

# Production of Marker Bulls

**A. M. Trent, D.V.M., M.V.Sc.**  
*Diplomate, A.C.V.S.*  
*Maplewood, MN*

As the value of individual cows with desirable genetic characteristics increases, the need for a safe, efficient, and reliable method of detecting heat also increases. Despite strides in the use of electronic and hormonal monitoring systems for detection of estrus, the male of the species still remains the most sensitive indicator of receptivity in many management situations. Therefore, production of effective teaser animals persists as an important management tool, particularly in situations involving large numbers of animals with limited personnel.

In order to be effective, a procedure for producing marker animals must meet four requirements. First, insemination of the female by the marker animal must be prevented. Second, transmission of venereal disease from the marker or from cow to cow via the marker must be avoided. Third, the marker must retain sufficient libido to actively pursue fertile females throughout the breeding period. Finally, the procedure must be economically feasible to perform, meaning that the procedure is technically simple to perform, is not inordinately expensive, and does not have a high morbidity or mortality. The multitude of procedures available indicate that no one procedure has yet been identified that optimally fulfills all 4 requirements. While each technique has its individual proponents, objective comparisons of techniques under equivalent field conditions are minimal or absent. The following paper will describe several of the more common procedures and discuss their ability to fulfill each of the 4 requirements.

Prevention of impregnation by the marker is achieved in three basic ways—prevention of viable sperm production, prevention of sperm transportation to the penis, or prevention of transportation of semen from the marker into the female reproductive tract. Elimination of disease transmission by the marker is approached in two ways—prevention of intromission or use of a disease free marker. Preservation of libido depends on maintenance of circulating hormone levels, and to some extent on preservation of neuroendocrine feedback occurring during the act of copulation.

Surgical procedures for production of marker bulls fall into two basic categories—procedures of the penis or prepuce and procedures of the testicle or epididymus:

## **Procedure of the Penis or Prepuce**

- Penectomy
- Penile Tie Down
- Lateral Penile Deviation

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Corpus Cavernosal Block

Preputial Pouch

Preputial Ring

## **Procedures of the Testicle or Epididymus**

Vasectomy

Epididectomy

## **Penectomy**

The penectomy technique is identical to the caudal urethrostomy technique with penile transection commonly used in some areas for treatment of urolithiasis in feedlot steers. The procedure is simple and quick to perform and causes minimal complications in the marker animal if done properly. It insures prevention of intromission and thereby essentially eliminates the risk of impregnation or disease transmission. The main disadvantage to the technique is the relatively rapid loss of libido commonly seen.

The procedure should be performed on a young healthy postpubertal bull. Previous sexual experience is preferable because it insures that normal breeding behavior has been established. A squeeze chute and an epidural are adequate restraint and analgesia. The approach is via a 6-8 cm incision on the caudal midline somewhere between the floor of the pelvis and 10-12 cm dorsal to the base of the scrotum (high or low caudal urethrostomy). The penile shaft is isolated, freed from adhesions, and exteriorized. Complete exteriorization as for urolithiasis is difficult in a young bull without the necrosis associated with urethral rupture and may be contraindicated in the polled beef and *Bos Indicus* breeds due to the risk of preputial prolapse. Instead, enough shaft should be exteriorized to allow transection at the distal exposed end of the penis, leaving an exposed stump of 3-5 cm in length. The stump is stabilized with several transfixing sutures placed through the skin on either side and through the corpus cavernosum of the penis, being sure not to damage or constrict the urethra. An angled transection of the stump (concave side longer) provides a running board for urine and prevents contamination of the incision and subcutaneous tissues. Service should be delayed at least 3 weeks to allow healing.

