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Effectiveness of immunocastration in adult boars

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Abstract. Immunocastration (IC) of pigs during their finishing stage avoids the traumatic castration surgery (Q) still practiced in many countries to prevent boar taint in pork. We have not found reports on IC of culled adult boars. In this study we evaluated boar taint, spermatogenesis, and weight loss of adult boars after castration by IC versus Q. A total of 21 boars were used (age: 29 months). The IC boars (n: 12) were injected with Innosure® (Pfizer Inc), and repeated four weeks later. The Q pigs (n: 9) were castrated when the IC were first injected. Both groups were monthly weighted and slaughtered five weeks after the second injection. Testes of IC slaughtered boars were sampled and compared with the Q group. Odor panels were conducted to test all carcasses and pork. The Q boars lost 0.172 kg BW/animal/day, while IC boars did not lose weight (P=0.016). None of the boars (IC or Q) resulted in tainted pork. The IC testes had lower spermatogenesis compared to Q. It is concluded that IC effectively prevented boar taint through testicle atrophy, and it also resulted in no weight loss after castration.

Keywords. Immunocastration – Immunological castration – Immunocontraception – Boar taint – Sex odour – Mature boar.

Efficacité de l'immunocastration des verrats adultes

Résumé. *L'immunocastration (IC) des porcs pendant leur phase de finition permet d'éviter la castration traumatique (Q) encore pratiquée dans de nombreux pays pour éviter l'odeur de verrat dans la viande du porc. Nous n'avons pas trouvé de rapports sur l'IC de verrats de réforme. Dans cette étude nous avons évalué la spermatogenèse, l'odeur de verrat, et la perte de poids des mâles adultes après la castration par IC versus Q. Un total de 21 verrats ont été utilisés (âge: 29 mois). Les verrats IC (n: 12) ont été injectés avec Innosure ® (Pfizer Inc), et le traitement a été répété quatre semaines plus tard. Les verrats Q (n: 9) ont été castrés au même moment où les IC ont été injectés. Les deux groupes ont été pesés deux fois et abattus cinq semaines après la deuxième injection du groupe IC. Les testicules des verrats IC abattus ont été échantillonnés et comparés à ceux du groupe Q. Des panels relatifs aux odeurs ont été réalisés afin de tester toutes les carcasses et les échantillons de viande. Les verrats Q ont perdu 0,172 kg de poids corporel/animal/jour, tandis que les verrats IC n'ont pas perdu de poids (P = 0,016). Dans aucun des groupes on n'a trouvé (IC ou Q) de contamination d'odeur. Les testicules IC ont présenté une spermatogenèse diminuée comparés aux Q. Nous en concluons que l'immunocastration est capable de diminuer efficacement l'odeur de verrat par une atrophie des testicules; de plus, aucune perte de poids après la castration du groupe IC n'a été détectée.*

Mots-clés. *Immunocastration – Castration immunologique – Immunocontraception – Odeur de verrat – Odeur sexuelle – Verrat.*

I – Introduction

It is well known that non-castrated fattening pigs perform better than barrows (Harding, 1993). Nevertheless, pork from non-castrated boars may present an unpleasant odor and taste to the consumer. This is due to the combined effect of androstenone derivatives and skatole deposited in the meat (Bonneau, 1982; Brooks and Pearson, 1986; Xue and Dial, 1997). Immunocastration (IC) is an immunological castration method which is currently used worldwide

to castrate pigs at the end of their fattening stage. The IC method works as a vaccine, stimulating the immune system to produce antibodies against the gonadotropin-releasing hormone (GnRF), ultimately inhibiting the generation of androstenone (Ferro, 2002). Immunocastration is an alternative to the usually traumatic surgical castration still in use in many countries (Prunier *et al*., 2006). Besides being regarded as animal-friendly, IC is also beneficial to the producer of grow-fattening pigs, considering that IC pigs grow leaner, have higher weight gain and better feed conversion ratio compared to pigs surgically castrated early in life (Dunshea *et al*., 2001; Schmoll *et al*., 2009). The performance advantages of a late castration are related to a longer exposition to androgens (Xue *et al*., 1995). We are not aware of studies that have evaluated the effectiveness of IC in adult boars once they have completed their productive life in the breeding farm and should be castrated before slaughtering. The main objective of this study was to evaluate the effect of IC on boar taint of adult boars.

