

The development of beef breeding bulls

T.J. Engelken *

*Veterinary Diagnostic and Production Animal Medicine, Iowa State University, College of Veterinary Medicine,
Ames, IA 50011, United States*

Abstract

Management of the bull battery will have a dramatic impact on profitability of the cow/calf enterprise. It is critical that young bulls be selected and developed to maximize longevity and productivity for the eventual buyer. Bulls must be structurally sound, healthy, and have adequate libido in order to service the required number of females. Once bulls complete their first breeding season, special care must be taken in order to ensure that they recover and regain needed body condition and pass a bull breeding soundness examination (BBSE). Mature bulls that have reached their genetic potential for growth require less intensive management, but the health program and annual BBSE cannot be overlooked. Mature bulls are also more likely to carry venereal disease and should be screened according to local disease incidence and state regulations. All bulls, regardless of age, should be observed early during the breeding season to ensure that they are physically capable of mounting and servicing females. The establishment of a complete management program, especially for young bulls, is essential to ensure that ranch resources are used efficiently, including maintenance of a high level of reproductive performance of the cow herd.

© 2008 Elsevier Inc. All rights reserved.

Keywords: Bull; Bull breeding soundness examination; Puberty; Scrotal circumference ;Venereal disease

1. Introduction

There are many factors that comprise a bull management program in individual cattle operations. Considerations including pasture size, herd size, speed of genetic turnover, availability of feedstuffs, bull age at the time of sale, and animal health concerns must all be considered when working with cow/calf clients. Economic projections indicate that the utilization of yearling bulls is more cost-effective over the bull's lifetime than waiting until bulls are 2-y-old at first turnout [1]. This advantage amounted to \$5.00–11.00 per exposed female, depending upon the age at first turnout and expected bull:female ratio. Although the use of yearling bulls has increased

over the past 20 y, there is still considerable variation by region of the country regarding adoption of this practice. Regardless of the bull's age, they must be developed so that they reach puberty in a timely fashion, pass a bull breeding soundness examination, be physically sound, and have the required libido to service females in a wide range of environmental conditions. Therefore, bull development programs should concentrate on strategies that will decrease the age at puberty and maintain structural correctness in order to ensure longevity and return on investment.

2. Management during suckling and weaning

Many of the same considerations that exist for the selection and management of replacement heifers during suckling and weaning also need to be evaluated for developing bulls [2–5]. Puberty is both age and weight

* Tel.: +1 515 294 2192; fax: +1 515 294 1072.

E-mail address: engelken@iastate.edu.

related and certainly can be impacted by nutritional management. Creep feeding will add weaning weight, but it can have a detrimental effect on subsequent performance. Therefore, production records and individual animal identification are important for developing bulls, since they need to reach puberty by 13–15 mo of age if they are to be used as yearlings. As weaning approaches, bull calves should be evaluated for structural correctness while standing and walking, the presence of eye lesions, or other physical defects [3,4]. The temperament of the calf should also be noted. Both testes should be descended and freely moving within the scrotum.

The negative effects of morbidity during the post-weaning phase are well documented in weaned calves that have arrived at the feedyard [6,7]; presumably, bull calves are similarly affected. Calves diagnosed with respiratory disease will suffer a decrease in average daily gain (ADG), poorer feed conversion, and decreased carcass value. This slower growth rate has the potential to delay the onset of puberty, whereas effects on carcass traits complicate production evaluation and genetic selection. The preweaning health program should be started during the suckling phase and include adequate coverage for respiratory pathogens, clostridial disease, and strategic control of parasites (external and internal) [3,8]. It is preferable that booster vaccinations be given at least 3 wk before the calves are weaned. Due to their negative effect on testicular development and the attainment of puberty, growth-promotant implants should not be used in bulls that are being developed as breeding animals [9,10]. Since there are substantial differences among locations regarding common management practices and pathogens of importance, it is imperative that the local practitioner be involved with designing the health program for these calves.

3. Postweaning through the first breeding season

The genetic aspects of reproduction cannot be ignored during the selection and development of breeding stock. Although the heritability of measures used to evaluate reproductive performance in cattle is relatively low, traits known to influence bull fertility are highly heritable. Scrotal circumference has a heritability of approximately 0.50 (range, 0.36–0.68). When coupled with the large amount of variation in bulls of the same age and breed, substantial genetic progress can be made in a relatively short time [3–5]. Scrotal circumference has been directly linked to multiple fertility measures in bulls and can be used to predict puberty. Percent motile and normal sperm, sperm volume and concentration, total sperm output, and

total epididymal sperm reserves are all favorably correlated with scrotal circumference. Reproductive traits in heifers can also be affected by the scrotal circumference of their sire. As scrotal circumference increases, age at puberty is decreased and subsequent productivity is improved in daughters. When scrotal circumference is measured at weaning and adjusted for 205 d of age and breed, bull calves need to achieve a scrotal circumference of approximately 20–23 cm. Screening potential herd sires at this time will help ensure that they have an opportunity to reach the required circumference (approximately 32 cm) needed to pass their breeding soundness examination as yearlings. This will also help decrease costs of the developmental program for the seedstock supplier by culling unsuitable bull calves at an earlier age.

