Introduction

Infertility and subfertility in the male dog is one of the most frustrating problems dealt with by the theriogenologist. Semen quality is difficult, if not impossible, to influence. When problems are suspected, the clinician must do a complete examination to determine the fertility status of the dog, as well as the potential cause(s) of the problems detected. Some causes of male dog infertility may be reversible, where most are not. If a bitch does not become pregnant after breeding, the dog must be considered as a potential reason for that infertility. Semen quality and breeding management account for most unsuccessful matings in the bitch. As part of the diagnostics applied to canine infertility, a breeding soundness examination of the dog must be performed.1

Keywords: Breeding soundness, infertility, semen evaluation, canine

Breeding soundness examination1-3

History

Breeding soundness examinations of the male dog should begin with a complete history of that individual dog. Health and breeding history may be helpful in identifying the cause and chronology of any problems. General health issues can influence the function of the reproductive tract of any male. Systemic disease, including any that might cause fevers, can adversely affect the functioning of the testes. Endocrine disease can disrupt the feedback mechanisms responsible for the production of sperm and hormones in the testes.

Physical examination

A physical examination of the dog is performed including the internal and external genitalia. The scrotal contents include the testes, epididymes, vaginal tunics, and the spermatic cord. The spermatic cord contains the pampiniform plexus surrounding the testicular artery, vas deferens and the cremaster muscle. The thermoregulatory properties of these structures keep the testes at a temperature that is less than body temperature combined with the ability of the tunica dartos of the scrotum itself to contract and relax. This reduced temperature is required for proper functioning of the testes in making spermatozoa. Testosterone is typically unaffected by the temperature of the testes and will continue to be in the normal range even in the event of abdominal testes. The only internal structure of importance is the prostate gland. The penis and prepuce is examined for normal anatomy, injuries, and evidence of inflammation.

Manual ejaculation

Most intact male dogs can be manually stimulated to ejaculate. There are three fractions to the dog ejaculate, the presperm, sperm-rich, and postsperm fractions. The presperm and postsperm fractions originate from the prostate gland. The sperm-rich fraction comes from the testes through the epididymes and the vas deferens. Evaluation of the ejaculate starts with noting the color of the ejaculate. The normal ejaculate will be grayish to white in color, depending on the concentration of sperm cells. Any other color indicates contamination of the ejaculate with such fluids as urine (yellow), blood (red or brown), or pus. The presperm fraction of the ejaculate is unpredictable in volume, depending on the level of sexual excitement of the dog or the health of the prostate gland. Typically, the presperm fraction is collected until followed by the sperm-rich fraction, collecting the first and second fraction together. The postsperm fraction is normally crystal clear and follows a pause in the pulsations. Any deviation from a water-like appearance in the prostatic fluid indicates problems.
Semen assessment

Sperm quality in the dog is evaluated by assessing motility and morphology of the spermatozoa. Motility is assessed on a warm slide with 10-40X objectives of bright field or phase-contrast microscopes. An attempt is made to estimate the total percentage of motile cells expressed by a percentage. Morphology is assessed with the 100X (oil immersion) objective after staining a drop of semen. Oil immersion (1000X) magnification is essential to correctly assess sperm morphology. The stain used is critical. Eosin-nigrosin (Hancock) stain is an excellent stain for semen. It is easy and inexpensive to use and readily available. Many veterinarians feel comfortable assessing motility, but neglect the assessment of sperm morphology. Major problems are missed when sperm morphology is not part of the semen evaluation therefore must be part of the semen assessment of the dog. Sperm quantity is measured by volume and concentration. Volume can be measured by aspirating into a syringe or pipetting the ejaculate into a graduated tube. Concentration is measured by the use of a hemocytometer, the gold standard. The number of total motile normal sperm cells in the ejaculate can be calculated by multiplying these four measurements together: Volume X Concentration X Percent Motile X Percent Normal. An estimated adequate breeding dose in the dog is 200 million normal motile cells. This number is probably reduced in small breeds due to the small size of both the dog and bitch.

If the semen output is found to be lacking in quantity or quality, then the fertility of that male dog is diminished. A low number of sperm cells is termed oligospermia. The presence of abnormal sperm cells is termed teratospermia. Poor motility, asthenospermia, can also affect the fertility of a dog. Lack of sperm in an ejaculate is azoospermia, the only condition that can be considered truly sterile.

Semen handling

When handling semen, care must be taken not to damage the sample. The major categories of iatrogenic damage to sperm cells are temperature, chemical, mechanical, and osmotic. Semen samples in the dog can be maintained at room temperature for several hours without significant damage to the sample. Extremes in temperatures are usually not a problem when handling dog semen, except in the case of overheating of equipment. Chemical damage of sperm is to be avoided. Reusable equipment is typically avoided due to the chance of detergent residues left after washing. Another source of chemical damage is with the use of lubricants that contain bacteriostatic compounds, (e.g. chlorhexadine). Osmotic damage is seen whenever semen is exposed to water. Care should be taken whenever water baths are used not to contaminate the semen with water. Mechanical damage can occur when aspiration or expression of the semen is performed too quickly. Slow aspiration of semen into or out of a syringe should be a goal.

