

Physical Defects Which Limit Breeding Soundness of Bulls

Robert S. Hudson, *D.V.M., M.S.*

Dwight F. Wolfe, *D.V.M., M.S.*

Large Animal Clinic

School of Veterinary Medicine

Auburn University, Auburn, Alabama 36849

The purchaser of a bull is entitled to as much accurate information about the animal as can be obtained on a practical basis. Likewise the seller deserves the same extent of information in order to preserve or establish a reputation, to avoid unnecessary sale and return of defective bulls and to form a sound basis for refusing unfair return of bulls that become unsound subsequent to sale. Additionally, the owner of a bull in service needs to know that bull will likely perform effectively and efficiently.

The breeding soundness examination should include (a) a thorough physical examination with emphasis on the locomotor and genital systems, (b) the collection and evaluation of semen and (c) a test of the bull's ability to copulate effectively and efficiently. Ideally the test of mating ability should evaluate a bull's libido and give an idea of the potential serving capacity.^{1 2} Both criteria require extensive time and the availability of females, often for large numbers of bulls. Scoring of libido and serving capacity are subjective and while quite valuable, are often omitted. Historically, particularly before serving capacity tests were devised, the prudent cattleman was obliged to observe bulls carefully after entering service. This test, after the optimum time for discovery of defects or inefficiency, is still common. All too often it is carried out inefficiently or not at all.

The foregoing places an extra burden on the examiner to perform a thorough physical examination, one which will detect obvious defects in breeding soundness. Less than thorough effort may prove embarrassing to the examiner and costly for both examiner and cattleman. The pressure of availability of time, particularly with large numbers of bulls, is frequently of concern but the experienced examiner realizes that a rapid examination need not be a careless one.

The purpose of this presentation is (a) to describe pathological conditions which should be discovered on routine breeding soundness examination and (b) to discuss those defects which may be detected best by a test of mating ability.

The Penis

The examination requires careful inspection and palpation of the penis which may be done immediately prior to semen collection if the examiner does not let interest in semen collection disturb examination of the penis. A

common finding in young bulls is a ring of tangled hairs around the free portion of the penis. The ring is acquired by the practice of young bulls mounting their young penmates during rearing or holding. Most of the rings are lodged superficially and can be removed easily. If allowed to remain with the bull going into service the ring may make a deep annular laceration or even amputate the penis.

Infectious bovine cutaneous papillomatosis commonly affects the penis, rarely the prepuce, of young bulls. Again the viral infection is usually acquired during homosexual activity among young bulls. The papillomas are easily removed surgically, the greatest concern being to preserve the integrity of the urethra. Massive papillomas may appear formidable but careful examination will reveal the pedunculated nature of the tumor with only the pedicle being materially attached to the penis. Ligation is preferable to cautery for hemostasis as cautery may cause deep and serious necrosis. In a small number of cases the papilloma recurs but rarely more than once. Commercial wart vaccine has some apparent benefit in prophylaxis but is usually of no therapeutic value.

Persistent frenulum, a congenital band-like attachment of the prepuce to the tip of the penis along the median raphe is usually encountered in virgin bulls and may be a cause of impotence, i.e. the tip of the erect penis is deviated ventrally by the frenulum. In fact the descriptive complaint of the owner may cause suspicion of ventral deviation. The frenulum is easily excised by transection at both ends with ligation of both stumps. Due to the strong evidence for heritability of the condition, these bulls should not be used in purebred herds.³ Bulls of Zebu ancestry, due to excessive length of prepuce, may be able to copulate even with the presence of the intact frenulum.

Lacerations of the penis or scars in evidence of healed lacerations are frequent and should not be overlooked. They may be significant from the effect(s) on the sensory nerve supply, urethral integrity, and invasion of the corpus cavernosum penis (CCP) or the corpus spongiosum penis (CSP).

