# EFFECT OF A GnRF VACCINE (IMPROVAC®) ON SLAUGHTER PERFORMANCE AND MEAT QUALITY OF BOARS

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***Abstract:*** **The objective of the study was to evaluate the effect of a GnRF vaccine, Improvac (Pfizer), on the slaughter performance and meat quality of boars. At weaning, a total of 400 healthy male animals were selected for 2 treatment groups: a vaccinated treatment group (n=200, 10 replicates of 20 pigs in a pen) and a physically castrated group (n=200, 10 replicates of 20 pigs in a pen). The vaccinated pigs received Improvac twice, once at 14 weeks and again 21 weeks of age. At the end of the study, all pigs were weighed individually. A total 40 pigs were selected for meat quality and carcass measurements (2 pigs per pen - the median and next heaviest). All pigs were slaughtered at 25 weeks of age. The longissimus muscles were collected to evaluate the meat quality. Compared to castration, vaccination significantly reduced the back fat depth (*P*<0.05); however lean meat yield was not significantly different between treatments. Vaccination had no significant effect on the objective meat quality parameters of $pH_{45}$, $pH_{24}$, L* value and a* value. The b* value was significantly lower in the vaccinated group (*P*<0.05). There was a trend for vaccinated boars to have a lower drip loss, lower shear force value, and a higher cooked meat rate than physically castrated boars, however these differences did not reach statistical significance(*P*>0.05). The results indicated that the GnRF vaccine could decrease the back fat depth, and improve the meat colour. In addition, it also has the tendency to improve the tenderness and the water holding capability. The results indicated that there were no adverse effects of the GnRF vaccine (Improvac) on slaughter performance and meat quality traits of boars.**

*Index Terms-* **GnRF vaccine, Improvac, meat quality, slaughter performance**

## I.INTRODUCTION

Boar taint results from the accumulation of chemical agents, primarily skatole and androstenone, in the adipose tissue of mature, intact male pigs (Bonneau, 1982). To negate the undesirable accumulation of these substances, male pigs are routinely castrated in most countries, which introduces stress and is not beneficial to animal welfare (Prunier et al., 2006). Improvac, a GnRF vaccine, can induce the formation of antibodies against gonadotropin releasing factor (GnRF), a chemical messenger that is critical for normal development and maintenance of testicular function. By blocking the action of GnRF, the use of Improvac provides an alternative way to reduce occurrence of boar taint.. However, consumers may have questions about the quality of the pork produced using this procedure.. Therefore, the current experiments were conducted to determine the effects of GnRF vaccine (Improvac) on the meat quality and carcass characteristics of boars.

## II.MATERIALS AND METHODS

### Animals and experimental design

All procedures involving animals were in cooperation with a pig producer in Henan province, China. At birth, pairs of healthy male pigs from the same litter were selected for the two treatments. One pig was physically castrated , others were left intact for later Improvac vaccination. At weaning, 200 healthy male pigs per treatment (Large White × Landrace × Duroc) were weighed individually and included in this study. Pigs were allocated to pens by treatment then by weight, to minimize body weight variation within the same pen. Each treatment consisted of 10 replicates (pens) of 20 pigs in a pen. Pigs destined for the physical castration group were castrated within 3 days of age. In the Improvac group, pigs received Improvac vaccination twice, getting 2ml/vaccination injected subcutaneously just behind and below the base of the ear. The first injection was given at 14 weeks of age, and the second dose at 21 weeks of age.

The experiment was performed in closed type pens with the slatted concrete floors. The total area per pen was $15m^2$ . All pigs were allowed to consume commercial diet and water *ad libitum*. The appetite, behaviour (particularly the appearance of sexual behaviour) and feces of pigs were observed throughout the study. Feed intakes were recorded for every pen. During the whole process, all pigs received vaccinations and medication as routine practice for the farm. At the age of 25 weeks， the pigs were slaughtered at a common plant.

### Carcass measurements

At end of the study, the median and next heaviest pig from each pen (giving 20 pigs per treatment) were selected for meat and carcass evaluation following slaughter. Feed was withheld for 12h before slaughter. Within 1h after slaughter, the warm carcass was weighed and subcutaneous back fat depth was measured at the shoulder and thorax intersect, last rib and lumbosacral junction. 10 carcasses from each group were randomly selected for detailed carcass measurement.. The eye muscle area was measured by Q871 Planimeter. Lean meat was dissected from carcass and lean meat yield (%) was calculated from the amount of lean obtained and carcass weight.

### Meat quality measurements

The pH of the longissimus muscle (approximately at thoracic vertebrae between the level of the second and the third last rib) was determined from each pig at 45 min ($pH_{45}$) and 24h ($pH_{24}$) postmortem with a HI9125 portable waterproof pH/ORP meter (HANNA instruments, Romania). The fresh (hot) longissimus muscle colour measurements of L *(lightness), a* (redness) and b* (yellowness) values were determined using a Minolta CR410 chroma meter (Konica Minolta Sensing, Inc., Osaka, Japan). Drip loss and cooked meat rate were measured using approximately 20 g of meat sample according to the plastic bag method, which was described by Honikel (1998). Shear force was measured by Digital Meat Tenderness Meter of Model C-LM3B (Northeast Agricultural University, Harbin, China).

