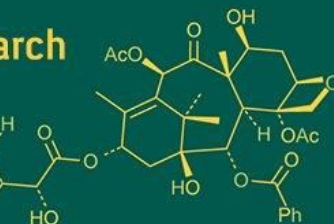


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## Does a non-invasive method of castration affect haemato-biochemical indices in domestic piglets?

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### Abstract

Castration is a common practice in pig husbandry for controlling reproduction and boar taint in meat. The study aimed to assess the haemato-biochemical variables in Ghungroo piglets after chemical castration in order to compare with surgical method. Twenty ( $n=20$ ) healthy male piglets weighing average 5 kg and aged around 1-2 months were selected for the study. The experimental animals were randomly divided into four groups. Each group contained five ( $n=5$ ) clinically healthy piglets. It was observed that both control (surgical) and treated (chemical) group did not differ significantly in terms of packed cell volume (PCV), Blood urea nitrogen (BUN) and total protein. However, serum cortisol in highest in  $T_0$  group when compared with experimental group. There were no differences ( $p<0.05$ ) among the treatment group, although;  $T_2$  has depicted the highest values. The present study revealed that chemical castration is an alternative method to open castration, as it is painless, low-cost and effective. It also demonstrated that the chemical method causes less stressful condition than surgical technique for male piglets.

**Keywords:** Chemical castration, haemato-biochemical, intratesticular injection, male piglets, surgical, testes

### Introduction

Pig rearing has been recognized as one of the most profitable ventures among the tribal community of India. One of the most efficient feed converting animals among all domesticated livestock species is pig, which plays a pivotal role in improving the socio-economic status of the tribal masses and weaker sections of the society. Efficiency of the pigs is recorded to as twice that of ruminants (Mpofu and Makuza, 2003) <sup>[12]</sup>. As compared to other livestock species, pig has a great potential to contribute to faster economic return to the farmers, because of certain inherent traits like high fecundity, better feed conversion efficiency, prolificacy, early maturity, short generation interval and excellent dressing percentage. Pig production has largely remained under backyard system of rearing with the backward sections of the society. It appeared as potential source of animal protein and avenue for additional income and employment that can improve the livelihood in a sustainable manner (Petrus *et al.*, 2011) <sup>[14]</sup>. Due to remoteness and inaccessibility, even the rural hill farmers have evolved a self-sustainable local resource-based production system, in which pigs are mainly dependent on local vegetation, crop residues and kitchen waste (Kumaresan *et al.*, 2007; Moanaro *et al.*, 2011) <sup>[8, 11]</sup>.

Castration is one of the most important management activities of the farm in pig husbandry. At present, surgical castration seems to be the only method of castration in pig. Though surgical castration is widely practiced over a long period of time, it required technical expertise, necessary facilities, expenses and post-operative care. The history of surgical castration of male pig dates back to 3000-4000 BC. It is practiced primarily to avoid boar taint (unwanted odour) to prevent skatole and androsterone accumulation in fat which is an unpleasant odour in meat of an un-castrated male pig and is a carcass quality concern. However, surgical castration is a painful procedure although this pain can be reduced with the use of analgesics (McGlone and Hellman, 1988; White *et al.*, 1995) <sup>[10, 15]</sup>, also induces oxidative stress in the blood of animals (Abou-Khalil *et al.*, 2020) <sup>[11]</sup>.

On the other hand, non-invasive method of castration gained the momentum in recent times due to welfare issues with open method castration. Non-surgical chemical castration has a positive impact on feed conversion and consequently, on the environment. It is cost effective, and animals return to normal physical activities easily, a small number of persons are required to perform this procedure, and more preferred than other methods of castration (Capucille *et al.*, 2002; Cavalieri, 2017; Hassan and Fromsa, 2017) [2, 3, 4]. It was hypothesized that chemical castration would not affect the haemato-biochemical variables in piglets due to painless method of orchiectomy. Hence, the present study was undertaken to compare the effect of chemical castration with surgical method on blood variables of Ghungroo piglets.