An intact sensory nerve supply to the glans and dorsum of the free portion of the penis is indispensable to efficient intromission and ejaculation, respectively.^{4 5} Permanent nerve damage may be sustained by the trauma associated with rupture of the corpus cavernosum penis (hematoma of

the penis). Lacerations which interrupt the nerve supply also cause impotence. A crude but somewhat effective test for intact nerve supply is to stimulate the glans and the dorsum of the penis with an electric livestock prod while holding the retractor penis muscles in one hand. The positive response is a very mild contraction of the muscles. Failure of any response is indicative of hypoesthesia.⁴ Because of frequent difficulty in interpretation of the test, the bull with no response should be subjected to test mating which will be described later.

Lacerations which cause fistula(e) of the penile urethra vary in significance. A urethral fistula near the tip of the urethra will not likely cause any decrease in efficiency of delivery of semen, whereas a fistula in the midsection of the free portion of the penis may reduce the soundness of the bull. Congenital fistulae (hypospadias) have been reported but usually accompany other deformities.³

Significant urethral fistulae are difficult to repair. It is thought that the violent wave-like movement of urination interferes with healing. For this reason, when the quality of the bull and the severity of the lesion merit repair, the authors have resorted to repair of the fistula with concomitant ischial urethrotomy through which an indwelling catheter is placed in the bladder for the duration of the healing of the fistula. This drastic procedure has yielded surprisingly good results with fistula repair, after which the ischial urethrotomy is allowed to heal spontaneously.

Lacerations which invade the cavernous tissue of the glans, the CCP or the CSP, if not repaired surgically, will often heal to the point of a fistula with a very small surface opening. The fistula appears insignificant until erection when copious hemorrhage appears. Whole blood is toxic to sperm. Surgical repair involves longitudinal incision over the fistula, exposure of a surprisingly large cavity, thorough curettage and careful suturing. Repeated attempts may be required.

Spiral deviation of the penis frequently appears during routine electroejaculation due to nonphysiologic erection. Therefore this should not be taken as a definitive diagnosis.⁶ The only correct method of diagnosis of spiral deviation is with test mating. Conversely, ventral deviation may be diagnosed with erection produced by the electroejaculator. Both deviations may be repaired by a method described elsewhere, however; ventral deviations which originate well up in the portion of the penis covered by prepuce with a gradual curvature apparently are incorrectable. Briefly the procedure consists of excising a 2 cm x 12-15 cm strip of fascia lata from the thigh of the patient and surgically implanting it between the tunica albuginea of the CCP and the apical ligament through a dorsal midline incision.

Erection failure has been found to be due to obstruction of the CCP⁷ or to vascular shunts from the CCP to peripheral veins or to the CSP.⁸ Obstructive lesions, e.g. intracorporeal thrombosis, sclerosing cavernositis and dystrophic calcification are not easily located antemortem and frequently are suspected in the living animal only after a

process of elimination. These lesions present a poor if retrospective prognosis.

Diagnosis of erection failure due to shunts may require a combination of the use of the electroejaculator, test mating and serial contrast radiographic cavernosography.⁸ Apparently the most common type of shunt (cavernosal-venous) follows extraordinary nonsurgical healing of a rupture of the CCP (hematoma of the penis). If a bull with erection failure has a palpable scar at the dorsal aspect of the distal bend of the sigmoid flexure or a history of rupture of the CCP, a shunt should be suspected. This type of shunt is amenable to surgical correction using the technique for repair of rupture of the CCP as will be described below. Multiple shunts in the free portion of the penis may be congenital (sometimes becoming evident after successful initial service) or acquired through deep laceration. These shunts and CCP-CSP shunts defy correction.⁵

The Prepuce

Most preputial injuries involving laceration, prolapse and abscessation are easily recognized. Of special note is the more obscure preputial stenosis following severe trauma or occasionally after circumcision. The problem may present as failure of penile extension or may be occlusive with urine retention in the preputial cavity. Resection of the stenotic fibrous tissue and anastomosis of healthy preputial integument is usually successful.⁹ Of much more serious nature is peripreputial abscessation and fibrosis following laceration and *complete retraction* of the prepuce. This lesion carries a very poor prognosis.

Test Mating

Observation of a suspected impotent bull in an attempt at natural service may be helpful in arriving at a diagnosis.¹⁰ This test is not to be confused with prebreeding tests of libido and serving capacity. The test is best performed on one or more estrual females belonging to the owner. Scheduling the test by injecting several cows with prostaglandin may save time.