### Statistic analysis

The data were analyzed by general linear models procedures of SPSS 13.0 for Windows (SPSS Inc., Chicago, USA). Univariate comparisons between treatments were conducted using T-test at the 0.05 level of significance. All results for data are presented as the arithmetic means ± standard deviation of the mean.

## III.RESULTS AND DISCUSSION

### Slaughter performance

The effects of GnRF vaccination（Improvac）on slaughter performance in boars are presented in Table 1. Compared to the physical castrates the vaccinated pigs had significantly decreased back fat depth (13.74 vs. 19.12, $P$<0.05). However there were no significant differences in eye muscle area or lean meat percentage.

Table 1 The effect of Improvac on slaughter performance in boars

| Items | Vaccinates | Physical castrates |
|---|---|---|
| Back fat depth /mm | 13.74±1.94* | 19.12±2.17 |
| Eye muscle area /$cm^2$ | 57.43±7.90 | 59.23±4.88 |
| Lean meat yield /% | 59.79±1.36 | 59.62±2.28 |

Note: Significantly difference ($P$ < 0.05) means within a row were indicated by *, the same as below.

One of the aims of this study was to ensure that slaughter performance was not compromised by GnRF vaccination. In the present study, comparing vaccinated pigs to physical castrates, the results showed that the back fat depth was significantly decreased. Jaros et al. (2005) also indicated that vaccination reduced the back fat depth compared to physical castrates. Compared with non-vaccinated boars, Lealiifano et al. (2009) reported that there was some small effect of vaccination on increasing the depth of back fat. However, they did not compare with castrates. Vaccination against GnRF did not appear to have any significant effect on lean meat yield in this study. In an earlier study, vaccinated boars gave a 3-4% higher lean meat yield than physical castrates (Bonneau et al. 1994). In a review paper by McKeith et al. (2009) it was reported that vaccinated pigs had a consistent trend for increased lean meat and decreased fat compared to castrates. The results of Boler et al (2010) suggest that the magnitude of this response depends on nutrition and in particular the lysine content of the diet, which may not have been optimized for the vaccinated pigs in this study. The characteristics of lower fat and higher lean reflect the growth characteristics of boars wheretestosterone could advance the growth of protein in the muscles (Chen, 2003). Compared to physical castration, immunologically castrated boars kept this anabolic potential for a much longer time (Metz and Claus, 2003), and had more lean meat and less fat. This aspect may be considered in meat production industry as lean meat is accepted as a quality parameter with direct financial advantages for the farmer.

**Meat quality**

The effects of GnRF vaccine (Improvac) on meat quality in boars are presented in Table 2. As the table shows, compared to physically castrated boars, vaccinated boars had the same warm meat quality as assessed by $pH_{45}$, $pH_{24}$, L* value and a* value.The yellowness or b* value was significantly different (5.58 vs. 6.28, $P$<0.05) between the two treatments. Compared to the castrates, the vaccinated boars tended to have a 3.5% lower drip loss, a 6.7% lower shear force value, and a 2.8% higher cooked meat rate, but these differences were not significant ($P$>0.05).

Table 2. The effect of Improvac on meat quality in boars

| Items | Vaccinates | Physical castrates |
|---|---|---|
| $pH_{45}$ | 6.59±0.18 | 6.63±0.14 |
| $pH_{24}$ | 5.65±0.10 | 5.67±0.09 |
| L* | 45.34±2.50 | 45.49±1.93 |
| a * | 1.99±1.21 | 2.10±1.28 |
| b* | 5.58±0.39** | 6.28±0.70 |
| Drip loss /% | 2.45±0.70 | 2.54±0.83 |
| Shear force value /kg | 3.62±0.50 | 3.88±0.57 |
| Cooked meat rate /% | 57.04±2.27 | 55.49±1.25 |

Hennessy et al. (2000) reported that with chilled pork some carcass quality characteristics such as colour of meat and drip loss were improved in immunocastrates compared to non-castrated boars. An earlier study (Pauly et al. 2009) indicated that with chilled pork both the initial and ultimate pH, and the colour values L*, a*, b*, as well as the percentage drip and cooking loss did not differ between castrated and vaccinated pigs.. Pauly also reported higher shear force values in the chilled meat of physical castrates compared to vaccinated boars, which was similar to the present study. A possible cause for this difference could be the compensatory growth of vaccinated compared to physically castrated boars, at the end of the finishing period (Pauly et al. 2009). Recently, Kristensen et al. (2002) and Bee et al. (2006) reported that compensatory growth before slaughter was followed by an increased proteolytic potential (m-calpain: calpastatin ratio) and a high tenderization rate. Yu et al. (2009) reported that L* values and b* values of pork were inversely related to the water preserving capability. The present research showed the vaccinated boars had lower b* values, which may explain the tendency for lower drip loss and better colour than the physical castrates.

## III.CONCLUSION

The results indicate that there were no adverse effects of the GnRF vaccine (Improvac) on slaughter performance and warm meat quality of boars. Compared to physical castrates, vaccination could decrease the back fat depth, and improve the meat colour through improved yellowness.

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