Causes of infertility/subfertility

Once a dog has been evaluated and found to have problems with sperm quality or quantity, an attempt is made to determine the cause. Many times, a cause cannot be identified. The spermatogenic cycle in the dog is 54 days. The ejaculate obtained on a particular day has been forming and developing for the last two months. Any condition or insult to the dog that has occurred during that two months will influence his semen quantity and quality. In order to assess prognosis, sequential samples may be taken at two-month intervals. The progression of a problem or of recovery can only be determined by serial evaluations.

Testicular degeneration

Testicular degeneration is a general term given to testes that have undergone some kind of decline from normal. Palpation reveals a softening of the testes and a lack of tone. Over time, testicular degeneration can result in a decrease in size of the testes, ultimately resulting in testicular atrophy. There are a multitude of causes of testicular generation. The most common one found in the dog is age-related testicular degeneration. As the dog ages, the semen quality will eventually decline. Any dog over the age of five is at risk for age-related testicular degeneration. One common morphologic abnormality seen in
the semen of older dogs is proximal droplets. Some older dogs will have an ejaculate with 100% proximal droplets leading to very reduced fertility, if not sterility. Often, these ejaculates have very good motility that will lead many evaluators to misjudge the fertility of the dog. Other individuals will show a progressive percentage of a variety of sperm abnormalities in the ejaculate. Age-related testicular degeneration is almost always irreversible.

Reversible testicular degeneration is seen when there is a correctable problem with the thermoregulation of the testes. This can be caused by high environmental temperature, ex. summer months, or by rigorous training. Show dogs are often exposed to hair dryers that can cause overheating of the testes. Systemic diseases that cause fevers or any inflammation of the testes or the scrotum can cause testicular degeneration. Skin disease can affect the scrotum’s ability to cool the testes. If a problem in thermoregulation is identified and corrected, the testes may recover and produce a normal ejaculate. As stated above, prognosis can only be accurately determined by serial evaluations.

Prostate gland disease

Intact male dogs produce testosterone that, in turn, causes an enlargement of the prostate gland. Being an accessory sex gland, the prostate gland is responsive to and stimulated by testosterone. The prostate gland, in turn, provides the volume of the canine ejaculate. Benign prostatic hypertrophy/hyperplasia (BPH) is a common finding in male dogs and may be a normal finding in many individuals. Attempts to determine the normal limits of prostatic size in intact male dogs have been made and debated. Due to the extreme body size differences seen among breeds, prostate gland size is variable and dependent on the size of the dog. Benign prostate enlargement typically does not cause any problems for the dog or his fertility. Benign prostatic enlargement will sometimes lead to the development of intraprostatic cysts by occluding ducts leading to the prostatic urethra. At this time, prostatic enlargement cannot be referred to as benign. Prostatic cysts may become contaminated with bacteria leading to prostatic abscesses. Abscesses of the prostate gland are life threatening and difficult to treat.

Another common finding in intact male dogs is prostatic bleeding. Prostatic bleeding is often brought on by exposure to cycling bitches and the sexual excitement generated by this exposure. Blood is seen in the ejaculate and in voided urine. Prostatic bleeding does not necessarily come from dogs with BPH. On rectal palpation, these prostate glands are often normal in size and nonpainful.

Ultrasoundography is a useful diagnostic tool for evaluating the prostate gland. Prostatic cysts, abscesses, or neoplasia can easily be identified by ultrasound examination. Ultrasound guided aspiration of the cysts transabdominally can help make the diagnosis of bacterial infection. Urinanalysis by cystocentesis is also helpful in identifying any bacterial component to the disease process as bacterial infections tend to occur simultaneously in the urinary bladder and the prostate gland. Bacterial infections should be confirmed prior to the use of antimicrobials.

Castration was once the only treatment for prostatic disease in the dog. With the discovery of 5 alpha reductase (5-aR) inhibitors, prostatic enlargement and prostatic bleeding are easily treated in those dogs that are still usable and desirable as breeding stock. Testosterone is converted to dihydrotestosterone by 5-aR within the prostate gland. Dihydrotestosterone is the hormone that most affects the prostate gland. By inhibiting 5-aR, the effect of testosterone on the prostate gland is effectively blocked. Finasteride (5 mg/day) and megestrol acetate (0.25 mg/lb/day) are two commonly used drugs which will inhibit 5-aR. Given orally for six to eight weeks, both compounds will dramatically shrink the size of the prostate gland. It has been the experience of the author that megestrol acetate is more effective than finasteride in clearing blood from the ejaculate. Megestrol acetate has more effect on libido than finasteride. If the dog needs to be mated during treatment, finasteride might be a better choice. Treatment with either drug can be repeated as needed over the course of the dog’s life.