II – Materials and methods

The study was conducted in three commercial pig farms located in Antioquia, Colombia. A total of 21 boars were used. The average age of the boars was 29 months (range: 26 to 36 months). To start the trial, twelve boars received a 2 ml subcutaneous injection of Innosure® (Pfizer Animal Health, Parkville, Australia) in the neck, close to the base of the ear. This group (IC) received a second injection four weeks later. The day of the first injection, another group of boars was surgically castrated. Castration of this second group (Q) was conducted with the same technique in the three farms. From trial start until pig slaughtering the boars were fed the same feed as before (2 kg/boar/day). Boars were weighed on three occasions: at the starting of the trial (defined by the first vaccination of IC or the surgical castration of Q), at the second vaccination (four weeks later), and at the end of the trial (five weeks later). Testes of IC slaughtered boars were sampled and spermatogenesis was compared with the testes taken from the Q group. Fifty observations (seminiferous tubules) per testicle were conducted to assess spermatogenesis scores, using the procedure reported by Johnsen (1970) and modified by Peters *et al*. (2000). Incidence of objectionable odor was assessed by odor panels conducted to test all boars. This was done by sniffing the hot carcasses right after slaughter, and then by sniffing a sample of pork previously warmed in a water bath, according to the method described by Judge *et al*. (1990).

III – Results and conclusions

The vaccine injection was well tolerated by the boars. No observable site reactions were detected at the time of slaughter. In general, testes size was notoriously reduced in the IC boars. Although the size variation was not measured, a picture is presented to give an idea of the difference in testis size at the end of the nine weeks of the trial (Fig. 1). Figure 2 reflects spermatogenesis scores. Scores from one to seven indicate lower production of sperm cells. Larger scores (e.g. greater than seven) imply normal spermatogenesis. The IC testes had lower scores compared to Q (seven versus 10, respectively).

Table 1 shows the body weight changes observed between treatments for the three weighing intervals (first to second, second to third, and first to third weighing). For the third weighing interval, which determines the weigh change for the overall trial, the Q boars had lost 0.172 kg BW/animal/day, while IC boars did not lose weight (P=0.016).

According to the odor panel results, none of the boars (IC or Q) resulted in tainted pork. It is concluded that IC effectively prevented boar taint through testicle atrophy, and it also resulted in no weight loss after castration.

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Fig. 1. Two testes longitudinally cut from a surgically castrated (Q) boar (left and center), and a testis from an IC boar. Note the size difference.

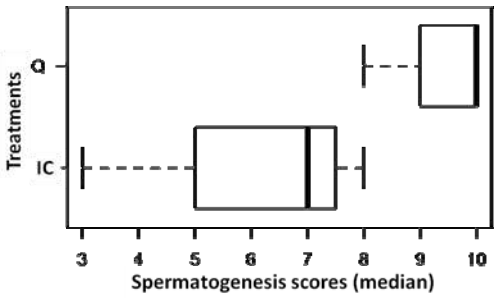

Fig. 2. Median spermatogenesis level for immunocastrated (IC) versus surgically castrated (Q) adult culled boars.

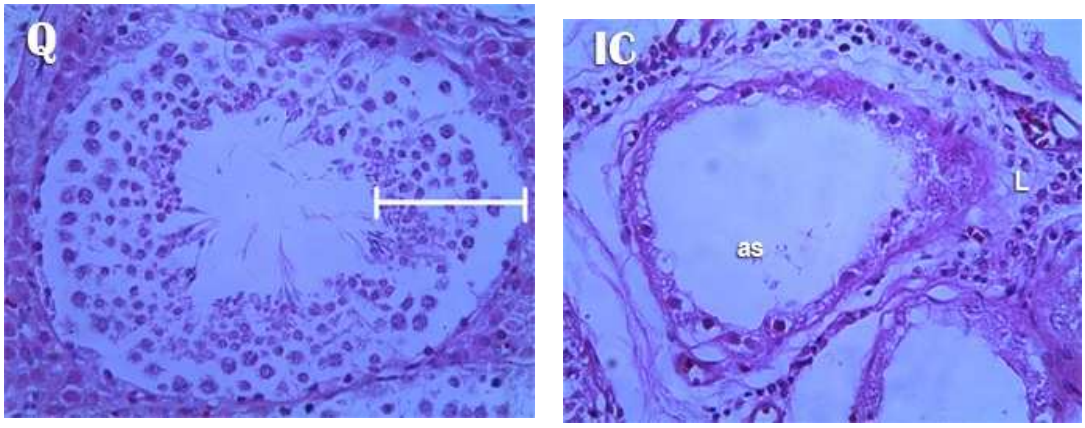

Fig. 3. Comparative sections through the testis of a surgically castrated (Q) and an immunocastrated (IC) boar following H.E. staining (400x magnification). Note the presence of all sperm stages in the Q testis, compared with azoospermia (as), depleted, and degenerated Leydig cells (L) in the IC testis. The magnification is the same for both treatments.

