DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Agriculture and Natural Resources

FSA3046

Breeding Soundness Evaluation for Beef and Dairy Bulls

Tom R. Troxel
Professor and Associate Department Head - Animal Science

Summary

The breeding soundness evaluation (BSE) is a practical method to identify bulls with less than satisfactory breeding potential. This evaluation should be conducted on every bull at least 30 to 60 days before each breeding season to allow enough time for replacement of deferred or unsatisfactory bulls. The first step in a BSE is to select a veterinarian in your area who is competent in conducting a complete BSE. You cannot afford to use a bull who is not a satisfactory potential breeder.

Introduction

Breeding soundness evaluation (BSE) is a method developed to assess breeding potential of bulls for natural mating. Bulls differ in reproductive capabilities. Various studies from several states show that about 20 percent (1 in 5 beef bulls) examined were not satisfactory potential breeders. These bulls can be identified before the breeding season with a complete BSE.

In evaluating bulls for use in natural mating, three parameters have been shown to be the most reliable and repeatable. A complete BSE is normally conducted by a veterinarian and consists of a (1) physical examination, (2) measurement of scrotal size and (3) semen evaluation for sperm motility (movement) and morphology (structure and shape). The "complete" BSE is strongly recommended.

The Breeding Soundness Evaluation (BSE)

Physical Examination

This part of the exam may be the most difficult to objectively assess. Some structural defects may have little or no influence on immediate mating ability but may predispose animals to early development of arthritis or injuries. As affected bulls age, the defect becomes more severe and serving capacity is reduced. Many hoof and sole problems result from poor conformation and may require trimming and other treatments to maintain serving capacity. Criticism of such defects often is taken as controversial opinion and may be detrimental to the veterinarian-client relationship. However, the long-term prognosis for structural unsoundness is poor. Most structural faults such as sickle hocks and post legs should be discriminated against since they are heritable and lead to lameness of the individual which will impair his willingness and/or ability to travel and breed. In addition, the bull needs to be able to eat, see and smell properly. Common eye problems are pinkeye, scars and cancer eye. When detected early, pinkeye and cancer eye can be treated, and only advanced lesions interfere with a bull's breeding ability. Cancer eye has been shown to be heritable, but it is difficult to select against it because the condition does not appear until the animal is in advanced age. Nasal swelling or blocking may affect a bull's ability to smell.

Arkansas Is Our Campus

Visit our web site at:
https://www.uaex.uada.edu

Other physical traits that may be evaluated during a BSE include the degree of muscling, conformation, body condition and body size measurements such as hip height, frame score and weight. These traits usually do not result in a bull being classified as unsatisfactory but may be a factor in his selection for breeding purposes.

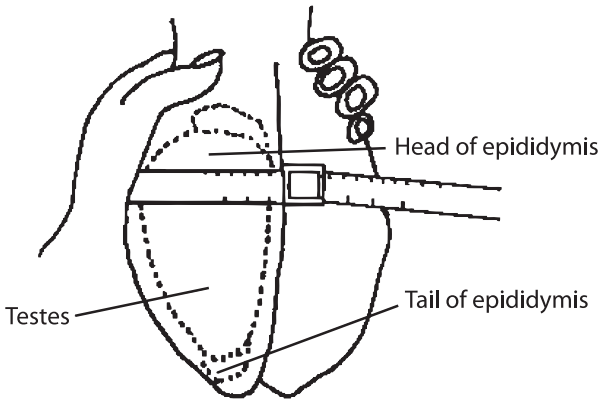
A thorough examination of the male reproductive system follows the general health examination. Developmental defects, inflammation and other deviations from normal are observed. The vesicular glands, ampullae and prostate can be examined by rectal palpation, while the spermatic cord, scrotum, testicles and epididymides can be palpated externally. Some groups of young bulls have a high incidence of infection of the vesicular glands (these produce accessory fluid in the semen ejaculate). This is generally a temporary infection, but occasionally it will cause the discharge of pus into the semen making fertility questionable. The penis and prepuce are best examined during collection of semen by using an electro-ejaculator or rectal palpation of the prostrate to stimulate erection. At this time, developmental abnormalities, warts or injuries may be detected. However, electro-ejaculation does not stimulate normal erection or ejaculation, so abnormalities with erection or copulation cannot be detected.

