PE1.20 Vaccination against GnRF increases growth and reduces variability in group-housed boars 171.00

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***Abstract*—It is generally accepted that entire boars are leaner and more efficient than barrows but that they have poorer meat quality with an increased risk of boar taint. An additional issue in producing boars to meet market specifications is variation in growth performance which may be exacerbated by negative sexual and aggressive behaviors. Vaccination against GnRF, leading to immunological castration offers a means of reducing negative behaviours while maintaining most of the production efficiencies associated with entire boars. Sixty each of entire boars, vaccinated boars and barrows were housed in pens of 15 pigs of each sex with access to electronic feeders. Vaccinated boars were given the anti-GnRF vaccine (Improvac®, Pfizer Animal Health, Parkville) at 14 and 18 weeks of age. From 18 to 23 weeks of age average daily gain was greater (P=0.005) in vaccinated boars than in entire boars and barrows. Average daily feed intake was greater (P=0.011) in vaccinated boars than in entire boars with barrows intermediate. The standard deviation of live weight increased with age but was lower (P from 0.032 to 0.09) in vaccinated boars than in entire boars and barrows between 18 and 22 and 17 and 21 weeks of age. Carcass fighting damage and pork pH were higher (P<0.05) for entire boars than for vaccinated boars or barrows. In conclusion, vaccination against GnRF increased growth rate and feed intake while decreasing variation in live weight and improving carcass and pork quality.**

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***Index Terms*—aggression, boar, immunocastration, variation.**

I. INTRODUCTION

The castration of male domestic animals of most species, with the exception of breeding stock, has been practiced for centuries. However, castration results in significant reductions in feed efficiency and excess deposition of fat [1,5,6,7] and so is little practiced in Australia. For the past few decades the use of entire male pigs for meat production was assumed to give Australian producers a competitive edge over those in the USA, Canada and most of Europe where castration of male pigs is virtually mandatory. However, recent concerns about the welfare issues surrounding castration have resulted in castration without anaesthesia being banned in some European countries, with others likely to follow suit. Within the EU, there is on going debate as regards castration of pigs but it is likely that there will be pressures from welfare lobby groups to ban castration or at least to use anaesthesia and analgesia. Importantly, this is likely to apply to pork that is imported into the EU.

To a large extent the assumption about superior performance of boars is based upon experiments conducted with individually penned pigs of a relatively old genotype and which were relatively immature [6]. However, the growth performance of boars in groups under commercial conditions is less than that of individually housed boars [7] suggesting that the putative benefits may not be as

marked as assumed when pigs are housed under commercial conditions. Furthermore, during the late finishing phase, group-housed entire males often grow at a similar or slower rate than barrows [3,6,7], possibly because of increased sexual and aggressive activities between entire males.

The release of Improvac™(Pfizer Animal Health) a vaccine for the control of boar taint, gives pig producers a powerful new alternative control method. By providing an environmentally and animal welfare friendly alternative, the vaccination approach allows producers to benefit from the natural growth and carcass quality advantages of non-castrated male pigs while controlling boar taint. The anti-GnRF vaccine works by inducing a temporary immunological castration and hence suppression of boar taint. Studies with this vaccine have found that group-housed vaccinated boars grew faster than entire males over the final 4 weeks before slaughter [2,5]. Therefore the aim of this study was to quantify the extent to which growth rate is reduced in group-housed boars and to determine whether immunological castration offered a means to overcome this barrier.

II. MATERIALS AND METHODS

a. Animals and handling

The experiment involved a total of 60 entire boars, 60 vaccinated boars and 60 barrows (surgically castrated at 5 days of age) in 4 replicates. Each replicate consisted of 3 pens of 15 pigs of each sex with each pen containing 2 electronic feeders. Pigs were weighed and selected at 14 weeks of age and the vaccinated boars were given the first 2 mL dose of an anti-GnRF vaccine (Improvac™, Pfizer Animal Health, Parkville). The second injection of vaccine was given at 18 weeks of age. From 16 to 23 weeks of age, growth performance was recorded with pigs being weighed weekly.