## **Penile Tie Down**

The penile tie down technique depends on creation of a stable adhesion between the dorsal surface of the penis and the linea alba, thereby preventing extension of the penis from the sheath. The procedure is fairly simple to perform, requires minimal equipment, and causes minimal morbidity or mortality. Some erection is allowed and maintenance of libido

may be better than with the penectomy technique unless the dorsal nerve is damaged during the procedure. Prevention of impregnation and disease transmission depends on prevention of penile extension. Unfortunately, premature use of these bulls may result in disruption of the suture line before adhesions are formed, and prolonged use may allow remodeling and stretching of the adhesions with some penile extension allowed. Overall such complications are rare.

The bull is cast and restrained in lateral recumbency and a local anesthetic infused along the lateral aspect of the prepuce from 10 to 20 cm cranial to the scrotum. An incision is made through the skin of the prepuce at the juncture between the prepuce and the body wall and blunt and sharp dissection continued to expose the dorsal surface of the penis. The dorsal penile vessels and nerve should be identified within the dorsal fascia by palpation before proceeding further. The loose connective tissue over the linea alba should be removed and a corresponding 6-8 cm strip of tunic on the dorsal surface of the penis caudal to the preputial attachment should be sharply resected. Only a shallow (0.5 cm) strip is required and overzealous resection can result in damage to the deeper dorsal artery and nerve. The tunic resection site should be sutured to the linea alba with a nonabsorbable *monofilament* material using a simple continuous or preplaced simple interrupted pattern. The subcutaneous tissue and skin should be closed. Good hemostasis is very important throughout the procedure to avoid the risks associated with hematoma formation and infection. While some will use the bulls immediately, this increases the risk of disruption and accidental breeding. Therefore, a rest period of 3-4 weeks is recommended.

#### Lateral Penile Deviation

In lateral penile deviation, a subcutaneous tunnel adjacent to the prepuce is created and the penis is directed out laterally through the tunnel. A caudal penile deviation uses a similar principle with the penis exiting just caudo-dorsal to the base of the scrotum. Prevention of impregnation depends on sufficient displacement of the penis to prevent intromission. Despite often dramatic deviations, some bulls figure out the angles and manage to successfully impregnate cows. This is reportedly of greater concern when the procedure is performed in young bulls who have not established a normal breeding pattern. The procedure is technically more difficult to perform and has greater risk of morbidity from drainage, hemorrhage, or infection than most of the other procedures. Because of the risk of learned adjustment to the altered angle, it is generally combined with an epididectomy or vasectomy, further adding to the initial expenditure of time and money. The main advantage of the procedure is the level of libido generally maintained, making it desirable if use of the same marker bull over several seasons is desired. However, the practice of multiple season use is discouraged based on the increased risk of disease transmission, the increased risk of injury to the cows by an older and heavier bull, and the relative ease of producing a new teaser bull every season by other

techniques. Therefore, aside from producing an interesting conversation piece, this procedure has little to recommend it over other less extensive procedures.

#### Corpus Caverosal Block

The principle of the corpus cavernosal block is that, by thrombosing the corpus cavernosum, the vascular engorgement that is necessary for erection and intromission is prevented. The procedure is done standing with an epidural block and requires minimal equipment. Limited descriptions of the clinical efficacy of the technique are available; however, if the thrombosis is complete even in one area the procedure should be very effective in preventing impregnation and disease transmission. The effect on libido is uncertain. The main risks are introduction of infection or trauma to the urethra, either directly during injection or by accidentally injecting the corpus spongiosum instead of the corpus cavernosum.

The procedure involves exposure of the penis at the distal flexure through a 10-15 cm incision on midline just caudodorsal to the base of the scrotum. A large gauge (16-14 g) needle is inserted into the corpus cavernosum on the dorsal (inside or concave side) of the flexure and saline is injected to confirm placement. Five to ten ml of Technovit are then injected and the corpus cavernosum of the flexure is tacked to the skin with one or two retention sutures until hardening is complete (2 weeks). The skin is closed and the retention sutures and skin sutures are removed 2 weeks after surgery.

