

BREEDING SOUNDNESS EXAM: BEEF BULLS

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Introduction

A bull breeding soundness exam (BSE) is an important beef reproductive management tool. Examinations are often conducted pre-purchase, pre-breeding, and for diagnostic purposes. A traditional BSE includes a general physical evaluation and detailed reproductive examination (the focus of this review). Historical information is recorded and may be useful for prognostic purposes. Evidence of a prior illness or injury may influence the bull's immediate breeding performance or longevity. Semen is evaluated for motility and morphology. Historical semen evaluation data may be used to predict future trends. A bull is classified as a satisfactory breeder, unsatisfactory breeder, or reexamination with classification deferred to a later date.

General Exam

A general physical exam is an important component of the breeding soundness examination. Areas evaluated include oral health, vision, respiratory health, conformation, hoof health, locomotion, and body condition score. Health issues, which may decrease the bull's ability to naturally generate pregnancies, decrease its longevity, or be associated with a heritable defect, are documented and reviewed with the client.

Reproductive Exam

Multiple external and internal reproductive structures are evaluated during the reproductive exam. External tissues examined include the testes, epididymides, scrotum, prepuce, and penis. Internal structures examined include the prostate, seminal vesicles, ampullae, and the inguinal rings. Table 1 summarizes important parameters and occasionally detected abnormalities.

Table 1. Summary of Abnormalities Detected During a Beef Bull BSE

Reproductive Structure	Parameters Evaluated	Abnormalities Occasionally Detected
Testis	Size, tone, symmetry, position, mobility	Hypoplasia, degeneration, orchitis, incomplete descent, cryptorchid, adhesions
Epididymis	Size, tone	Epididymitis, sperm granuloma, hypoplasia, aplasia
Scrotum	Circumference, shape, epithelial health	Excessive adipose tissue, adhesions, hernia, frostbite
Inguinal Ring	Size, contents	Hernia
Ampulla	Size, tone	Abnormalities are rare
Seminal Vesicle	Size, symmetry, tone	Seminal vesiculitis
Prostate	Size, tone	Abnormalities are rare
Prepuce	Length, degree of eversion, epithelial health	Lacerations, adhesions, abscesses, frostbite
Penis	Erection, protrusion, epithelial health	Persistent frenulum, fibropapilloma, hematoma (fracture), adhesions, foreign body, deviation, avulsion, insensitivity

Testicular weight is an accurate estimate of the sperm producing parenchyma within the testicle, is highly heritable (0.69 +/- 0.15), and is closely related to the scrotal circumference (SC) measurement (1,2). The majority of yearling beef bulls have a SC measurement 32-38 cm while the majority of mature beef bulls measure 38-45 cm.

Adverse physical, environmental, or pathogenic conditions may temporarily or irreversibly interfere with seminiferous tubule health and spermatogenesis. Bulls exhibiting smaller than average testicles may have testicular hypoplasia or be experiencing testicular degeneration. Testicles experiencing transient degeneration typically palpate softer and smaller. Testicles experiencing irreversible degeneration often palpate smaller and firmer due to atrophy, fibrosis, and/or mineralization. A testicle experiencing recent and significant trauma palpates large, firm, warm, and painful. A blood filled hematocele or fluid filled hydrocele may develop in the testicular space following a traumatic event.

A testicle may be undescended (cryptorchid) or partially descended into the scrotum. A partially descended testicle may be smaller and firmer when compared to the adjacent, fully descended testicle. This is a significant problem because further testicular descent is negligible in bulls older than 6 months.

Adverse physical, environmental, or pathogenic conditions may also be detrimental to epididymal health, which may compromise sperm maturation and transport. Leakage of sperm into the extra-tubular compartment will cause an intense inflammatory response (sperm

granuloma), which may cause compression or blockage of the epididymal lumen and decrease sperm transport. Occasionally, a bull may be born with only a portion (hypoplasia) or complete absence (aplasia) of the epididymis. A rarely diagnosed congenitally blocked efferent ductule may cause severe inflammation near the head of the epididymis (3).

A lean, pendulous scrotal neck is desirable for optimal sperm production. A short or overly conditioned scrotal neck may compromise the efficiency of the pampiniform plexus, which is a counter-current heat transfer system important for maintaining optimal testicular temperature. Adhesions present between the testicle and scrotum may also interfere with testicular thermoregulation.

Inguinal hernias may be acquired or congenital. Acquired hernias may be traumatic or nontraumatic. Nontraumatic inguinal hernias occurring in mature bulls have been associated with over conditioning when yearlings.

The deferent duct extends from the epididymis through the inguinal ring to the ampulla located on the dorsal aspect of the neck of the bladder. The ducts of the ampulla and ipsilateral vesicular gland form a short, but common duct before entering the urethra. Retrograde flow of semen from this duct into the seminal vesicle may cause a rare, but intense seminal vesiculitis. Seminal vesiculitis is more commonly associated with an infectious pathogen.

