Bull BSEs: Evaluation for success

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Abstract

Bull breeding soundness exams are among the most critical responsibilities we have as bovine veterinarians. These exams are designed to identify subfertile and infertile bulls, which, if used for breeding, can lead to significant financial losses for the producer. Such losses arise from a decrease in the number of calves born, an extended calving season, and ultimately, fewer pounds of calf at weaning.

Introduction

Bull breeding soundness exams are complex because they involve evaluating multiple factors to determine a bull's potential breeding status, including a physical exam, scrotal circumference, sperm motility, and morphology. In this talk, we will explore some of the most challenging aspects of the exam and discuss strategies for achieving success.

Physical exam and scrotal circumference

Physical exams are a crucial aspect of bull breeding soundness exams because they provide a comprehensive assessment of the bull's overall health and structural soundness, which are essential for successful breeding. During the physical exam, veterinarians evaluate the bull's musculoskeletal system, ensuring that the animal can physically mount and breed without limitations such as lameness, joint issues or muscular deficiencies. Additionally, examination of the eyes, teeth and body condition score is critical, as visual acuity and the ability to effectively graze are vital for the bull's stamina and longevity in a breeding program. The physical exam also includes an evaluation of the external genitalia, detecting any abnormalities, lesions or infections that could impair breeding performance or lead to the spread of disease.

Scrotal circumference in bulls is a critical component of the breeding soundness evaluation, as it directly correlates with a bull's reproductive potential. Scrotal circumference serves as an indicator of testicular mass, which in turn is associated with sperm production capacity. Larger scrotal circumferences generally suggest higher sperm output, better semen quality, and earlier onset of puberty in both the bull and his offspring. Moreover, bulls with adequate scrotal circumference are more likely to produce calves that reach sexual maturity at an earlier age, enhancing the reproductive efficiency of the herd. This measurement also provides insight into the bull's overall endocrine function, as testicular size is linked to the production of testosterone, which influences libido and mating behavior. Therefore, scrotal circumference is a valuable predictor of a bull's fertility and is essential in selecting sires that will contribute to the genetic and productive success of the herd.

Slide preparation

Slide preparation is essential in bull breeding soundness exams because it significantly impacts the accuracy of evaluating sperm morphology and motility. Proper slide preparation ensures that sperm cells are evenly distributed, well-preserved, and free from artifacts that could distort the assessment. Any errors in slide preparation, such as uneven smearing or inadequate staining, can lead to misinterpretation of sperm quality, potentially resulting in the incorrect classification of a bull's fertility status. Therefore, meticulous slide preparation is vital to provide reliable data for determining a bull's reproductive viability.

Select morphological defects

Proximal cytoplasmic droplet

Proximal droplets are spherical condensations of cytoplasm 2-3 µm in diameter that surround the neck and proximal midpiece of sperm. A high percentage of sperm with proximal cytoplasmic droplets in an ejaculate is associated with abnormal epididymal function and sperm maturation, or abnormal spermiogenesis. Peripubertal bulls often have a high percentage of sperm with proximal droplets in the ejaculate. As bulls mature, the number of proximal droplets in the spermiogram should decrease.

Round cells

Round cells can be noted during evaluation of semen motility slides especially in young bulls. The evaluator must differentiate between immature sperm cells and white blood cells to allow for accurate diagnosis. Immature sperm cells are quite variable in size, depending on whether the cell is a primary or a secondary spermatocyte or a spermatid.[11,16] Immature sperm cells must be differentiated from white blood cells in semen. This differentiation can be accomplished by staining a dried semen smear in Diff-quik^{Ò}, new methylene blue, or Wright's giemsa. Once the stain is dried the round cells can be evaluated and a final diagnosis of immature sperm cell or white blood cell can be made by the evaluator. If a diagnosis of immaturity is made the bull should be reevaluated in 4-6 weeks to allow for maturation.

Detached heads

Detached but otherwise normal heads are likely due to senescence of normal sperm during storage in the epididymis or ductus deferens, whereas detached abnormal heads may be due to abnormal formation of the basal plate and/or implantation fossa. In normal bulls, peristalsis continually moves sperm from the cauda epididymis into the urethra, ensuring a reserve of fresh sperm for ejaculation.92 Failure of this transport mechanism is associated with sperm accumulation and eventual senescence of stored sperm. These bulls are referred to as "sperm accumulators" or "rusty load bulls". Sperm accumulation in bulls is not associated with age and a predilection to the occurrence accumulation appears to be permanent. Re-occurrence within 1 month after sexual rest is common following resolution of sperm accumulation by frequent electroejaculation. Regardless of cause, detached heads are not normal and should be counted as abnormal cells.

Iatrogenic changes

Iatrogenic changes noted in the spermiogram are mostly associated with slide preparation. The most common change noted are those due to hypo-osmotic changes whether that comes from stain, fixing solutions, prolonged drying times, cold slides or cold shock of ejaculate prior to staining. Hypo-osmotic changes are of high suspicion when there is a high percentage of bent midpieces. Characteristically, these midpieces have no retained droplet within the bend which aids in differentiating this iatrogenic defect from DMRs (distal midpiece reflexes). Cold shock may also be noted during evaluation of progressive motility as will be depicted by sperm moving slowly, backward and circling and in severe cases, shimmering in place.

Evaluation of semen slides

Differential counts of sperm morphology must be performed using 1000x magnification (oil immersion) as lower magnifications may result in failure to recognize some defects. Semen should always be evaluated at 100x oil immersion because this magnification level allows for a detailed examination of sperm morphology, providing the resolution necessary to identify subtle abnormalities in sperm structure that may not be visible at lower magnifications. At 100x oil immersion, individual sperm cells can be closely inspected for defects in the head, midpiece and tail, which are critical indicators of fertility. This high level of detail is essential for accurately assessing the proportion of normal versus abnormal sperm, aiding in the overall evaluation of the bull's reproductive potential. Additionally, the clarity provided by oil immersion ensures that the observations are precise, reducing the likelihood of diagnostic errors that could affect breeding decisions.

References

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