Azoospermia

Azoospermia is the lack of sperm in an ejaculate. In order to confirm this diagnosis, several tests should be run. Urinanalysis (U/A) will confirm the presence or absence of sperm within the urinary tract. Intact male dogs almost always have sperm in their urine. In addition to the U/A, alkaline phosphate
(ALK) can be measured from the seminal plasma. Alkaline phosphate originates from the epididymes and should be high (>1000) if the second fraction of the ejaculate has been collected. If the second fraction has been collected yet there are no spermatozoa present, a diagnosis of azoospermia can be made. If ALK is low (<100), an incomplete ejaculate has been obtained and a repeat ejaculation is needed. Some dogs are timid or resentful of manual ejaculation. Dinoprost (prostaglandin F₂α), can be used in those individuals that refuse to respond to manual stimulation with an ejaculation. If a diagnosis of azoospermia is confirmed, the dog is sterile. Azoospermia is rarely reversible. Often, azoospermia is congenital.

Oligospermia

Low numbers of sperm in the ejaculate of the dog is a finding confirmed when sperm concentration is measured. Sperm numbers in males is a factor of testicular size and mass. More testicular tissue gives the ability to produce greater numbers of sperm. If dogs give <200 X 10⁶ sperm cells, (<50 X 10⁶ in toy breeds), the diagnosis of oligospermia is made. Some males will experience retrograde ejaculation, putting numbers of sperm into the urinary bladder. Diagnosis of retrograde ejaculation can be made by examining the urine after manual collection and determining the number of sperm contained within the urinary bladder. Treatment of retrograde ejaculation can be accomplished by the use of a sympathomimetic agent, (i.e., pseudoephedrine hydrochloride 4 mg/kg PO) one and three hours prior to semen collection.

If oligozoospermia is diagnosed, and no other cause is found, the author has been able to treat oligospermia with injections of gonadotropin releasing hormone over a four to six month period (i.e. gonadorelin 3 μg/kg im once weekly). The author has been able to double or triple sperm output in some individuals with this treatment.

Bacterial infections

Bacterial infections within the male genital tract can occur. Most infections will involve the prostate gland along with the urinary tract. Some infections will ascend up the vas deferens into the epididymes and testes while others will infect the reproductive tract by the hematogenous route.

*Brucella canis*

*Brucella canis* is the number one rule out for orchitis and epididymitis in the dog. Brucella can be spread by venereal or by oral contact with the organism. Brucella in males prefers the testes and epididymes most likely due to erythritol present in these tissues. Erythritol is a preferred nutrient for the Brucella organism. Brucella is an intracellular organism, thus very difficult to clear from the body. Since the reproductive tract is the primary target, Brucella quickly causes damage to the fertility of the male dog. Acute infections are evident by orchitis and epididymitis, while chronic infections lead to testicular atrophy. Breeding stock is lost permanently to *Brucella canis*. Euthanasia is considered the treatment of choice due to the infectious nature of the disease to other canids and its zoonotic potential. Long-term antimicrobial therapy with castration can be a second treatment choice if care is taken to prevent contact with susceptible populations. Yearly serology is suggested if this route is taken to identify any recrudescence of the organism.

Miscellaneous bacterial infections

Any orchitis can cause infertility that may be permanent. Bacterial infections of the male dog’s reproductive tract include organisms that are documented as normal flora. Mycobacterium has been shown to be normal flora in the dog and bitch’s reproductive tract. In certain situations (i.e. high population density), mycobacteria can cause problems in semen quality. Husbandry is a primary mode of management, by reducing the population density. Only then can antimicrobials help in eliminating the problem. Without attention to husbandry, antimicrobials are only a stop-gap treatment, with recrudescence expected due to environmental contamination of the organism. Blastomycosis has been shown to cause orchitis in affected dogs, but only in 2% of the cases. Blastomycosis has been known to
affect the testes and epididymis. It is a complicated disease which is difficult and expensive to treat. Most cases of blastomycotic infections result in loss of functional testes. Castration may be required as part of the treatment in any case of orchitis. Unilateral castration can be considered if the problem is affecting only one testes. A single testes has been shown to produce 75% of the sperm that two can produce due to hypertrophy of the remaining testes after surgery. Orchitis caused by penetrating injury is treated like any other infection. Prognosis for fertility is guarded until treatment is complete and the damage to the testes is known.

Conclusions and potential treatment

Treatment in a subfertile or infertile male is often futile. Infertility and subfertility have a variety of causes in the male dog. Unless a cause can be identified and corrected, reversal is unlikely. Only time and sequential examinations will give an accurate prognosis. Age-related testicular degeneration is the most common cause of infertility in the dog seen in the author’s practice and is rarely reversible. Problems related to thermoregulation are also common (i.e. seasonal infertility related to hot summer temperatures). It is not unusual for a dog to be subfertile in the fall months and fertile in the spring months due to summer heat stress. If poor quality semen is seen in the late summer, additional evaluations are indicated after several months of cooler weather to document this seasonal effect. Another potential treatment for testicular degeneration is acupuncture. Acupuncture has been shown to positively affect the reproductive tract in humans and horses. The author has seen remarkable results in reproductive cases that normally would have had no hope of resolution. At this time, no one definitively knows how acupuncture affects the reproductive system. It is theorized that acupuncture causes a normalization of the autonomic nervous system.

References

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