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Auburn University Canine Breeder Excellence Seminar

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Stud dog management

Introduction:

- When discussing breeding management in the dog, the stud is an important part of the equation for a successful breeding program.
- The stud is half the equation when developing such a program and his management is vital to success.
- Proper management includes an understanding of anatomy and physiology of the stud dog as well as an understanding of common conditions that may affect fertility.
- Management should be focused on health and well-being of the stud as correcting loss of fertility can be difficult or impossible.

Anatomy and physiology of the stud dog:

Basic anatomy:

- The male reproductive tract of the stud is composed of the penis, testicles, and prostate.
- Penis:
    - Type – cavernous
    - Covered by the prepuce – should be pulled back to view the penis during the breeding soundness exam.
    - Swelling of the bulbus glandis responsible for the "tie" in natural breeding
- Testicles:
    - Contained within the scrotum
    - Should be 2 present
        - Cryptorchid individuals should be identified and not selected as sires
    - Thermoregulation is vital
        - Can be raised or lowered to regulate temperature
        - Pampiniform plexus – counter-current blood flow to cool arterial blood entering the testicles
    - Should be roughly symmetrical in size
    - Should palpate similar to a peeled hard-boiled egg
    - The tail of the epididymis
        - Sperm storage area for the testicle
        - Should be palpated for abnormalities
- Prostate:
    - Only accessory sex gland of the dog
    - Responsible for the prostatic portion of the ejaculate

    - Can be palpated transrectally
        - Bi-lobed and should palpate similar to a "Barbie's Butt"
    - Possible site for infection or neoplasia
    - Benign prostatic hyperplasia occurs in mature aging studs

Andrology:

- Testosterone – the primary male sex hormone
    - Produced by the Leydig cells of the testicle
    - Responsible for the masculine appearance and behavior of the stud

Spermatogenesis:

- The testicles are the site of spermatogenesis
    - 62 days in the dog
        - Significance – from a clinical standpoint if a disruption does occur it will take time to show up and time to go away.
        - At minimum would take 1 spermatogenic cycle or 62 days

Puberty:

- Can be defined different ways:
    - Age at first ejaculation
    - Age at which spermatozoa first appear in the ejaculate
    - Age at which breeding can occur and offspring are produced
- A practical definition is when the stud first develops an interest in copulatory behavior and is capable of producing spermatozoa.
- Age at which spermatozoa first appear in the ejaculate in the dog is 7-9 months (average)
- Has been described as 7-10 months and 5-12 months
- In general, small dogs achieve maturity sooner than large breeds

Care of the stud dog:

General Health Care:

- Good preventative disease practices:
    - Regular yearly exams
    - Standard vaccinations
    - Parasite testing and prevention

Pre-breeding screening (beyond the scope of this lecture):

- Testing for breed-associated genetic disorders
- Orthopedic screening practices considered standard for the breed

Brucellosis testing:

- The major venereal disease of the dog – zoonotic potential
    - Quick review:

        - Causes orchitis/ epididymitis in the male and eventual fertility loss
        - Abortions in the female
        - Chronic infections may result in infection of the vertebral endplates - discospondylitis
        - Host-adapted to avoid detection by the immune system
- Transmitted by secretions from saliva, urine, nasal secretions, and semen
    - Breeding is not the only way to contract
    - Could be contracted other ways – think about how a dog will sniff or lick the ground where another dog has urinated.
- Regular testing for the active stud
    - Test 2x per year if breeding/ competing/ showing
    - Require all females to have a confirmed negative before live cover
    - Every time before you freeze semen

Nutrition:

- Consider the activity performed by the stud dog as the guide for nutrition
- The plane of nutrition required for the activity performed by the stud should be adequate for reproduction as well
- Maintaining the stud's body condition is important – maintaining ideal BCS is the most important
    - An over-conditioned stud is as bad as an under-conditioned one

Supplementation:

- Commonly discussed and used widely
- Data supporting use is sparse and often conflicting
- Should be used with caution especially with products that have limited research and potential adverse effects
- Few commonly discussed supplements:
    - Fatty acid supplementation:
        - Has been evaluated in multiple species – results range from beneficial to no change
        - Sperm membranes contain large amounts of phospholipids – may increase flexibility of the membranes and improve flagellar motion and overall motility.
        - Recent study in the dog showed that fish oil increased motility, total sperm count, total sperm viability, increased morphologically normal sperm.
        - Probably no detrimental effects
    - Vitamin E:
        - Would function as an anti-oxidant
        - Study showed its use increased sperm quality in dogs classified as having poor semen quality
        - Limited research
    - Selenium:

        - Often supplemented with vitamin E
        - Acts indirectly as an antioxidant
        - One study showed increases in morphologically normal sperm when administered with vitamin E
        - Probably not enough literature backing its use
        - Can increase sperm damage if excessively supplemented
    - Zinc:
        - In prostatic fluid helps protect against infection and stabilize DNA
        - Low levels have been associated with decreased fertility
        - Low level supplements are harmless but high doses can be toxic
    - Glucosamine and glycosaminoglycans:
        - Anecdotally reported to improve semen quality
        - No documentation to support its use
        - No detrimental effects are known
    - Carnitine:
        - Used in fatty acid transport into the sperm cell which is then used to produce energy and allow for motility
        - May be an anti-oxidant as well
        - No reproductive studies in the dog to date – have been extrapolated from man
        - Naturally high in meat and milk – dogs eating food derived from animal protein likely are not deficient

Housing:

- Differences exist and often not considered in other domestic species
- Consider a kennel scenario vs. a person that owns a stud dog that may be housed indoors as the family pet
- Differences in housing may need to be considered if a problem with fertility surfaces
    - Differentials for factors that could affect fertility may be different based on housing conditions.
    - Example would be heat stress in a kennel situation where a dog is being evaluated for decreased fertility

Stud dog training:

- Need to consider prepping the stud for semen collection either for analysis, fresh AI, cool shipment, or semen freezing
    - This needs to be planned out in advance as part of the stud dog management program
    - Training the stud to collect does not need to be an after-thought
- Certain degree of training required for stud to be comfortable with collection process
- Also consider some people in clinic may be better than others with certain stud dogs
    - May want to identify other individuals in clinic that can be trained in the semen collection process in the advent semen collection is not successful

Breeding frequency and semen collection:

- Frequency of breeding or semen collection needs to be considered as part of the management plan
- Studs in high demand may be requested for frequent live-cover breedings or semen collections
- Do not want to overwhelm daily sperm production
- If decreases in fertility are seen with a high-demand stud may need to consider the current breeding or collection schedule and make adjustments if needed
- Dogs collected every 2-3.5 days will not see a change in total semen numbers – breeding/collection every other day should not significantly deplete semen output

Gamete preservation:

- It is of vital importance to recognize exceptional individuals early and to develop a plan for semen freezing and storage for future genetics and use
- Semen freezing is a harsh process
- Typically, as a stud ages, semen become less resilient to the freeze-thaw process
- Identify individuals early and go ahead a freeze semen so it can be saved
    - Would consider semen freezing as soon as all health clearances completed and stud has promise as a sire
- Frequently people have not done this and their stud advances in age before they realize they should have already been freezing and storing semen:
    - Doesn't freeze well
    - Has undergone senescence
    - Develops a disease process that renders him infertile

Common diseases that cause infertility:

Prostatic disease:

- Benign Prostatic Hyperplasia or BPH
    - Most common prostatic condition of the intact dog
    - 80% of studs older than 6 years will have signs
    - Results from long-term androgen exposure to the prostate
        - Hypertrophy/ hyperplasia of the prostate
        - Vascular leakage into the genitourinary tract
    - Prostate is typically non-painful
    - Can have constipation or stranguria
    - Blood can be seen in urine or dripping from the penis
    - Semen quality would be affected by the presence of blood in the ejaculate
    - Diagnosis would need to exclude infection or neoplasia
    - Treatment:
        - Castration is curative
        - Finasteride – 5-alpha-reductase inhibitor; 5mg once daily