Developmental defects, as well as missing or underdeveloped portions of the male reproductive system, can be detected by a thorough examination. These defects are not common problems but are important because they can have severe effects on fertility. One developmental defect that will prevent a bull from servicing is persistent penile frenulum (tied back penis). This defect can be eliminated by ligation of blood vessels and cutting the adhesion. One caution in using a bull even after the correction of this problem is that the condition appears heritable.

Changes in testicular tone are associated with a degenerative process and can be detected to some degree by testicular palpation. Degenerative change in the testicle is a frequent cause of infertility in all males, including bulls. This is a common occurrence following inflammatory reactions to infection. Many noninfectious factors can also contribute to this condition. Examples are frostbite and injury; or, the condition may develop with old age. Regardless of cause, the effect is reduced fertility.

Measurement of Scrotal Size

Measurement of scrotal circumference with a scrotal tape gives a relatively accurate estimate of the semen producing ability of a young bull. Although accuracy of this estimate declines in older bulls (greater than 4 to 5 years old), the measurement is of value even in aged bulls. In young bulls, scrotal circumference, actual testicular size and daily sperm production are all highly related. This measurement is simple, very repeatable from one technician to another and is highly heritable (i.e., 60 to 70 percent). Bulls with large testicles produce more semen and sire sons with larger testicles.



Scrotal Measurement

Circumference measurements are taken at the widest point on the scrotum.

Selecting bulls with large testes also improves female fertility. Work at Colorado State University has shown that female relatives of bulls with larger testes reach puberty at a younger age. Through selecting bulls for testes size as well as growth traits, Colorado State has reduced the age at puberty, as 80 percent of the heifers reach puberty by 10-12 months of age and nearly 100 percent by breeding age at 14-15 months. The positive relationship between scrotal circumference and yearling weights ensures that growth traits are not compromised when selecting for both fertility and growth rate.

There appears to be some variation between breeds as to testicular size at a given age. Brahman bulls will have smaller testes at the younger ages and will reach maturity at an older age. Brahman bulls will have adult scrotal circumferences similar to other beef breeds. Management and body condition can also affect this measurement. However, most results show that a satisfactory rating on the breeding soundness evaluation is more closely related to scrotal circumference than to age, weight, body condition or breed.

Testicular hypoplasia (underdevelopment) is also evaluated during the BSE. The term implies an incomplete development of the germinal layers of the seminiferious tubules in the testicle. This defect decreases semen quantity and quality and is highly heritable. The condition may occur on one or both sides and with varying degrees of severity. One or

both testicles are often less than one-third to one-half of normal size.

Diseases of the testes and epididymis are common in bulls. Despite the cause, any recognizable disease of the testes or epididymis has an unfavorable prognosis for normal fertility.

Inflammation of testes and epididymis will produce sperm damage, infertility and varying degrees of degeneration of the organs. The effect may be slight with only minor reduction in sperm production or sperm quality. These infections may go unnoticed and recover. Significant inflammation, however, may produce degeneration, scar tissue or abscesses of the organ. The testes are highly sensitive to any damage and degeneration may develop acutely within a few days, but any regeneration may take months. The most common causes of inflammation and degeneration are thermal, trauma, local infections, systemic infections and some toxins. Aged bulls often develop testicular degeneration without any signs of inflammation.

Semen Evaluation

A semen sample may be collected from bulls by a variety of methods, but electro-ejaculation is the most common under normal field conditions. This is a harmless procedure and yields semen of acceptable quality to evaluate the bulls when compared to semen collected by other methods. Bulls that do not respond to an electro-ejaculator may produce semen when the reproductive organs are rectally palpated by a trained individual.

