

Impact of replacing physical castration with vaccination against GnRF (Improvac®) on carcass grading following the SEUROP system

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Abstract— Vaccination against GnRF (using Improvac, Pfizer Animal Health) is an alternative to physical castration for the control of boar taint. Studies have shown that the implementation of an Improvac regimen, and consequent avoidance of early physical castration, leads to an increase in carcass leanness. This in turn might be expected to influence the distribution of carcass grades. The objective was to examine the impact of Improvac vaccination on carcass grading through review of a multi-study database. The SEUROP system for grading carcasses is commonly used within Europe and 13 studies from 10 countries were identified where carcasses from comparable groups of vaccinated and physically castrated animals were graded in this way. In total information was available for 1234 Improvac vaccinated pigs and 1345 physically castrated pigs. Data pooled from the 13 studies that used the SEUROP system showed a significant shift in distribution of grading to the more superior grades in vaccinated animals. A total of 75.3 % of the Improvac vaccinated animals were graded S or E, typically the most valuable grades, compared to 50.6 % of carcasses from physically castrated pigs. In contrast 8.1% of physically castrated pigs and 4.1% of vaccinated pigs were in the lowest (O and P) grades.

Index Terms – Carcass grading immunological castration SEUROP.

I. INTRODUCTION

The castration of male production pigs, at an early age, has been practiced for centuries in most countries, primarily to control the problem of boar taint. However, physical castration has been demonstrated to result in marked reductions in growth performance and excess deposition of fat at the expense of lean tissue (2, 3, 4, 5, 7, 9, and 10)

Vaccination against gonadotrophin releasing factor (GnRF) offers an effective means of controlling boar taint that avoids these negative effects (5, 8, and 11). Use of the

commercially available product Improvac (Pfizer Animal Health) enables producers to replace early physical castration with an immunological suppression of testicular function close to the time of slaughter. As a consequence the natural production efficiency of the entire boar is retained for most of the fattening period, resulting in improved on-farm growth performance and typically a higher lean meat, lower fat carcass. There have also been reports of reduced variation in the weight of vaccinated animals (6).

Lean meat yield is seen as a key economic indicator in the overall efficiency of meat production and is often reflected in the “carcass grading” applied post slaughter. In some countries slaughterhouses reward producers with a better price for a better grade. In the EU there is a standardised post-slaughter grading scheme known as the SEUROP system. In this system grades of “S”, “E”, “U”, “R”, “O” or “P” are assigned after estimation of the lean meat yield using various calibrated measurement devices on the slaughter line. A grade of “S” has the highest lean meat yield (60+% lean meat) while a grade of “P” has the lowest (<39% lean meat).

In European trials conducted with Improvac, carcass grading was recorded in 19 studies. Thirteen of these studies, from 10 countries, recorded carcass grading using the SEUROP standardised system, 4 studies from Germany used the EUROP system and 2 from the Netherlands used an in-country AA, A or B grading. This paper reports on the carcass grading found in the 13 studies using the SEUROP system.

II. MATERIALS AND METHODS

A. Data base

During the development and market introduction of Improvac, multiple controlled clinical studies were conducted, under commercial production conditions, in many European

countries. In 13 studies, from 10 countries, both non-castrated vaccinated boars and physical castrates were evaluated in a blind manner at slaughter using the normal processes for SEUROP carcass grading at each particular slaughterhouse. In total the carcass grades were available for 1234 Improvac vaccinated pigs and 1345 physical castrates.

B. Animals

In each study both physical castrates and Improvac vaccinated boars were compared in real time. Pigs in both treatment groups were from the same litters, were fed the same commercial diets (typically formulated for castrates), were housed in the same buildings, but in separate pens, and were slaughtered at normal commercial ages on the same day. Two doses, each of 2 mL, of Improvac were given subcutaneously to the vaccinated boars according to the label indications. The second dose was given around 5 to 6 weeks prior to the anticipated slaughter age, with the first dose being given at least 4 weeks before the second.

All animals were slaughtered at weights representative of current commercial slaughter weights for the respective country. Within each study both treatment groups were slaughtered on the same day. After evisceration the carcasses were graded by the normal operator in a blind manner.

III. RESULTS AND DISCUSSION

To date, there have been no published reports describing the effect of vaccination with Improvac on carcass grading in large numbers of animals. When the data from the 13 studies using the SEUROP system were pooled a shift in distribution of grading to more superior grades was found for the Improvac vaccinated pigs. The shift in distribution is highly significant when tested with a Chi-Squared test ($P < 0.001$). The results are shown in Table 1 and Figure 1.

In the pooled data from the 4 German studies and 2 Dutch studies where a different grading system was used, the same shift to higher grades for the Improvac pigs was also noted (data not shown).