## Materials and Methods

### 1. Experimental design, animals and management

Twenty (n=20) healthy indigenous Ghungroo male piglets (*Sus domesticus*) weighing on an average  $4.5 \pm 2$  kg and aged around 1-2 months were used for the study. The piglets were maintained under standard feeding and management of the farm. The experimental animals were randomly divided into four groups. Each group contained five (n=5) clinically healthy piglets. Every animal in each treatment group (T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>) was administered a single bilateral intratesticular injection of potassium permanganate solution of three different concentrations for a volume of 1ml per testis (T<sub>1</sub>=0.25 g, T<sub>2</sub>=0.20 g and T<sub>3</sub>= 0.15 g whereas control group is denoted as T<sub>0</sub>). Each intratesticular injection was performed using a sterile 21-gauge needle inserted from the caudoventral aspect of each testis approximately 1 cm from the epididymal tail directed towards the dorso-cranial aspect of that testis. The solution was deposited carefully in a withdrawing fashion over entire route by linear infiltration from proximal end to the distal end. The small area to be injected at the bottom of each testis was cleaned with Betadine® solution 5% (Povidone iodine) before every injection. Necessary measures were taken to avoid seepage of the solution from the injection site. Following injection, the animals were kept under normal routine observation.

### 2. Collection of blood samples and analysis

Blood samples were collected from the experimental animals on the 2<sup>nd</sup> day post-injection of chemical and surgery. A 5ml disposable syringe (DispoVan®) and 20-gauge needle was used to collect blood from the anterior venacava of the experimental animals. The collected blood samples were immediately transferred into a sterile glass tube and allowed to stand in tilted position for 2-3 hours for separation of serum. The serum samples were kept at -20 °C in deep freezer until assayed.

All the analysis was done at the laboratory with the help of standard protocol for each sample of different variables.

### 3. Statistical analysis

All the data were collected, stored and processed in Microsoft excel. The data were analysed with the help of IBM SPSS software 26.0 version. The data was analysed using two ANOVA. Means having significant differences were subjected to post-hoc comparisons (Duncan's multiple range test) and considered as significantly different when  $p < 0.05$ .

### Results and Discussion

The effect of male pig chemical castration on hematological variables has been scarcely investigated. In the current trial, no impact of it was detected on packed cell volume, total protein, blood urea nitrogen except serum cortisol (Table 1). The present result would suggest that orchiectomy with open method increases cortisol, thereby enhancing stress level which hamper animal welfare and performance. Mean packed cell volume of different treatment groups were recorded as  $37.14 \pm 5.90$ ,  $39.15 \pm 4.60$ ,  $44.73 \pm 3.10$  and  $29.29 \pm 5.20$  respectively. All the treatment groups did not differ significantly; however, increased values were recorded in T<sub>2</sub> group followed by T<sub>1</sub>, C0 and T<sub>3</sub>. The present findings are in conformity with the study conducted by several researchers (King *et al.* 1991; Kang *et al.* 1993; Neto *et al.* 2014) [7, 6, 13].

**Table 1:** Haemato-biochemical profiles of piglets of different groups (Mean  $\pm$  SE)

| Group          | Packed cell volume (%) | Total protein (g/dL) | Blood urea nitrogen (mg/dL) | Serum cortisol ( $\mu$ g/dL) |
|----------------|------------------------|----------------------|-----------------------------|------------------------------|
| T <sub>0</sub> | $37.14 \pm 5.90$       | $7.25 \pm 0.48$      | $18.80 \pm 1.93$            | $8.38^a \pm 0.40$            |
| T <sub>1</sub> | $39.15 \pm 4.60$       | $7.13 \pm 0.48$      | $23.20 \pm 2.63$            | $7.09^b \pm 0.49$            |
| T <sub>2</sub> | $45.73 \pm 3.10$       | $7.32 \pm 0.89$      | $20.20 \pm 1.32$            | $7.01^b \pm 0.17$            |
| T <sub>3</sub> | $29.29 \pm 5.20$       | $7.17 \pm 0.62$      | $19.20 \pm 1.71$            | $6.95^b \pm 0.10$            |

Means within a row with different superscripts (a, b) differ significantly at  $p < 0.05$

Mean total protein values were  $7.25 \pm 0.48$ ,  $7.13 \pm 0.48$ ,  $7.32 \pm 0.89$  and  $7.17 \pm 0.62$  respectively. The result showed no significant difference among all the groups. There were no alterations in total protein concentrations in any of the treated groups with respect to the control group as well as among the three treated groups ( $p < 0.05$ ). This is in agreement with the study of Jana *et al.* (2007) [5].

Type of castration did not elevate certain blood parameters in domestic animals due to orchiectomy. Mean blood urea nitrogen of control, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> groups were recorded as  $18.80 \pm 1.93$ ,  $23.20 \pm 2.63$ ,  $20.20 \pm 1.32$  and  $19.20 \pm 1.71$  respectively. The study revealed that there was increase in the concentration of BUN among T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> than control group but the values were under normal physiological range.

