

Clinical Reports

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ORIGINAL

calcium chloride castration

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Experimental injections of calcium chloride (CaCl_2) intratesticularly have produced necrosis and atrophy (castration) in calves, colts, pigs, lambs, goats, dogs and cats.^{1, 2}

Advantages of nonsurgical chemical castration are apparent reduction in pain and stress, and elimination of hemorrhage, hernia, infection, myiasis and other surgical sequelae. This minor inexpensive technic may simplify a routine operation for the busy practitioner, and permit a contribution to population control presently not feasible. The long-range overall benefits should far outweigh any reduction in income for the veterinarian.

Various solutions and concentrations of CaCl_2 have been tested, using disposable syringes and small gauge needles. Dosages ranged from 0.1 to 30 ml CaCl_2 solutions, depending on testicular mass. Solutions ranged from 75 g CaCl_2 in 100 ml of sterile distilled water, to 30 g in 99% ethyl alcohol, to 10 g in 70% isopropyl alcohol. Neither optimal solutions nor dosages have as yet been determined.

Two technics of injection are under study. From a single point of injection, approximately 30% of the dose is deposited in the draining area of the head of the epididymis, with aliquots of the remainder distributed throughout the testis. Care is exercised to prevent leakage outside the tunica vaginalis. The other approach is with a shorter needle and separate lateral injections.

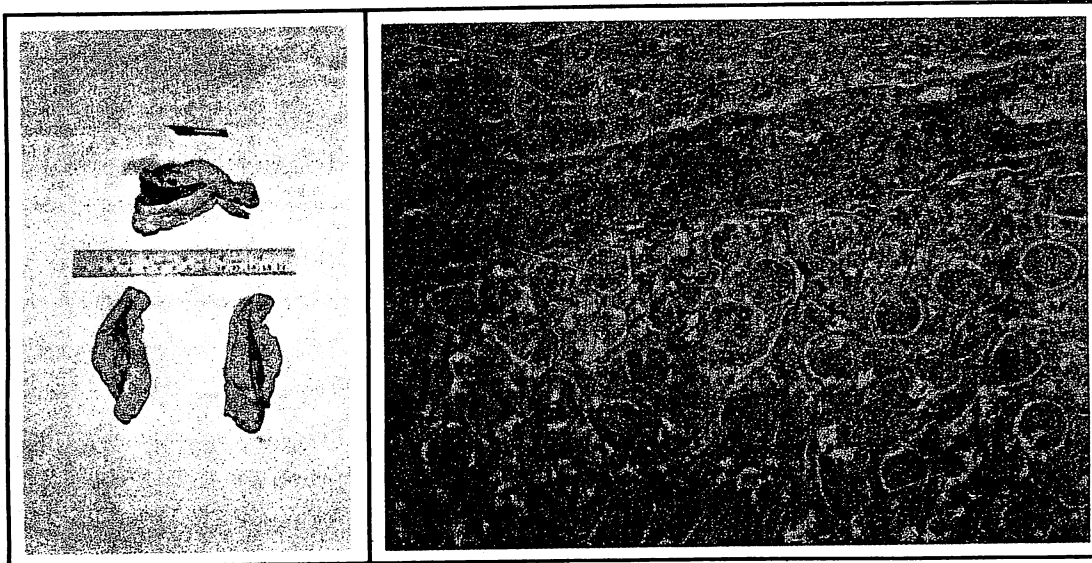
Most animals respond slightly to the prick of the needle and may react to excessive injection pressures. The evidence of pain is comparable to that caused by the injection of a local anesthetic agent. The alcohol



Unscarred juvenile scrotum of bull 2 months after chemical castration.



Same animal 1 month later; note steer-like appearance.



Left: Testicular remnants at slaughter weighing 34 and 35 g.

Right: Section of canine testicular remnant showing necrotic tubules.

solutions appear to have anesthetic properties. Within seconds after injection, the testes become very firm to palpation and of much greater turgidity than could be ascribed to the volume introduced. Most animals walk with a stilted gait in the hindquarters for 24-48 hours. Swelling and progressive induration persist for 4-5 days. Atrophy is apparent after 2-3 weeks, and after 3 months only a small testicular remnant can be palpated if an adequate dose was administered.

Bovine Case Reports

More than 300 calves, and lesser numbers of other species, have been castrated by CaCl_2 injections, with consistent and practical results. Some problems remain to be solved, especially in other species. Two case histories will be described.

Case 1. A Holstein bull calf WSU 950 B2 was born 26 May 1975. Birth weight was 95 lb (43 kg). On 30 May 1975 he was injected with 10 mg xylazine (Rompun: Haver-Lockhart) for restraint to permit an unassisted operation. One ml 50% CaCl_2 aqueous was injected into each horn bud to dehorn him as described previously^{3,4} and 1 ml 50% CaCl_2 aqueous was injected into each testis. Within 2 hours the calf had recovered, and no abnormal behavior was described by attendants. The results were satisfactory, as described. Within 2 months his poll was healed, and only a cord-

like remnant of the testes could be palpated, with the scrotum remaining approximately the same size as when injected. In September 1975 the calf was purchased by the author and moved to a pasture at his home for observation. The animal's appearance and behavior were asexual. His disposition was gentle, permitting palpation examination while at pasture without haltering. At 17 months of age on 12 October 1976 he was slaughtered, weighing 1050 lb (477 kg) and the carcass was rated "good." His juvenile scrotum was unscarred; it contained some fat and a fibrous cord-like remnant of the testes.