            - Blocks to conversion of testosterone to DHT thus reducing androgen-stimulation of the prostate.
            - This may allow continued use for breeding or semen collection
        - There are other progesterone or estrogen based treatments but typically not recommended or commonly used
- Prostatitis
    - May affect any age dog
    - May be acute or chronic
    - Acute form: dogs are usually febrile and systemically ill
        - Prostate is painful
        - Typically enlarged
    - Chronic form: may be more insidious and could even go unnoticed
    - Diagnosis based on standard diagnostic work-up
        - CBC/chemistry
        - UA
        - Imaging
        - Prostatic wash or collection of the ejaculate for cytology and culture
    - Treatment:
        - Long-term antibiotics chosen based on culture
        - NSAIDs
        - Dogs that have BPH concurrently should be castrated or treated with finasteride

Testicular disease:

- Infectious orchitis/ epididymitis:
    - Infection of the testis/ epididymis
    - Can result from hematogenous spread or may be the result of local injury to the testicle
    - Brucellosis would need to be a primary rule out
    - Diagnosis:
        - Physical exam with enlargement and pain of one or both testicles
        - Culture and cytology of the ejaculate
        - Testicular ultrasound
        - Testicular aspiration should be avoided
    - Treatment:
        - Antibiotics and NSAIDs
        - If unilateral, consider hemi-castration
        - If bilateral, can manage medically but castration should be performed if a quick response is not seen
        - Sexual rest – remember the cycle and wave of spermatogenesis; may take time to see improvements in the spermiogram
- Testicular Overheating:

    - Heat-related oligospermia (reduced sperm number) and teratozoospermia (mal-formed spermatozoa) may be present with increased testicular temperature
    - This may be the result of increased body temperature:
        - Hyperthermia related to a disease process
        - May be the result of environmental temperature increasing the testicular temperature
        - May be caused by physiologic hyperthermia related to work or exercise
    - Primary cause needs to be identified – sometimes may be difficult unless a disease process is located
    - If the underlying cause is located, fertility should be expected to return with cycling of the germinal epithelium and the production of new spermatozoa.
- Testicular Degeneration:
    - Can occur primarily with the aging process as part of senescence
    - Can be secondary and related to testicular damage from disease, injury, toxic insult, etc.
    - Diagnosis:
        - Primarily the spermiogram
        - Full work-up may be indicated to elucidate the underlying cause
    - Once degeneration starts as process, return of fertility is unlikely and often there is progressive decline of sperm production.

Neoplasia:

- Can occur in any area of the reproductive tract:
    - Scrotum
        - Squamous cell carcinoma
        - Melanoma
        - Mast cell tumors
    - Penis/ prepuce
        - Squamous cell carcinoma
        - Papilloma
        - Transitional Cell carcinoma
        - Mast cell tumors
        - Transmissible venereal tumors
    - Testicular tumors
        - Cryptorchidism increases risk approx. 9-11 times that of a normal, descended testicle
        - Leydig cell tumors
        - Sertoli cell tumors
    - Prostatic tumors:
        - Adenocarcinoma
- Treatment and return to fertility are dependent on the tumor type and location
- If the tumor is testicular in origin and affecting spermatogenesis, hemicastration may be possible.

    - The remaining testicle will undergo compensatory hypertrophy
    - 2/3 return to function can occur due to compensation
- Other forms of neoplasia may unfortunately mean an end to the breeding ability of the stud as treatment of the disease may result in loss of reproductive capability.
    - Generally speaking, chemotherapeutic agents attack rapidly dividing cells (i.e. sperm cells) and have a detrimental effect on fertility.