Serum cortisol level revealed that there was a slight increase of concentration in T<sub>1</sub> group as compared to other treatment groups. The mean values of control, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were  $8.38 \pm 0.40$ ,  $7.20 \pm 0.49$ ,  $7.01 \pm 0.17$  and  $6.95 \pm 0.10$  respectively. All the values are under normal physiological range. This study is in accordance with King *et al.* (1991) [7] and Lessard *et al.* (2002) [9].

The stress indicators including concentrations of Packed cell volume (PCV), total protein, Blood urea nitrogen (BUN) and Serum cortisol were measured to ascertain whether a single intratesticular injection of potassium permanganate was associated with any chronic stress response in the experimental animals. Table 1 showed that there were no significant differences among all the treatment groups.

Similarly, King *et al.* (1991)<sup>[7]</sup> have suggested that serum cortisol concentration following chemical castration may be minimal and is less than the surgical castration.

### Conclusion

Chemical castration has proven itself as a safe and alternative to surgical castration in pig. The present study reveals that intratesticular injection of potassium permanganate in Ghungroo piglet rendered them sterile. It has no effect on haemato-biochemical variables viz. packed cell volume, blood urea nitrogen and total protein except serum cortisol level. The study also showed there is considerable stress to piglets castrated surgically, whereas chemically castrated piglets suffered minimal pain and stress. It can be recommended that chemical castration acts as an effective and alternative method to open technique.

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### Conflict of Interest

The authors declare no competing interest.

### References

1. Abou-Khalil NS, Ali MF, Ali MM, Ibrahim A. Surgical castration versus chemical castration in donkeys: response of stress, lipid profile and redox potential biomarkers. *BMC Vet Res.* 2020;16(1):310. doi: 10.1186/s12917-020-02530-0.
2. Capucille DJ, Poore MH, Rogers GM. Castration in cattle: techniques and animal welfare issues. *PubMed.* 2002;24(9):66-73.
3. Cavalieri J, Wang M, Johnson L. Chemical sterilisation of *Bos indicus* bull calves following intra-testicular injection of zinc acetate: Effects on semen quality and testicular changes. *Anim Reprod Sci.* 2017;156:23-33.
4. Hassan A, Fromsa A. Review on chemical sterilization of male dogs. *Int J Adv Res.* 2017;5(11):758-770.
5. Jana K, Samanta PK. Sterilization of male stray dogs with a single intratesticular injection of calcium chloride: a dose-dependent study. *Contraception.* 2007;75:390-400.
6. Kang YS, Park CS, Chung HS. Chemical castration by intracellular injection of silver nitrate solution in pigs. *Korean J Anim Sci.* 1993;35(6):463-469.
7. King BD, Choen RDH, Thomas LR, Janzen ED. Efficacy and stress of chemical versus surgical castration of cattle. *Can J Anim Sci.* 1991;70(4):1063-1072.
8. Kumaresan A, Bujarbaruah KM, Pathak KA, Chhetri B, Das SK, Das A, *et al.* Performance of pigs reared under traditional tribal low input production system and chemical composition of non-conventional tropical plants used as pig feed. *Livest Sci.* 2007;107:294-298.
9. Lessard M, Taylor AA, Braithwaite L, Weary DM. Humoral and cellular immune responses of piglets after castration at different ages. *Can J Am Sci.* 2002;82:519-526.
10. McGlone JJ, Hellman JM. Local and general anaesthetic effects on behaviour and performance of two- and seven-week-old castrated and uncastrated piglets. *J Anim Sci.* 1988;66:3049-3058.
11. Moanaro NE, Walling I, Krose M, Bhatt BP. Traditional animal husbandry practices in tribal states of Eastern Himalaya, India: A case study. *Indian J Anim Nutr.* 2011;28:23-28.
12. Mpofo I, Makuza SMM. *Pig Production Science and Technology.* 1st ed. Shonhiwa A, editor. Upfront Publishing; 2003.
13. Neto OA, Gasperin BG, Rovani MT, Ilha GF, Nóbrega JE, Mondadori RG, *et al.* Intratesticular hypertonic sodium chloride solution treatment as a method of chemical castration in cattle. *Theriogenology.* 2014;82(7):1007-1011.
14. Petrus NP, Mpofo I, Schneider BM, Nepembe M. The constraints and potentials of pig production among communal farmers in Etayi constituency of Namibia. *Livest Res Rural Dev.* 2011;23:159.
15. White RG, DeShazer JA, Tressler CJ, Borchert GM, Davey S, Waninge A, *et al.* Vocalization and physiological response of pigs during castration with or without a local anaesthetic. *J Anim Sci.* 1995;73:381-386.