

# Management of preputial injuries in bulls

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## Introduction

Veterinarians are frequently asked to examine bulls for reproductive inefficiency. The goal of most beef producers is to utilize 1 herd bull per 25-35 cows for breeding and this is the goal upon which breeding soundness evaluations of beef bulls is designed. Veterinarians and livestock producers should have a firm understanding of normal fertility or reproductive efficiency in cattle. Age, parity, health, body condition, length of breeding season, number of cows per bull and fertility of cows and bulls affect reproductive performance.

Average first service conception percentage in healthy herds is approximately 65%. Therefore, in a herd of a normal, healthy, fertile cows a normal healthy fertile bull would be expected to get 65 cows pregnant after one heat cycle. The remaining 35 open cows would be normal and with 65% conception rate on the next heat cycle, an additional 23 cows would be pregnant resulting in 88 pregnant cows after 2 heat cycles. Of the remaining 12 normal, healthy open cows, 8 (65%) would be expected to be pregnant after 3 heat cycles. Consequently, 96 cows should be pregnant after 3 heat cycles.

A thorough understanding of the anatomy, physiology and behavior of bulls is necessary to diagnose causes of reproductive inefficiency. Inefficiency may be due to the absolute inability of a bull to reproduce, impotentia generandi. These bulls may suffer impotentia generandi, the inability to achieve erection, impotentia erigendi, the inability to complete coitus, or impotentia coeundi, the inability to produce an adequate volume of morphologically normal progressively motile sperm. More frequently reproductive inefficiency is evident as a bull failing to get a large percentage of cows pregnant during a limited breeding season. A thorough history, physical examination, semen evaluation and perhaps observation during coitus may be necessary to identify causes of reproductive inefficiency.

## Anatomy and physiology of erection

Erection in the bull occurs by a complex mechanism whereby blood flow increases in the deep artery of the penis, into the crus penis and subsequently into the corpus cavernosum penis (CCP) following olfactory or visual sexual stimulation. The CCP in the bull is a closed system in that erectile blood flows into the penis from the crus and leaves this same area during detumescence. The stimuli that cause reflex dilation of the deep artery of the penis also causes relaxation of the retractor penis muscles which hold the penis in the preputial cavity. As the retractor penis muscles relax, the penis becomes mildly engorged, the sigmoid flexure relaxes and the penis begins to protrude from the sheath. As with continued stimulation continues the ischiocavernosus muscles (ICM) begin rhythmic contraction which rapidly raises blood pressure within the CCP. Peak pressure within the CCP may be greater than 14,000 mm Hg at the time of ejaculation. This rapid increase in intracorporeal blood pressure complete penile extension and erection. After ejaculation the ICM relax, blood pressure within the CCP decreases causes detumescence and the retractor penis muscles withdraw the penis back into the preputial cavity.

Erection may be artificially induced in bulls by an electroejaculator with the bull restrained in a chute. Normal function of the penile nerves is essential for coitus. Erection and penile nerve function are most accurately assessed by observed test mating or by semen collection via artificial vagina.

## Examination of the penis and prepuce

A successful past breeding history indicates the bull may now have an acquired problem. Alternatively, when no history is available or the bull is a virgin, the examiner must consider juvenile or congenital conditions which prevent reproduction as well as acquired conditions. Examine the penis and prepuce from a distance prior to physical examination with the bull safely restrained in a squeeze chute with a drop side. For optimal mating ability the distal end of the sheath should be no longer than a horizontal line drawn from the hock to the carpus, the preputial orifice, should not be excessively large, and the angle of the sheath should roughly approximate a line drawn along the ventral aspect of the sheath which intersects the lower front leg or foot. The preputial hairs serve to drain urine away from the preputial orifice and they should be free of calculi, exudate, or hemorrhage. Normally bulls hold the penis and prepuce within the sheath although naturally polled bulls may allow a slight prolapse of the prepuce during hot weather or when they are relaxed. This normally exposed preputial skin is moist, normal colored, and slightly wrinkled in appearance. Palpate the entire penis through the sheath for swelling or fibrous tissue. Pay particular attention to the area of the distal bend of the sigmoid flexure which is the location of penile hematoma as well as urethral rupture due to urinary calculi. Penile hematoma is caused by rupture of the dorsum of the tunica albuginea with accumulation of blood (hematoma) in the peripenile elastic tissue. This blood accumulation causes symmetrical swelling along the long axis of the dorsum of the distal bend of the sigmoid flexure and prevents penile extension. This swelling must be differentiated from abscesses which may form as sequelae to preputial lacerations in *Bos taurus* bulls. Abscesses are usually circumscribed asymmetrical swellings along the midportion of the sheath. Generalized swelling within the sheath along the penis may be due to cellulitis or phlegmon from preputial laceration or from urine contamination of the peripenile elastic tissue.

For complete examination of the penis when swelling is not present in the sheath, manually extend the penis, grasp the free portion of the penis with a dry surgical sponge and complete penile extension. The skin of the normal bull penis should be moist and pink with no evidence of swelling, lacerations or scar tissue.

Manually extend the penis and when penile extension is complete examine the skin of the which should have no evidence of swelling, vesicles, pustules, papillomas, lacerations or scar tissue.