The guidelines for bull breeding soundness examination (BBSE) are well established and provide minimum targets that bulls must meet [11]. This procedure involves a physical examination, measurement of scrotal circumference, and evaluation of sperm motility and morphology. The importance of the physical examination performed with the first BBSE should not be overlooked [2–4]. The bull's feet, legs, eyes, and internal organs should be carefully evaluated for abnormalities. Seminal vesiculitis, penile warts and hair rings, and developmental defects such as persistent frenulum, can all impair the young bull's ability to breed successfully. The attachment and structure of the prepuce should be carefully evaluated, especially in Brahman-influenced breeds, to minimize the potential for injuries during the breeding season. Poor feet and leg structure, as well as abnormalities of the tarsal joints, can lead to premature musculoskeletal breakdown in young bulls and increase the cost of maintaining a bull battery.

Reproductive behavior is commonly affected by socialization and dominance [3,4]. This relationship is driven primarily by age and body weight. When yearling bulls are placed in breeding groups with mature bulls, mounting behavior and the number of pregnancies from the younger bulls are reduced. Multi-age groups can increase the number of injuries in the younger bulls as they compete for females and feed resources. Therefore, whenever possible, bulls should be grouped by age several months ahead of the breeding season. This will enable bulls to effectively establish the order of dominance prior to the start of breeding. Younger bulls tend to be less efficient in their mating behavior due to their relative lack of experience. Therefore, yearling bulls should not be expected to breed more than 25 females under normal conditions. Finally, cattlemen must be reminded to observe bulls during the first week of the

breeding season to monitor the breeding activity. Producers must also understand differences among mounting, copulation, and ejaculation, if problems with the bull battery are to be detected in a timely fashion. Routine monitoring must also continue through the course of the breeding season to detect common bull injuries, including penile hematomas, preputial lacerations, or musculoskeletal injuries.

It is not the purpose of this presentation to provide a complete discussion regarding the effects of nutrition on bull development and fertility. However, nutritional mismanagement following weaning can have a devastating effect on developmental costs, bull fertility, and productive longevity. Bulls that are fed diets that are extremely low or high in energy will have decreased fertility. Extremely low levels of energy delay puberty, decrease sperm production, and lower sperm reserves in the epididymis [4,5]. Conversely, rations with extremely high levels of energy can lead to acidosis, chronic laminitis, and cause similar developmental defects, due to increased fat deposition in the neck of the scrotum. Also, bulls carrying excess body condition during the breeding season will have poorer semen quality (motility and morphology) and decreased libido, resulting in fewer cows serviced, along with decreased conception and pregnancy rates. Prior to the start of their first breeding season as yearlings, bulls weighing at least 500 kg, with a body condition score of six or seven (nine-point scale) should be of adequate condition to deliver acceptable breeding performance. Generally, rations that are moderate in the amount of energy and contain adequate fiber work well in diets used to develop bulls after weaning.

4. Conclusion

Reproductive efficiency is the most critical component of profitability for cow/calf operations. Considering the investment in land, capital, and breeding females, it is imperative that the bull battery perform at a high level. Genetic selection, nutritional management, physical and seminal characteristics, and the understanding of how bull management affects the expression of these traits, are critical for the successful development of the young bull.

The way in which bulls are developed prior to their first breeding season will have a direct effect on the economic well-being of the seedstock producer and the commercial bull buyer. The commercial cattlemen must have bulls that excel in growth, fertility, structural soundness, and longevity, if he is to control costs associated with the bull battery. Furthermore, the seedstock producer's reputation and ability to attract repeat buyers also relies on these same bull characteristics. Veterinary practitioners need to play a key role in overseeing bull development programs in order to ensure that both the buyer and seller remain profitable.

References

- [1] Kasari TR, Jones R, Wikse SE. Use of yearling bulls in beef cattle operation. Part I. Economic analysis and fertility assessment. *Comp Con Ed Pract Vet* 1996;18:1244–53.
- [2] Barling K, Wikse SE, Magee D, Thompson J, Field R. Management of beef bulls for high fertility. *Comp Con Ed Pract Vet* 1997;19:888–903.
- [3] Spire MF. Health management of beef bulls. *Vet Med* 1995;90:777–88.
- [4] Coulter GH, Kastelic JP. Management programs for developing beef bulls. In: Howard JL, Smith RA, editors. *Current Veterinary Therapy 4 Food Animal Practice*. WB Saunders Company; 1999 p. 127–36.
- [5] Corah LR, Ritchie H, Selk G. The reproductive and nutritional management of beef bulls. In: *Beef Cattle Handbook*, Publication BCH 2030. MidWest Plan Service, Ames, IA; June 1999. p. 1–5.
- [6] Busby WD, Strohbehn DR, Beedle P. Effect of postweaning health on feedlot performance and quality grade. *Iowa State University Animal Industry Report*, AS Leaflet R1885; 2004.
- [7] Gardner BA, Dolezal HG, Bryant LK. Health of finishing steers: effects on performance, carcass traits, and meat tenderness. *J Anim Sci* 1999;77:3168–75.
- [8] Engelken TJ. Preventative programs for respiratory disease in cow-calf operations. *Vet Clin North Am: Food Anim Pract* 1997;13:647–60.
- [9] Staigmiller RB, Brownson RM, Kartcher RJ, Williams JH. Sexual development in beef bulls following zeranol implants. *J Anim Sci* 1985;60:342–51.
- [10] Godfrey RW, Randel RD, Rouquette FM. Effect of zeranol on sexual development of crossbred bulls. *J Anim Sci* 1989;67:1751–6.
- [11] Chenoweth PJ, Spitzer JC, Hopkins FH. A new bull breeding soundness evaluation form. In: *Proceedings, Society for Theriogenology Annual Meeting*; 1992. p. 63–70.