Bulls with a long, pendulous prepuce or a significant preputial eversion are more susceptible to preputial injuries. Injuries occasionally occur during the ejaculatory thrust when the prepuce becomes compressed between the bull's abdomen and female's pelvis. Extensive swelling at the preputial orifice may prevent penile protrusion (phimosis).

A frenulum connecting the penis to the prepuce typically separates prior to puberty. Persistence of the frenulum will limit penile extension and deflect the glans penis ventrally. The dorsal ligament of the penis may stretch or tear and predispose to a corkscrew, ventral, or S-shaped penile deviation. Sexual activity following a long period of rest may predispose to a penile epithelial avulsion or separation of the prepuce from the penis. The penile tunica albuginea near the distal bend of the sigmoid flexure may rupture during natural service and cause a hematoma anterior to the scrotal attachment. The injury may predispose to adhesions and/or penile sensory nerve damage. A fibropapilloma is commonly detected on the penis of young bulls. Large masses may prevent penile retraction (paraphimosis). Histopathology is recommended for recurrent penile masses to diagnose rare, locally malignant, fibrosarcomas. A hair ring may be present in young bulls and is associated with homosexual activity.

Semen collection for evaluation may be accomplished using an artificial vagina, rectal massage, or an electroejaculator. The utilization of segmented probes or finger rings permits the stimulation of the tissues initiating electroejaculation with minimal stimulation of uninvolved tissues. Intravenous xylazine (0.01-0.02 mg/kg) has been used prior to the procedure to increase bull comfort.

Rectal massage of the pelvic urethra, prostatic area, and ampullae is a gentle and effective method of semen collection, especially in yearling bulls. The lack of penile visualization and a reduction in semen quality may limit the utilization of rectal massage (5).

Miscellaneous Considerations

Additional factors, which may affect the bull's ability to service a female, include degree of libido, arthritic disease, neuromuscular disease, or penile insensitivity secondary to injury or senility.

Diseases, which may be seminally transmitted, include tuberculosis, brucellosis, trichomoniasis, campylobacteriosis, and bovine viral diarrhea (BVD). Cooperative state-federal eradication programs exist for tuberculosis and brucellosis. Testing for trichomoniasis and campylobacteriosis includes scraping the preputial epithelium with a sterile pipette. Culture and PCR laboratory tests are available to evaluate the recovered smegma. Campylobacter viability is sensitive to commonly used transport enrichment medias. Twenty-four hours or less is recommended from the time of smegma collection to laboratory arrival (4). Due to limited diagnostic sensitivity, multiple tests for trichomoniasis and campylobacteriosis are necessary to insure freedom in sexually active bulls.

The BVD virus may persist systemically (persistent infection) or may rarely persist exclusively within the testicles (persistent testicular infection). A persistent testicular infection may result from a transient BVD virus infection near the time of puberty. The BVD virus may replicate within testicular tissue and persistently shed virus into the semen.

Compliance with international semen requirements may be important for clients interested with marketing semen. In addition to the diseases mentioned above, the importing country may require sero-negative status for brucellosis, infectious bovine rhinotracheitis virus, leptospirosis, bovine leucosis virus, *Mycobacterium avium paratuberculosis*, bluetongue virus, epizootic hemorrhagic disease virus, vesicular stomatitis virus, and *Coxiella burnetti* (Q fever). The vaccination of bulls for infectious bovine rhinotracheitis virus, leptospirosis, or *Mycobacterium avium paratuberculosis* may interfere with semen export eligibility.

Literature Cited

- Coulter, G. H. 1980. Testicular development: its management and significance in young beef bulls. Proc., 8th Tech. Conf. Artif. Insem. Reprod., National Asso. Anim. Breeders. pp 106-111.
- Coulter, G. H. and D. G. Keller. 1979. Scrotal circumferences and its heritability in yearling beef bulls. Proc. 71st Annu. Meet., Amer. Soc. Anim. Sci. p 288.
- Monke, D. R. 2002. Bull management: artificial insemination centres. Pages 198-204 in H. Roginski, J.W. Fuquay, & P.F. Fox (Eds.), *Encyclopedia of Dairy Sciences*. London: Academic Press.

- Monke, H. J., B. C. Love, T. E. Wittum, D. R. Monke, and B. A. Byrum. 2002. Effect of transport enrichment medium, transport time, and growth medium on the detection of *Campylobacter fetus* subsp. *venerealis*. J. Vet. Diagn. Invest. 14:35-39.
- Palmer, C. W., L. F. C. Brito, A. A. Arteaga, L. Söderquist, Y. Persson, and D. Barth. 2005. Comparison of electroejaculation and transrectal massage for semen collection in range and yearling feedlot beef bulls. Anim. Reprod. Sci. 87:25-31.