Table 1. Body weight changes (kg/day) between weightings for immunocastrated (IC) versus surgically castrated (Q) adult culled boars

Treatment	Period of time between weightings	Ave. body weight change (k/d)*	T test**		
			t- value	DF	P-value
IC	1st to 2nd	0.079 ± 0.06	a 1.410	19	0.1748
IC	2nd to 3rd	-0.026 ± 0.05	a -0.482	19	0.6354
IC	1st to 3rd	0.053 ± 0.06	a 0.940	19	0.3590
Q	1st to 2nd	-0.279 ± 0.07	a -4.29	19	0.0004
Q	2nd to 3rd	0.107 ± 0.06	b 1.69	19	0.1084
Q	1st to 3rd	-172 ± 0.07	a -2.65	19	0.0160

*Average plus or minus the standard error. **T-test corresponding to each line. DF: Degrees of freedom.

References

Judge M.D., Mills E.W., Orcutt M.W., Forrest J.C., Diekman M.A., Harmon B.G., Lin R.S. and Nicholls L.L., 1990. Utilization of boar meat: composition, quality and odor incidence in relation to androstenone and skatole . In: *J Anim Sci*. 68: 1030-1033.

Dunshea F.R., Colantoni C., Howard K., McCauley I., Jackson P., Long K.A., Lopaticki S., Nugent E.A., Simons J.A., Walker J. and Hennessy D.P., 2001. Vaccination of boars with a GnRH vaccine (Improvac) eliminates boar taint and increases growth performance1. In: *J. Anim. Sci.* 79: 2524–2535.

Peters M.A.J., de Rooij D.G., Teerds K.J., van der Gaag I. and van Sluijs F.J., 2000. Spermatogenesis and testicular tumours in ageing dogs. In: *Journal of Reproduction and Fertility.* 120: 443–452.

Johnsen S.G., 1970. Testicular biopsy score count – a method for registration of spermatogenesis in human testes: normal values and results in 335 hypogonadal males. In: *Hormones:* 12–25.

Ferro, V.A., 2002. Current advances in anti-fertility vaccines for fertility control and non-contraceptive application. In: *Exp. Rev.Vaccine.* 1(4): 443–452.

Prunier A., Bonneau M., von Borell E.H., Cinotti S., Gunn M., Fredriksen B., Giersing M., Morton D.B., Tuyttens¢ F.A.M. and Velarde A., 2006. A review of the welfare consequences of surgical castration in pigletsand the evaluation of non-surgical methods. In: *Animal Welfare.* 15: 277-289.

Harding J., 1993. The risks and benefits of feeding intact male swine in the United States and Canada. In: *Swine Health and Production.* 1(5): 11-18.

Xue J.L. and Dial G.D., 1997. Raising intact male pigs for meat: Detecting and preventing boar taint. In: *Swine Health and Production.* 5(4): 151–158.

Bonneau M., 1982. Compounds responsible for boar taint with special emphasis on androstenone: A review. In: *Livest. Prod. Sci*. (9): 687–705.

Brooks R.I. and Pearson A.M., 1986. Steroid hormone pathways in the pig, with special emphasis on boar odor: A review. In: *J Anim Sci*. (62): 632–645.

Schmoll F., Kauffold J., Pfutzner A., Baumgartner J., Brock F., Grodzycki M. and Andrews S., 2009. Growth performance and carcass traits of boars raised in Germany and either surgically castrated or vaccinated against gonadotropin-releasing hormone. In: *J Swine Health Prod*. 17(5): 250–255.

Xue J.L., Dial G.D., Schuiteman J., Kramer A., Fisher C., Marsh W.E., Morrison R.B. and Squires EJ., 1995. Evaluation of growth, carcass, and compound concentrations related to boar taint in boars and barrows. In: *J. Swine Health and Production*. 3(4): 155-160.