After weighing at 23 weeks of age the pigs were tattooed and then transported a short distance (ca. 1 km) to the abattoir and held in lairage overnight before slaughter the next morning. Carcasses were identified by tattoo and photographed using simple autofocus cameras with in built flash at a standard position and orientation just before entering the chiller. Photographs were analysed for fighting lesion scores by two assessors without reference to the treatment the pig had undergone. The degree of bruising was assessed, principally on the neck and shoulder region. A numeric score of 0 was assigned to unmarked carcasses, 1 if it was considered there might be one or two bruises, 2 if there was obvious bruising of the shoulder and 3 if there was severe bruising involving the shoulders and other parts of the carcass. In addition, some measures of meat quality were made on chilled carcasses at 24 hours post-slaughter. The pH of the *Longissimus dorsi* (between the 12th and 13th rib) was determined at 24 h after slaughter using a portable pH-temperature meter (Jenco Electronic Ltd, Sydney, Australia, Model 6009) fitted with a polypropylene spear-type gel electrode (Ionode IJ42S, Brisbane, QLD) and a temperature probe. Surface lightness (L*) of the *Longissimus dorsi* and *Biceps femoris* muscles were measured with a Minolta Chromameter CR-200 (Minolta, Osaka, Japan), using D65 lighting, a 2° standard observer (measuring aperture 8 mm).

b. Statistical analyses

Data were analysed by ANOVA (Genstat Release 11) for the main effects sex with the pen being the experimental unit for all analyses.

III. RESULTS AND DISCUSSION

There were no significant effects ($P<0.18$) of sex on average daily gain (ADG), average daily feed intake (ADFI) or feed conversion ratio (FCR) in the 2 weeks prior to the secondary vaccination (i.e. between 16 and 18 weeks of age). From 18 to 23 wks ADG was greater in vaccinated boars than in entire boars and barrows (1097 v. 951 and 914 g/d for vaccinated boars, entire boars and barrows respectively, $P=0.005$). Over this same period ADFI was greater in vaccinated boars than in entire boars with barrows being intermediate (3057 v. 2506 and 2860 g/d, $P=0.011$). From 18 to 23 wks FCR was similar for vaccinated and entire boars which were lower than barrows (2.82 v. 2.77 and 3.02, $P=0.048$). Final weight was greater in vaccinated boars than either entire boars or barrows (108.9 v. 102.3 and 103.9 kg, $P=0.025$). Despite the differences in final weight, there was no significant effect of sex on carcass weight (84.3 v. 80.2 and 82.4 kg, $P=0.18$). In part this could be explained by the lower dressing percentage of vaccinated boars (77.2 v. 77.9 and 78.9%, $P<0.005$). At slaughter the barrows were fatter than the vaccinated boars which in turn were fatter than entire boars as indicated by P2 back fat (12.7 v. 10.5 and 15.6 mm, $P<0.001$). The cross sectional area of the *Longissimus dorsi* was similar for vaccinated and entire boars which in turn were greater than the barrows (19.3 v. 18.9 and 15.8 cm^2, $P=0.050$). Therefore, these data confirm that under group-housed conditions there is little difference in the ADG of boars and barrows although the latter are fatter from at least 14 weeks of age. Similarly, Suster et al. [7] found that under group-housed conditions there was very little difference between entire boars and barrows in growth performance and lean tissue content until 18 weeks of age, although again the latter were fatter. In the present study immunological castration

increased ADG and ADFI without changing FCR consistent with the findings of others [5].