The two seminal characteristics that have shown to be the most reliable and repeatable in evaluating fertility under field conditions are initial spermatozoa motility (the vigor and number of cells moving in a linear progressive manner) and spermatozoa morphology (form and structure of individual sperm cells). Unfortunately, there can be a great deal of variation both within and between technicians in estimating sperm motility. Environmental factors can also have an effect on this estimate, and proper handling of the semen after collection is critical to a successful evaluation.

Electro-ejaculation is the most common method of collecting semen samples.

Relationship of BSEs to Fertility

A definite relationship exists between abnormal spermatozoal morphology and infertility in the bull. Note the relationships between percent normal cells and conception rate in Table 1. A system by which abnormal sperm are categorized into primary abnormalities and secondary abnormalities has proved useful for evaluating bulls. “Primary abnormalities” (abnormal head and mid-piece shapes, abnormal attachment of mid-pieces and tightly coiled tails) are thought to indicate defects in spermatozoal development. Bulls with large scrotal circumference generally have fewer primary abnormalities. “Secondary abnormalities” (separated normal heads, droplets and bent tails) indicate sperm storage problems and are considered less severe than primary abnormalities. Although these designations may not be clear cut, evaluating the percent of normal sperm cell types is well correlated with fertility.

Table 1. Effect of Percent Normal Cells on Conception Rate[1]

% Normal	CR Rate (%)
<20	29
21-40	27
41-60	22
>60	41

[1]Reproductive Management of Beef Cattle.

The system used by The Society for Theriogenealogy and the similar one used by the Extension Service classifies the breeding soundness evaluation of bulls as the following: satisfactory potential breeders, unsatisfactory potential breeders or classification is deferred. Failing any single aspect of the examination can cause a bull to be judged unsatisfactory or deferred. Bulls that have inadequate scrotal circumference or are physically unsound will receive an unsatisfactory classification. Bulls that are deferred should be reexamined in 30-60 days to confirm the original examination. This is especially true for sperm characteristics. The sperm picture presented at examination represents events that took place in the testes 60 days before because that is how

Table 2. Effect of BSE Categories on Conception Rates[1]

Investigator	BSE Classification of Bull		
	Satisfactory	Questionable[2]	Unsatisfactory
	---------- Conception Rate (%) ----------		
Wiltbank, 1965	60%	48%	30%
Chenowith, 1978	54%	43%	----

[1]Reproductive Management of Beef Cattle.
[2]Questionable classification has been replaced with "Deferred."

long it takes a basic germ cell to develop into a mature sperm cell. The semen evaluation, therefore, shows only the current status of sperm production, and if defects are currently observed, one cannot predict when or if a change will occur.

The BSE cannot predict conception rates either. The effect of breeding soundness categories on conception rate is illustrated in Table 2. There was great variation within categories. Some satisfactory bulls had very low conception rates, and some unsatisfactory bulls had acceptable conception rates. The BSE is to identify and eliminate unsound breeders rather than to make a prognosis on fertility. This must be understood by sellers and buyers.

The BSE also does not evaluate libido or sexual desire. The owner must observe and evaluate the bulls mating habits, or a serving capacity test should be done by experienced personnel in a controlled environment.

Conclusions

Remember that one bull in five will not be a satisfactory potential breeder. A complete BSE is important in all situations but becomes even more critical in single-bull cow herds. This examination should be conducted 30 to 60 days before breeding season to allow adequate time to find a replacement bull if needed.

References

Reproductive Management of Beef Cattle. 1994. Department of Animal Science. College of Veterinary Medicine. Oklahoma Cooperative Extension Service.

Society for Theriogenealogy. 1992. *Manual for breeding soundness examination of bulls*. Journal of the Society for Theriogenealogy. Vol. XII.

TOM R. TROXEL, Ph.D., is professor and associate department head - animal science, with the University of Arkansas Division of Agriculture, Department of Animal Science, Little Rock.

Pursuant to 7 CFR § 15.3, the University of Arkansas System Division of Agriculture offers all its Extension and Research programs and services (including employment) without regard to race, color, sex, national origin, religion, age, disability, marital or veteran status, genetic information, sexual preference, pregnancy or any other legally protected status, and is an equal opportunity institution.

FSA3046-PD-12-11RV