In a review of available studies in 2009 Allison et al. (1) showed that compared to the carcasses of castrates the carcasses from immunized boars had on average 10.2% lower back fat (28 studies) and contained 4.6% more lean meat (16 studies). The results presented in this paper are consistent with those findings.

It should be noted that in all studies included in the analysis the experimental groups were fed and managed equally. In none of the studies was any attempt made to optimize the nutrition and management of the vaccinated pigs. In practice the physiology of vaccinated animals offers

additional opportunities to target desired carcass characteristics.

IV. CONCLUSION

When assessed using the SEUROP grading system Improvac vaccinated pigs show a significant shift in distribution towards the more superior grades compared to castrates. A higher grade means more lean meat, which translates to more value – especially for slaughterhouses that are further cutting the carcasses into smaller presentations for supermarkets or converting the carcasses into hams and other processed products.

V. REFERENCES

- [1] Allison, J., McVeigh, F., Souza, C., Boler, D., Killefer, J. and Hennessy, D. (2009). Impact of using vaccination with Improvac® rather than physical castration on the carcass characteristics of finishing male pigs. Pages 1230-1233 in Proceedings 55th International Congress of Meat Science and Technology. Copenhagen, Denmark.
- [2] Boler, D. D., Kutzler, L. W., Meeuwse, D. M., King, V.L., Campion, D.R., McKeith, F.K. and Killefer, J. (2011). Effects of increasing lysine levels on carcass composition and cutting yields of immunologically castrated male pigs. *Journal of Animal Science*. In press.
- [3] Campbell, R.G. and M.R. Taverner. 1988. Genotype and sex effects on the relationship between energy intake and protein deposition in growing pigs. *Journal of Animal Science*. 66:676-686.
- [4] Dunshea, F.R., King, R.H., Campbell, R.G., Sainz, R.D. and Y.S. Kim. (1993). Interrelationships between sex and ractopamine on protein and lipid deposition in rapidly growing pigs. *Journal of Animal Science*. 71:2919-2930.
- [5] 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 performance. *Journal of Animal Science*. 79:2524-2535.
- [6] Dunshea, F.R., Cronin, G., Hemsworth, P., Campbell, R., Luxford, B., Smits, R., Tilbrook, A., King, R. and McCauley, R. (2009) Vaccination against GnRF increases growth and reduces variability in group-housed boars. Pages 102-105 in Proceedings 55th International Congress of Meat Science and Technology. Copenhagen, Denmark.
- [7] Hennessy, D., Changwei, Ma, Zhinan, Liu, Qilin Wu and Hanchun, Yang. (2009). Growth performance of male pigs vaccinated with the boar taint vaccine, Improvac® and the effects on boar taint assessment. Pages 122-125 in Proceedings 55th International Congress of Meat Science and Technology. Copenhagen, Denmark (ICoMST), Copenhagen, Denmark, 16-21 August 2009.
- [8] Jaros, P., Bürgi, E., Stärk, K.D.C., Claus, R., Hennessy, D. and Thun, R. (2005). Effect of active immunization against GnRH on androstenone concentration, growth performance and carcass quality in intact male pigs. *Livestock Production Science*. 92:31-38.

- [9] Pauly, C., Spring, P., O'Doherty, J.V., Ampuero Kragten, S. and Bee, G. (2008). Performances, meat quality and boar taint of castrates and entire male pigs fed a standard and a raw potato starch-enriched diet. *Animal* 2:1707–1715.
- [10] Suster, D., Leury, B.J., Kerton, D.J., Borg, M. R., Butler, K.L. and Dunshea, F.R. (2006). Longitudinal DXA measurements demonstrate lifetime differences in lean and fat tissue deposition in individually penned and group-penned boars and barrows. *Australian Journal of Agricultural Research* 57:1009-1015.
- [11] Zamaratskaia, G., Andersson, H.K., Chen, G., Andersson, K., Madej, A. and Lundstrom, K. (2008). Effect of a gonadotropin-releasing hormone vaccine (ImprovacTM) on steroid hormones, boar taint compounds and performance in entire male pigs. *Reproduction in Domestic Animals* 43, 351–359.

Table 1. Distribution of carcass grading against the SEUROP system pooled from 13 studies from 10 European countries.

	Grade (lean meat %)					
	S (60+)	E (55-59)	U (50-54)	R (45-49)	O (40-44)	P (<39)
Castrates (1345 pigs)	8.1%	42.5%	30.3%	11.1%	5.9%	2.2%
Improvac (1234 pigs)	16.5%	58.8%	12.7%	7.8%	2.5%	1.6%

Figure 1. Distribution of carcass grading against the SEUROP system pooled from 13 studies from 10 European countries.