Immunological castration decreased the variation in live weight when expressed as either the standard deviation (Figure 1) or coefficient of variation (Figure 2). The standard deviation of live weight increased ($P<0.001$) with age but was lower ($0.09<P<0.032$) in the vaccinated boars than in the entire boars and barrows between 18 and 22 and 17 and 21 weeks of age, respectively as indicated by the interaction ($P=0.022$) between sex and age (Figure 1). Also, the coefficient of variation of live weight declined ($P<0.001$) with increasing age and was lower ($0.073<P<0.024$) in the vaccinated boars than in the entire boars and barrows between 18 and 22 and 14 and 21 weeks of age, respectively as indicated by the interaction ($P=0.009$) between sex and age (Figure 2). These are important findings because variation in growth is a major impediment to matching carcass specifications to payment grids in many pork markets.

Average scores for fighting damage were higher ($P=0.007$) for entire boars than for vaccinated boars or barrows which in turn were not different (0.24 v. 1.01 and 0.26, $P<0.001$). The frequency of pigs with fighting scores of two or greater was 35.6% for entire boars, 3.6% for vaccinated boars and 0% for barrows ($P<0.001$). The pH of the *Longissimus dorsi* was not different between vaccinated boars and barrows which in turn were lower than boars (5.82 v. 5.95 and 5.77, $P=0.034$). There was no effect of sex on surface lightness of either the *Longissimus dorsi* ($P=0.40$) and *Biceps femoris* ($P=0.72$) muscles. These data suggest that chronic and acute aggressive activities of entire boars [2] will increase carcass damage and possibly deplete muscle glycogen leading to high pHu and an increased risk for dark, firm and dry pork. On the other hand, immunological castration reduces these activities and the resultant carcass lesions ensuring pork quality indistinguishable from that of barrows [4].

IV. Conclusion

Boars are more efficient and deposit less fat than barrows, particularly at high slaughter weights. However, the risk of boar taint has resulted in legislation or recommendations that boars are slaughtered at low carcass weights, negating some of the production benefits. Also, animal welfare organizations are advocating for a cessation in castration in many parts of the world, particularly the EU. However, this could result in inferior pork products being placed in the market. The present data suggest that vaccination against GnRF (immunological castration) offers an acceptable means of castration that maintains most of the production benefits of entire boars and the meat quality of barrows. An additional benefit is the reduced variation in growth performance.

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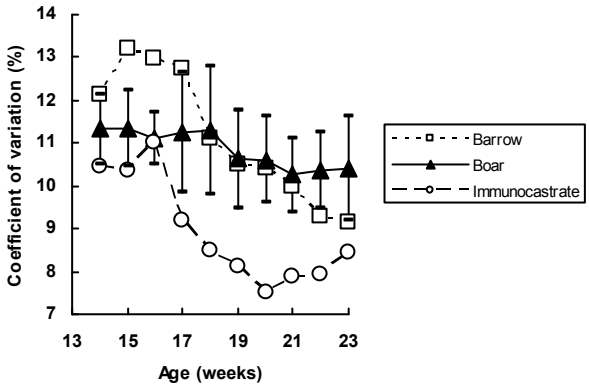

Figure 1. Effect of immunological or surgical castration on the standard deviation of live weight.

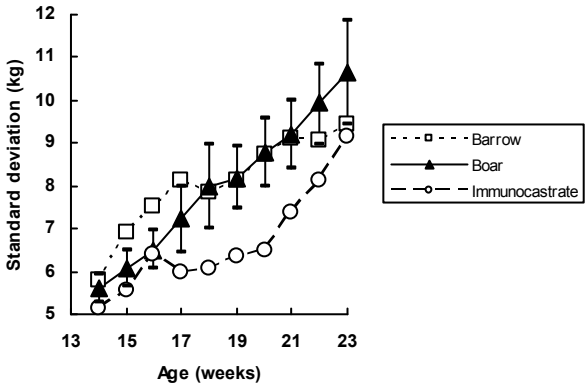

Figure 2. Effect of immunological or surgical castration on the coefficient of variation of live weight