#### Preputial Pouch

The procedure involves closure of the preputial orifice and creation of a stoma for drainage of urine on the ventral aspect of the prepuce. If the stoma is placed too far cranially and is too large an occasional animal will learn to extrude the penis through the orifice, however this should be considered unlikely. The procedure is fairly simple to perform and requires minimal equipment. There is a tendency for calculi to form in the pouch with associated chronic infection. If the pouch is too small it may close down and restrict urine flow but it can be reopened in most cases. Documentation of clinical efficacy is limited.

The preputial orifice may be closed with a tight pursestring suture or the mucocutaneous juncture resected and the orifice sutured closed with a nonabsorbable material. The latter provides more permanent closure but is more easily disrupted by attempted extension in the early stages of healing. The stoma is created by making a ventral midline incision 5-6 cm caudal to the preputial orifice and 7-8 cm long. The internal lamina of the prepuce is incised and the edges sutured to the skin edges. Sexual rest for at least 14 days is recommended.

A modification of this technique involves placement of a metal ring in or around the preputial orifice which prevents extrusion of the penis. The ring may be selected to allow urine passage through the orifice or may be combined with a ventral urethral pouch. Both pouch and ring technique are often

combined with epididectomies.

### *Epididectomy*

In an epididectomy the tail and part of the adjacent body and ductus deferens are ligated and resected. It is a simple rapid technique but does require good hemostasis and asepsis to prevent infection. The procedure depends on interruption of sperm transportation from the testicle to the penis to prevent impregnation. Recanalization has reportedly occurred when insufficient tissue was removed, resulting in an unexpected return of fertility. Actual frequencies of recanalization are not available. Because intromission is permitted excellent libido is maintained, however disease transmission can occur and epididectomy alone is probably a poor choice in a herd with previous or ongoing venereal disease. The procedure can be combined with any of the penile/preputial procedures as an added precaution against impregnation.

The bull is restrained in lateral or dorsal recumbency and lidocaine infused subcutaneously over the tail of the epididymus, taking care not to penetrate the epididymus or testicle. A 3-5 cm incision is made through the skin parallel and 1-2 cm lateral to midline over the tail of the epididymus. A similar length incision is made through the common tunic to expose the epididymus. The proper ligament of the testicle (between testicle and tail of epididymus) is carefully incised or cut to free the tail of the epididymus. The fascia connecting the epididymal body and ductus deferens is carefully separated for 1-2 cm dorsal to the epididymal tail. The body and tail are separately ligated with 2-0 to 0 absorbable material and the distal 1-2 cm of epididymal body, the epididymal tail, and 1-2 cm of proximal ductus deferens is removed. The tunic is closed with 3-0 absorbable material in

a continuous pattern and the skin is closed in a subcuticular pattern with absorbable material. Careful and complete hemostasis is critical throughout to minimize the risk of hematocele, hydrocele, or infection. Sperm may persist in the ductus distal to the transection site and markers should not be used for at least 4 weeks. A semen evaluation is recommended before the animal is turned out to document complete ligation.

### **Vasectomy**

As with the epididectomy, the vasectomy relies upon interruption of transport of sperm from the testical to the penis. With a vasectomy, a section of both ductus deferens are removed. Advantages and disadvantages are similar to epididectomy. Debatably, the procedure is more difficult and recanalization more common. The difficulty lies in accurately identifying the ductus without damaging associated structures. The procedure may also be performed alone or in conjunction with a penile/preputial procedure.

The procedure may be done with the bull in a standing or recumbent position using infusion of 3-4 ml of a local anesthetic directly into the spermatic cord for analgesia. The testicle is manually forced to the bottom of the scrotum and a 3-4 cm vertical incision is made on the cranial or caudal surface of the neck of the scrotum. The common tunic is also incised and the ductus is identified by palpation as a firm tubular structure is a separate fold of visceral tunic. The ductus is isolated from its tunic and ligated at the proximal and distal extent of the incision to allow resection of at least a 3 cm segment. The skin but not the common tunic is closed. The same considerations for delay of return to service as for the epididectomy apply.