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CHEMICAL STERILIZATION IN DOMESTIC ANIMALS

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Abstract. Sterilization of animals dates back to 7000 BC. Sterilization or castration of domestic animals has been applied for centuries to control the number of animals, genetic selection, tranquillity of aggressive animals and, most importantly, to ensure the production of high quality meat from human needs. An ideal castration should be in such a way that it will require permanent, low-cost treatment, block spermatogenesis and androgenetic and not affect animal welfare levels. The main methods of castration are operative castration, hormonal castration and chemical castration. Chemical sterilization or castration has found application area for male monkeys, goats, bulls, hamsters, rabbits and dogs. Calcium chloride, lactic acid, sodium chloride, chlorhexidine, formalin, zinc tannate, zinc gluconate, glycerol, glucose, ethanol, silver nitrate are commonly used in chemical castration. After intratesticular application, destruction in seminifer tubules and leydig cells, decrease in testosterone and sperm production, atrophy in testicles is observed. In this review, the methods of chemical castration were mentioned in domestic animals.

Keywords: *Domestic animal, chemical castration, sterilization, sperm, testicle.*

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1. Introduction

Sterilization of animals dates back to 7000 BC. Sterilization of domestic animals has been applied for centuries to control the number of animals, genetic selection, tranquillity of aggressive animals and, most importantly, to ensure the production of high quality meat from human needs (Cavalieri, 2017). An ideal castration should be in such a way that it will require permanent, low-cost treatment, block spermatogenesis and androgenetic and not affect animal welfare levels (Hassan & Fromsa, 2017). The main methods of castration are operative castration, hormone inhibition, and chemical castration (Cavalieri, 2017). Chemical sterilization or castration has found application area for male monkeys, goats, bulls, hamsters, rabbits and dogs (Ijaz *et al.*, 2000; Jana *et al.*, 2005; Canpolat *et al.*, 2006) open wound in operative castration is always an infection focus. Hormonal castration not only directly affect the target organ but also indirectly damage other organs. Chemical castration provides the ideal conditions of castration, economic expectations in consideration of the effect in a short time, the animal's normal physical activities after the process to return easily, a small number of person are required to be more preferred than other methods of castration (Cavalieri, 2017; Hassan & Fromsa, 2017).

2. Chemical Castration

Chemical castration provides the ideal conditions of castration, economic expectations in consideration of the effect in a short time, the animal's normal physical activities after the process to return easily, a small number of person are required to be more preferred than other methods of castration (Capucille *et al*., 2002; Oliveira *et al.*, 2012).

Calcium chloride (% 20, 10 ml), lactic acid (1 ml/ 10kg), sodium chloride (% 20-30, 20 ml), chlorhexidine (setrimide with 2,5 ml), formalin (%10, 1 ml), zinc tannate, zinc gluconate (0,8- 1ml), glycerol (% 70, 1 ml), glucose (% 20), ethanol (10 ml), silver nitrate (% 1, 0,3-0,5 ml) are commonly used in chemical castration (Koger *et al.*, 1978; Weinbauer *et al*., 1985, Mitra *et al.*, 2000; Jana & Samantha, 2007; Emir *et al*., 2008; Levy *et al*., 2008; Mohammed & James, 2013; Fagundes *et al*., 2014; Canpolat *et al.*, 2016).

After intratesticular application, destruction in seminifer tubules and leydig cells, decrease in testosterone and sperm production, atrophy in testicles is observed. (Capucille *et al*., 2002; Canpolat *et al*., 2006; Hassan & Fromsa, 2017).

Castration greatly reduces testosterone hormone, androgenic hormones and estrogenic levels .Very little hormones secreted from the testicles. They continue to be secreted only in very small amounts adrenal glands. There is a negative correlation between growth hormone and body weight and a positive correlation between leptin, and growth hormone and testosterone. So, important changes metabolism and growth rate of these hormones due to deficiency in castrated animals (Karakus *et al*., 2017).

Canpolat et al (2006) observed a decrease in the testicular volume in ethanol-treated bulls within 3 weeks, while there was no significant difference in calcium chloride-treated testicles in the same study.

Response rates were associated with variational dose rates, concentrations, diluents, testicular size and injection techniques in the management of $CaCl_2$ and zinc-based chemosteronants (Emir *et al*., 2008) .

Excessive doses of chemosterilants has resulted in seepage beyond the testis and into the region between the visceral and parietal vaginal tunics. This seems to increase the risk of necrosis of scrotal skin occurring both with the use of $CaCl_2$ and zinc-based solutions (Oliveira *et al*., 2012, Leoci *et al*., 2014).

In addition to local symptoms such as redness, swelling, dermatitis and ulceration after injection of zinc gluconate, vomiting, diarrhea, loss of appetite, lethargy and leukocytosis may occur (Ibrahim *et al*., 2016).

Chemical substances, such as calcium-chlorid ($CaCl_2$), have the potential to be applied in female animals (Emir *et al*., 2008, Cavalieri, 2017, Figure 1).

Canpolat et al. (2005) they injected a mixture of formalin and ethanol into the prostate gland, and edema, hemorrhage, coagulatif necrosis and atrophy were observed in the gland. Formalin is not suitable for use in animals grown especially for meat and milk (Destefanis *et al*., 2003).

Sodium chloride - 20% hypertonic NaCl solution is cheap and easy to apply (Ibrahim *et al*., 2016). Canpolat et al (2016) in their study in 2016, they argued that sodium chloride application in young male dogs was an effective non-operative method of sterilization.

Intratesticular injection can be performed using a sterile 21-gauge needle directed from the caudo-ventral direction of each testis approximately 1 cm from the

epididymal tail and towards the dorso-cranial direction of that testis, so that the solution can be deposited over the entire route by linear infiltration while withdrawing the needle from the proximal end to the distal end. Care should be taken to prevent the solution from leaking from the injection site (Immegart & Threlfall, 2000, Figure 2) .

Figure 1. Effects of chemical sterilization in male and female animals (Emir et al., 2008; Cavalieri, 2017)

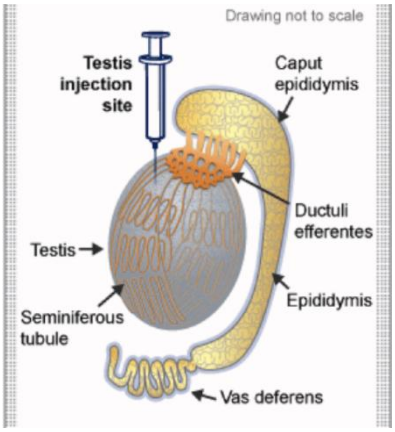

Figure 2. Approach to testicle on chemical castration

3. Conclusion

As a result, especially in male animals, these methods are important in terms of both economic and animal welfare. Each substance has minimal side effects. Since there is no surgical application, it can be preferred for post operative care, cheap, small number of staff requirements, easy implementation and especially positive effect on meat yield in bulls.

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