Bulls are attracted to estrual females mostly by sight and to a lesser extent by auditory and olfactory cues. Recent evidence indicates bulls need to physically sample female fluid to detect pheromones.¹¹ The pattern of usual activity varies with the size and level of sexual activity of the cow herd. Bulls in a multisire herd may be affected by dominance ranking.¹² Obviously this pattern is not easily evaluated in a 1:1 bull to cow test.

The estrual cow or heifer should be of compatible size for the test mating. The setting should be free of crowds of people. The presence of other bulls nearby may stimulate some bulls and inhibit others. The examiner must be prepared to observe a complexity of actions in a very short time or, conversely, the act may be disturbingly prolonged.

The normal bull will approach a cow and sniff the vulva.

This alone is a manifestation of libido. Failure to follow through then is probably due to another defect, not lack of libido. When mounting is imminent the ischiocavernosus muscles contract visibly, the preputial orifice is elevated, the penis extends momentarily and drips preseminal fluid. The bull may mount at this time or make one or more abortive efforts and then mount.¹

Today many bulls are being pressed into service at a very young age. Inexperienced bulls may react awkwardly, perhaps trying to mount the head or side. There may be evidence of frustration, anxiety, frenzy or aggression.¹⁰ Most bulls overcome this stage without aid or notice. Still there is a learning component to mating ability¹³ and the occasional slow learner may require one or more supervised educational services.

If a bull demonstrates basal libido but fails to mount or to stay mounted, locomotor disease, especially in the hind limbs, should be suspected.⁶ During the initial part of mounting the bull's full weight is shifted to one and then the other of the rear limbs, thus exaggerating a lameness that might be obscure without mounting. If the bull begins to mount, stops short and "treads" with the front feet, a lumbar spinal lesion should be suspected. In a study in which 54 bulls were culled for locomotor abnormalities, 16 failed to show lameness on routine physical examination.¹ It must be emphasized that bulls that perform satisfactorily may have surprisingly serious locomotor defects. Pain in locations other than locomotor structures has been observed to interfere with service. Acute orchitis and seminal vesiculitis are examples.¹⁰

When mounting is complete the penis of the bull should be generally in the area of the vulva. Failure of extension may be due to adhesions from hematoma of the penis or preputial abscess or stenosis, persistent frenulum or excessively pendulous sheath. If the penis spirals in the sheath it can be palpated while the bull is mounted. Erection failure, as discussed above, may be due to obstruction or shunts of the CCP.⁸

Occasionally there is complaint that the bull's penis is deflected laterally over one gluteal area of the cow, indicative of nerve damage. In such cases the examiner should look for the typical short "searching" movements of the penis for the vulva. The normal glans penis can distinguish the warmth and moisture of the vulva; a hypoesthetic penis does not make this distinction, i.e. the bull cannot "find" the vulva.⁴ There is no known treatment.

Spiral and ventral penile deviations may be confirmed on test mating. It is wise to remember that ventral deviation in Zebu ancestry bulls may be masked by an extremely long sheath and appear as insufficient protrusion.

Because rupture of the corpus cavernosum penis (hematoma of the penis) may be associated with several of the defects listed above, viz. adhesions restricting protrusion, sensory nerve damage, preputial injury, and erection failure due to shunts,^{14 15} the injury must be considered a serious one. It is known that the injury will heal spontane-

