induce a permanent or temporary blockage of the ducts as they enter the prostate

### 2. Epididymal Problems

- Spermatozoa are synthesized in the testicles. They acquire motility and fertilizing ability during epididymal transit. Any disorder affecting these organs may therefore lead to infertility
- Bacterial infection of the epididymis usually occurs via two main routes, ascending infection from the urethra via the deferent duct and accessory genital glands, or hematogenous spread
- *Brucella canis* is the most common *Brucella* found in dogs.
- epididymides increase in size, pain develops and there is extra fluid within the cavity of the vaginal tunics
- Epididymitis, presumably caused by Gram negative organisms such as *E. coli*, tends to be more severe and necrosuppurative than those seen in canine brucellosis.
- Protozoal epididymitis, in particular caused by *Leishmania*

### 3. Testicular Problems

- Gram negative organisms such as *Escherichia coli* and occasionally by *Brucella canis* and *Brucella suis*
- *Aureimonas altamirensis* - edematous testicle
- **Rickettsia**-Dogs with Rocky Mountain Spotted Fever are reported to develop orchitis
- Necrosis of the testis is particularly seen in retained (or cryptorchid) testes
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- The causes of testicular atrophy are:
  - high environmental temperature
  - fever
  - epididymitis and orchitis
  - scrotal dermatitis
  - scrotal edema
  - periorchitis
- radiation (for cancer therapy)
- poor health and debility
- advancing age.



- hormones
  - estrogen
  - testicular sustentacular (Sertoli) cell tumors
- drugs
  - chemotherapy

#### 4. Urinary problems

- Cystitis or urethritis may interact with sperm motility when they modify the acidity of the urethra.
- Food-induced alkalization of urine may have the same wrong effect.

#### 5. Hormonal problems

- Any hormonal trouble may interact with the hypothalamus-pituitary axis – OAT
- Hypopituitarism – azoospermia
- Prolactin adenomas - Prolactin adenomas
- insufficiency of FSH or LH - alter spermatogenesis
- Testicular tumors - excessive hormonal secretion - decrease of spermatogenesis
- Hypothyroidism - a potential cause of infertility-especially in large breeds
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#### 6. Retrograde ejaculation

- A retrograde backflow of semen into the bladder when ejaculation occurs - aspermia or oligospermia
- Causes of this problem in the dog are: urethral calculus, cystitis (due to a weak inflammation of the sphincter of the bladder), local injuries and post-surgery strictures.

#### 7. Infectious diseases

- Infections often lead to an orchitis/epididymitis, with a subsequent alteration of the quality of the semen.
- Canine brucellosis is often responsible for a rapid decrease in the quality of the semen by causing an acute and more often a chronic orchi-epididymitis. In 2 to 5 weeks, a high number of abnormal spermatozoa will appear (30% to 80%).
- *Coxiella burnetii* have been identified as potential causes of orchitis in the dog.
- Among aerobic flora, *Streptococcus* sp., *E. coli*, *Pasteurella multocida*, *Staphylococcus* sp., *Proteus* sp., *Corynebacterium* sp, are often identified when a prepuce swabbing is cultured
- These germs can penetrate organs like the prostate or the testicles when local injuries occur (bites) or by ascendant progression in the genital ducts.
- Fungi - *Blastomyces dermatidis* - orchitis and balanoposthitis

#### 8. Drugs

The drugs that are known to affect infertility. They include

- Steroidal compounds (methyltestosterone, Estrodiol, diethylstilbestrol, KABI1774,
- betamethasone, prednisolone)
- Contraceptive compounds: tamoxifen citrate, gossypol.



- Chemotherapeutic agents: Busulfan, Chlorambucil, Cisplatin, cyclophosphamide, methotrexate, vincristine.
- Miscellaneous drugs: anticholinergics, barbiturates, chlorpromazine, diazepam, digoxin, levodopa, phenytoin, primidone, propranolol, thiazine diuretics, verapamil.

### 9. Genetical problems

- 79 XXY syndrome - hypoplastic testes
- XX sex reversal (78 XX males) - normal male external genitalia and testicular or ovarian gonadal tissue -in Cocker Spaniels, Pointers, Kerry Blue Terriers, Weimaraners, Pugs, and Beagles.
- An immotile cilia syndrome - absence of dynein arms in the microtubules of the sperm tail
- Kartagener's syndrome - respiratory tract disease, male sterility, situs inversus and hydrocephalus - autosomal recessive mode of inheritance

### 10. Abnormal sexual behaviour

- Lack of libido – Can be observed in Basset-Hounds or Golden Retrievers
- Painful mating
- Socialization
- Stress

### Aspermia or oligospermia (lack of volume)

This may be occurred due to

- An incomplete collection of semen
- Lack of sexual maturity
- The existence of pain during ejaculation
- A prostatic problem
- A retrograde ejaculation
- Neuropathy, spinal cord injury or diabetes mellitus.

### Asthenozoospermia

- In infertile men, asthenozoospermia occurs when less than 25% of spermatozoa have normal motility. In dog, this terminology may be used when less than 50% of spermatozoa have a normal forward motility

This condition can be seen in

- The collection material that has not been correctly rinsed and may harbor spermicidal substances during semen collection
- An inflammation of the urinary or genital organs, such as prostatitis, cystitis, urethritis
- May be start of another genital problem

### Azoospermia or severe oligozoospermia

In this condition

- Ultrasonography of testes may show tumors, or heterogeneous testicular tissue, which makes the veterinarian often believe that spermatogenesis is reduced and that the seminiferous tubes are empty
- Alkaline phosphatase concentration in seminal fluid -assay



- In males with bilateral obstructive azoospermia, the concentration may be very low (sometimes as less than 10 units/L). Aspiration of the cauda epididymis may allow verification of spermatogenesis, but it may cause the formation of sperm granulomas and antisperm antibodies.