## Observed test mating

As the normal bull approaches the cow the bulbospongiosus muscles begin rhythmic contractions which are visible as pulsations just ventral to the anus. The retractor penis muscles relax and the penis begins to protrude from the sheath as the bull prepares to mount. As he mounts the penis becomes engorged and the free portion should extend from the sheath. When the bull fully mounts the glans penis makes two or three searching motions near the vulva then the penis makes forceful intromission, the bull ejaculates in one thrust then dismounts the cow.

Bulls with erectile dysfunction do not achieve sufficient erection pressure to complete coitus. Bulls with nerve dysfunction mount the cow but the penile searching motions near the vulva are not evident and the bull fails to make intromission and the penis is placed along the cow's hip or below the vulva in the escutcheon area above the cow's udder. Bulls with phimosis or congenitally short penis do not adequately extend the penis beyond the preputial orifice.

## Preputial laceration

The most common breeding is preputial laceration which occurs as the preputial skin bursts due to compressive forces generated during the ejaculatory lunge, leading to a preputial laceration. This rupture of the preputial skin predictably occurs on the ventral aspect of the prepuce along a longitudinal axis, but assumes a transverse orientation as the penis and prepuce are retracted into the preputial cavity. Edema quickly develops in the traumatized skin and elastic tissues of the prepuce, resulting in preputial prolapse in *Bos indicus* breeds. If the bull continues to attempt to breed, repeated trauma worsens the condition.

In contrast, *Bos taurus* bulls are usually able to completely retract the damaged prepuce into the preputial cavity following injury. Consequently, the laceration of the prepuce may go unnoticed until cellulitis, abscessation, or stenosis occurs.

## Medical management of preputial prolapse

Care of preputial prolapse requires cleansing the damaged tissues, support bandaging to reduce edema and prevent secondary injury, and application of emollient antiseptic or antibacterial ointments.

After the damaged tissues are cleaned with surgical scrub and emollient ointment is applied, cover the prolapsed prepuce with a clean two-inch orthopedic stockinette. A length of latex tubing, 0.25 inch in diameter or larger placed in the preputial cavity will provide for urine drainage. Application of an elastic tape bandage over the stockinette will help resolve edema. The bandage may be left in place for up to three days but should be changed more frequently if it becomes excessively soiled.

A support sling fashioned from burlap, heavy netting or other loosely woven material may be designed to lift the sheath close to the body to help reduce preputial edema.

When the initial edema has resolved often the prepuce can be reverted into the preputial cavity and held in place by elastic tape, utilizing a piece of latex tubing placed in the preputial lumen for urine drainage. Avoid placement of a purse string suture to retain the prepuce as its use is associated with abscess formation and stenosis of the preputial orifice. Bandaging should continue until the prepuce no longer prolapses. The bull

should be allowed 60 days sexual rest and examined for normal penile function before returning to breeding.

*Bos taurus* bulls typically retract the prepuce into the preputial cavity following injury. These bulls may benefit systemic antibiotics, daily irrigation of the preputial cavity with antiseptic solutions and by hydrotherapy of the sheath over the area where the swelling is most evident. Enforce sexual rest for at least 60 days after the swelling subsides. Prior to returning the bull to service, extend the penis and evaluate the prepuce for stenosis or restriction due scar formation. The bull should be allowed 60 days sexual rest and examined for normal penile function before returning to breeding.

## Surgical repair of preputial laceration

Following establishment of a healthy bed of granulation tissue in the preputial laceration the damaged tissue may be removed if it obvious that excessive scar tissue or wound contracture prohibits normal penile extension. This surgery consists of resection and anastomosis of the damaged tissues and ensuring apposition of such that healthy skin margins. This surgery may be accomplished with general anesthesia or local anesthesia with heavy sedation. Following surgery the prepuce must be at least 1.5 times the length of the free portion of the penis in order to allow complete penile extension. Bulls undergoing surgery should have at least 60 days sexual rest prior to resuming breeding.

## Pudendal nerve block to assist penile extension

Occasionally veterinarians experience difficulty manually extending the bull penis for examination or therapy. This process can be facilitated by achieving anesthesia of the pudendal nerves which innervate the retractor penis muscles and other areas of the penis and prepuce.

The internal pudendal nerve is formed from fibers originating from the ventral branches of the third and fourth sacral and the pelvic splanchnic nerves. With the bull adequately restrained in a chute achieve caudal epidural anesthesia then introduce the hand into the rectum to the depth of the wrist. Direct the fingers laterally and ventrally to locate the lesser sacroscliotic notch and foramen by rectal palpation. Locate the internal pudendal artery by its pulsations at the cranial angle of the notch and palpate the pudendal nerve approximately 1 cm caudodorsal to the artery. Insert an 18-gauge, 10 cm spinal needle through the skin in the ischiorectal fossa beside the tail and direct the needle forward and slightly ventrally to a depth of 5 to 7 cm. Palpate the tip of the needle through the rectal wall and direct the needle in the direction of the nerve in the foramen. Inject approximately 10 mL of 2% lidocaine hydrochloride along the nerve then withdraw the needle 2 to 3 cm and inject an additional 10 to 15 cm at the cranial border of the foramen to desensitize the muscle branches of the rectal nerve. Repeat the procedure on the opposite side of the pelvis.

The advantage of the pudendal nerve block is that the penis and prepuce are easily extended and the animal can remain standing. A disadvantage of the technique is that a bull will not be able to retract the penis and prepuce for approximately 30 minutes following the procedure.

## References

1. *Large Animal Urogenital Surgery*, Wolfe DF and HD Moll. Lip-pincott, Williams and Wilkins. 1998.