ously in many cases which is fortunate and appropriate for bulls of marginal quality. Ultrasound therapy has been reported to provide good results.¹⁶ The present authors believe that surgical closure of the rent in the tunica albuginea provides stronger repair thus reducing risk of recurrence and minimizing the incidence of shunts. If surgical correction is planned it should be done as soon after the injury as possible. If more than 10 days expire postinjury and before surgery, fibrous tissue repair surrounding the CCP is so extensive that exposure is difficult. Briefly the procedure^{14 15} involves placing the animal in right lateral recumbency under deep sedation or, preferably, general anesthesia, making a cranioventral skin incision over the lateral aspect of the bulge of the hematoma in the aseptically prepared field, and incising subcutaneous tissue until the clot is exposed. Sufficient clot is then removed to expose the penis which is carefully but firmly drawn through the incision. The distal bend of the sigmoid flexure is located near the attachment of the retractor penis muscles. The rent very predictably will be on the dorsal aspect of the distal bend. Multiple layers of peripenile elastic tissue, some of which has been severely damaged by the force of blood from the rupture, are incised on the left lateral aspect of the penis. The ventral urethral groove is a helpful reference. The severely damaged elastic tissue must not be mistaken for the rent in the tunica albuginea. The laterally incised elastic tissue is reflected dorsally and will contain the dorsal sensory nerves which must not be disturbed. The tunica albuginea will be recognized as very firm, dense, smooth ivory colored tissue. The rent is usually smooth and transverse, appearing as an incision. Distraction of the torn edges may be as much as 2 cm. The edges are debrided and completely closed with a bootlace suture of number 1 polyglycolic acid suture. The incision in the elastic tissue, regardless of degree of damage, is closed with a single simple continuous suture of 000 gut. Loose clots in the hematoma cavity are washing away with warm (37 C) saline with 3% povidone iodine. No attempt should be made to close space between the penis and the wall of the hematoma cavity which is closed with 0 gut after which the skin incision is closed. Sexual rest for 60 days is required for maximal healing.

References

1. Blockey, M.A. de B: Value of a serving test in the breeding soundness examination of beef bulls. *Victorian Veterinary Proc*: 21, 1976.
2. Chenoweth, P.J.: Libido and mating ability in bulls. In Morrow, D.A.: *Current Therapy in Theriogenology*. Wm. Saunders Co., Philadelphia, 342-344, 1980.
3. Leipold, H.W. and Dennis, S.M.: Congenital defects affecting bovine reproduction. In Morrow, D.A.: *Current Therapy in Theriogenology*. Wm. Saunders Co., Philadelphia, 435, 1980.
4. Beckett, S.D., Hudson, R.S., Walker, D.F., Purohit, R.C.: Effect of local anesthesia of the penis and dorsal penile neurectomy on the mating ability of bulls. *JAVMA* 173:838-839, 1978.
5. Hudson, R.S.: The effect of penile

injuries on breeding ability of bulls. Proc. Soc Theriogenology Ann. Conf. 83-87, 1978. 6. Walker, D.F.: Physical Examination. In Walker D.F. and Vaughan J.T., Bovine and Equine Urogenital Surgery, Lea & Febiger, Philadelphia 3-4, 1980. 7. Hudson, R.S.: Thrombosis of the corpus cavernosum penis in a bull. JAVMA 159:754-756, 1971. 8. Young, S.L., Hudson, R.S., Walker, D.F.: Impotence in bulls due to vascular shunts from the corpus cavernosum penis. JAVMA 171:643-648, 1977. 9. Walker, D.F.: Surgery of the prepuce. In Waler, D.F. and Vaughan, J.T.: Bovine and equine urogenital surgery. Lea & Febiger, Philadelphia, 37-51, 1980. 10. Hudson, R.S.: Diagnosis of disturbances of mating ability in bulls. Auburn Veterinarian 37, 3:81-84, 1981. 11. Vacobs, V.L.; Sis, R.F.,

Chenoweth, P.J., Klemm, W.R., Sherry, C.J. and Coppock, C.E.: Tongue manipulation of the palate assists estrus detection in the bovine. Theriogenology 13: 353, 1980. 12. Blockey, M.A. deB: Observations on group matings of bulls at pasture. Applied An. Ethology 5:15-34, 1979. 13. Chenoweth, P.J.: Sexual behavior of the bull: a review. J. Dairy Sci 66:173-179, 1983. 14. Hudson, R.S.: Surgical correction of hematoma of the penis in bulls. Proc. 9th Convention Am Ass'n. Bovine Pract:67-69, 1976. 15. Wolfe, D.F., Hudson, R.S., Walker, D.F.: Common penile and preputial problems of bulls. Compend. Contin. Educ. for Veterinarian 5,8, 5447-5455, 1983. 16. Bracken, F.K.: Ultrasound therapy for hematoma of the penis of bulls. Proc 9th Convention Am. Ass'n. Bovine Pract, 60-66, 1976.