### **Oligo-astheno-teratozoospermia (OAT)**

- In the case of inflammation, the return to normal fertility is unlikely to happen if fibrosis or degenerative changes have occurred.
- Most of the time OAT is a step towards complete azoospermia and it may be reversible only during a short time period.
- With any treatment, no improvement will occur for at least 62 to 70 days after the start of treatment, that is, the duration of a normal spermatogenic cycle.
- In case of genital or urinary infection, specific antibacterial compounds, depending upon the antibiogram, may be used for a long period (at least 3 weeks to one month)
- Dogs with brucellosis should not be used for breeding, even after treatment and even if they become seronegative.

### **Pyospermia**

- Normal dogs should normally have less than 2000 white blood cells per microliter in the first and second fraction
- Definitive diagnosis of infection of the urinary or reproductive tract can be stated when more than 10 000 bacteria per milliliter of semen are cultured

### **Hematospermia**

- Dogs with blood in the ejaculate are not necessarily infertile
- check first if any lesion of the penis may bleed during erection
- If no lesion of the penis is observed, a thorough clinical examination of the prostate

### **Failure to achieve erection**

- If the dog experiences pain
- If no semen can be obtained - blood sample should be taken to assay androgens and thyroxine levels
- Electroejaculation under general anesthesia could be considered as a mean of obtaining semen from very recalcitrant dogs

### **Failure to achieve copulation**

- dogs with painful orthopedic conditions
- Dogs with idiopathic poor libido - GnRH injections prior to semen collection or breeding attempt

### **Clinical Approach to The Infertile Dog**

Clinicians should try to put together the following information:

- a) If and how was fertility assessed for mated bitches
- b) If and how was ovulation determined in previous breedings
- c) If some of the bitches bred did whelp, it is very important to calculate the exact duration of pregnancy. Gestations of 57-59 days mean that the bitch had already ovulated when she was mated, while gestations of 67-72 days mean that the bitch ovulated 2-9 days following mating. Gestations whose lengths is shorter or longer than the interval 60-66 days may be characterized by a small litter size, but this is more likely due to wrong timing of breeding rather than to poor male fertility.
- d) If, how and when (after breeding) was pregnancy diagnosis carried out on mated bitches
- e) Whether any drugs were used which could depress testosterone production (such as androgens,



glucocorticoids, oestrogens, progestogens, cimetidine or ketoconazole) or act on the ejaculatory process (such as xylazine or fentolamine)

f) Whether the dog has suffered from any disease, accidents or injuries which can be relevant to reproduction

### **Semen Evaluation**

- Sperm motility, concentration and morphology, presence of white blood cells in the sperm sediment, seminal plasma pH and alkaline phosphatase should be assessed.
- Sperm concentration can be measured loading a haemocytometer with the right amount of semen and the right dilution rate according to manufacturer's instruction for the haemocytometer being used. The number of cells in the central square millimetre x 106 x semen volume gives the total number of spermatozoa/ejaculate (normal is 200-2000 million sperm/ejaculated).
- Sperm morphology should be evaluated on at least 100 cells (we normally evaluate 200 sperms in infertility cases). The number of white blood cells (WBC) can be calculated by counting the number of WBC in the 4 large corner squares of the haemocytometer and multiplying by 250 (normal is < 2000/ml).
- Seminal plasma alkaline phosphatase (ALP) is produced in the epididymides. Low concentration or absence of ALP indicates incomplete ejaculation or bilateral obstruction of the epididymides or of vasa deferentia
- 'Sperm bacteriology and virology tests should also be performed.

### **Endocrine Testing**

#### **Testosterone**

Stimulation test using GnRH (25-50 mcg/dog, or 2.0 mcg/kg, IM) or hCG (44 IU/kg) - Basal and 1-hour (GnRH) or 4-hour (hCG) post-stimulation blood samples should be taken- Serum testosterone is 0.1-4.0 ng/ml prior to stimulation, and 3.0-7.0 ng/ml after stimulation.

#### **Gonadotropins**

Commercial semi-quantitative LH assays can be used if the testosterone concentration following stimulation is low, in order to distinguish between a hypothalamic-gonadal problem and a true gonadal problem

#### **Thyroid hormones**

Hypothyroidism should be ruled out in hypofertile dogs (clear link between low thyroid function and reproductive disease has not been established yet)

#### **Ultrasonography**

- Prostate and testicles are best evaluated in the sagittal and transverse planes using 5.0 or preferably 7.5 MHz scanners.
- An enema should be administered prior to scanning the prostate to eliminate colonic contents
- echogenically complex areas may indicate neoplasia or areas of infection within the gland
- Ultrasonography of the testicles may reveal non palpable neoplasms, cysts, abscesses or areas of cavitation.

### **Research tests**

- Canine anti-sperm antibodies - direct immunofluorescence& gelatin agglutination- Acute testicular inflammation can damage the integrity of the seminiferous tubules, exposing spermatozoa to the immune system, thereby causing development of antibodies directed against spermatozoa, spermatogenic cells and tubular basement membranes.



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