Case 2. An intact bull calf, LJ7 ($\frac{3}{4}$ Limousin and $\frac{1}{4}$ Jersey), at 9 months of age exhibited secondary male characteristics in appearance and behavior, including pawing and bellowing. His weight was estimated at 650 lb (295 kg). His testes were large and well developed, measuring more than 30 cm in circumference. On 28 November 1976 he was restrained in a stanchion, an assistant elevated his tail, and 2.0 ml mepivacaine HCl 2% (Carbocaine: Winthrop) were injected into the spermatic cord midway between the testes and the body wall. Five ml 30% CaCl_2 in 90% ethanol were injected into the right testis, using a 22-ga 1.5" needle, and 4 ml into the left. He appeared somewhat uncomfortable for a few hours, walked stiffly for about 20 hours and subsequently walked normally. Attitude and

behavioral changes (comparable to a surgically castrated steer) were noticed within 3 weeks.

On 18 January 1977 the right testis was observed to be about $\frac{1}{3}$ and the left about $\frac{1}{2}$ their former size. Five ml 30% CaCl_2 /90% ethanol were injected into the right testis and 6 ml into the left. No anesthetic or sedative was given and, other than from the prick of the needle, little if any behavioral discomfort was observed. He was maintained on pasture, with supplemental grain during the last 2 months before slaughter. At that time his scrotum appeared about $\frac{1}{2}$ normal size, flaccid, and empty. Palpation revealed some fat and the remnants of the testes, estimated to be 3 cm in diameter, in the dorsal part of the scrotum.

He was slaughtered 11 October 1977 at a live weight of 1105 lb (502 kg) and his dressed carcass weighed 691 lb (314 kg). The ribeye was 15 square inches, the fat was high standard, but the shear test was 16 psi and a taste panel of meat experts rated the quality very good. The right testicular remnant weighed 34 g and the left 35 g. Sections of both testes were examined by a pathologist who reported: "Atrophy and necrosis of the testes had occurred with small remnants of viable interstitial cells and seminiferous tubules containing a very few sperm cells; granulomas with focal mineralization; and normal epididymides." To date, however, no viable sperm have been observed in the discharges collected from injected animals.

In cattle, results so far indicate that doses of 1.0-2.5 ml/100 lb (45 kg) body weight are effective, depending on individual variation.

Canine Case Reports

In addition to cattle, several dogs have been presented for injections after their owners observed the procedure in calves or were informed by acquaintances. Two case histories will be described.

Case 1. A 3-year-old 85-lb (40-kg) male Golden Retriever owned by a veterinary student, who was also boarding in the same kennel a female English Pointer that he wished to breed to a purebred sire, was presented for chemical castration on 14 January 1977. The large active dog was secured in left lateral recumbency by holding his legs, and 2 ml of a solution containing 30 g CaCl_2 in 100 ml 90% ethanol were injected into each testis through a 22-ga needle. The dog flinched at the prick of the needle but made no resistance. Upon

release he hopped down off the table and happily followed his master home. Both testes became swollen and enlarged, and the following day his gait was stiff. By the second day his gait was normal, the swelling subsided in about 1 week, and atrophy of the testes gradually progressed for about 2 months, leaving small fibrotic remnants. About 6 weeks later the English Pointer female came into estrus, but the chemically castrated male Golden Retriever displayed no particular interest in her. She was bred to the desired sire and whelped 8 typical Pointer puppies.

Case 2. For a 3-year-old 15-lb (6.8-kg) Cocker-Terrier male, also owned by a veterinary student, 10% CaCl_2 in 70% isopropyl alcohol was used: 0.75 ml in the right testis and 0.6 ml in the left, in proportion to their asymmetry. As reported by the owner: "Although the dog was apprehensive, and yelped when the needle entered each testis, he immediately wagged his tail and looked up happily after being put on the floor following the injections. No differences in attitude and conduct were noticed, but he markedly reduced his scent-marking (urinating and scratching) tendency when taken out for walks. His testes 3 months post-injection are little larger than peas (0.5 cm), as compared to the diameter of a nickel (2.0 cm) when they were injected."

Because of the problems of obtaining end-result information from some private owners, no exact statistics can be presented. In about 35% of the dogs, one testis failed to atrophy, and CaCl_2 injections were repeated to rectify an inadequate initial dose. If an excessive dose had been injected or leakage occurred outside the tunic, scrotal skin necrosis and sloughing followed, but this healed rapidly without infection. Because excessive licking of the scrotum causes dermatitis, irritating skin antiseptics are avoided in dogs.

Conclusion

Calcium chloride castration is a convenient, rapid experimental technic that, if perfected, will offer advantages of economy, reduction of pain, and elimination of surgical complications in animal population control.

References

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