Tenderness of meat from entire male pigs: effects of breed, slaughter weight and measuring method

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Abstract

One of the alternatives for castrating male pigs could be the production of entire male pigs. Apart from the need to deal with the problem of boar taint effectively, other potential consequences on meat quality traits ought to be considered prior to the wide-scale implementation of this alternative.

In two experiments, meat from entire males was evaluated for tenderness by consumer panels and the Warner-Bratzler shear force measurement. The first experiment compared entire males and barrows, while the second experiment investigated the influence of breed (Piétrain, Large White, Belgian Landrace Stress Negative) and live weight at slaughter (90 and 110 kg) for entire male pigs. Housing, management and feeding conditions were similar for all animals.

The grilled meat from barrows was found to be more tender than of entire males according to the consumer panels whereas the Warner-Bratzler shear force method did not indicate such a difference. For the different breeds and slaughter weights, consumers found a significant higher tenderness for Large White compared to Belgian Landrace Stress Negative entire males, but detected no difference between 90 and 110 kg. However, shear force was not affected by breed, but increased significantly (indicating tenderness decline) with higher weight.

Introduction

Castration of male pigs (without anaesthesia) is practised in order to avoid the occurrence of boar taint, an unpleasant odour present in some entire males. If a production system of entire male pigs with an acceptable prevalence of boar taint could be achieved, other meat quality characteristics should be considered. The literature suggests that meat of barrows is more tender than that of entire male (e.g. Bãnón *et al*., 2004, Jaturasitha *et al.*, 2006), although there are exeptions (e.g. Bonneau *et al.*, 1992). As tenderness is known to be one of the major quality attributes of meat, especially for pork (Enfält *et al.*, 1997), this surely should be taken into account.

Materials and methods

In the first experiment, meat samples were collected from 21 entire males and 17 barrows (Piétrain x Hybrid) slaughtered at 110 kg. For the second experiment 117 entire males from 3 breeds (Piétrain, Large White and Belgian Landrace Stress Negative) were slaughtered either at 90 or at 110 kg. All animals were fed a standard diet. Meat samples from *m. longissimus thoracis* (around the fourth rib) were collected 24 hours after slaughter, divided into slices of 2 cm, vacuum packed and stored at -18 °C until analysis. Sensory evaluation and Warner-Bartzler shear force (WBSF) were performed after overnight thawing at 4 °C.

Sensory evaluation of tenderness was performed during consumer panels for boar taint evaluation. Meat was grilled (1800 Watt) during 3 minutes. The consumers scored each sample from 1 to 6, from very tender, moderately tender, a little bit tender, a little bit tough, moderately tough to very tough. Each sample was evaluated by 6 consumers and the average was used for further analysis.

For WBSF, samples were boiled in a closed plastic bag in a hot water bath of 75 °C during 50 minutes, followed by cooling of the samples in cold tap water for 40 minutes. Per meat sample, ten cylindrical cores (∅ 1.25 cm), parallel to the longitudinal orientation of the muscle fibres, were taken and sheared by a V-shaped cutting blade (thickness 0.9 mm) with a triangular aperture of 60° and a velocity of 200 mm/min (1000S apparatus with Warner-Bratzler shear force attachment, Lloyd Instruments, Warsash, Southampton, UK).The maximal forces, recorded for 10 cylindrical cores, were averaged per meat sample and this was used for further analysis (Boccard et al., 1981).

Statistical analysis was performed using paired t-tests for the difference between entire males and barrows (Statistica 8.0, Statsoft, Tulsa, USA). Breed and slaughter weight effects were analysed with ANOVA with breed and slaughter weight as fixed factors (the interaction between both factors was not

significant and therefore excluded from the model). The correlation between consumer panel evaluation of tenderness and WBSF was also calculated.

Results and discussion

Consumers found meat from barrows to be more tender than that of entire males (p=0.004). However, this difference could not be detected by WBSF (p=0.437) (Fig. 1). Jaturasitha *et al.* (2006) also found the lowest overall sensory acceptance for meat from entire males compared to barrows and gilts, mainly because of reduced tenderness scoring which was also confirmed by shear force measurements.

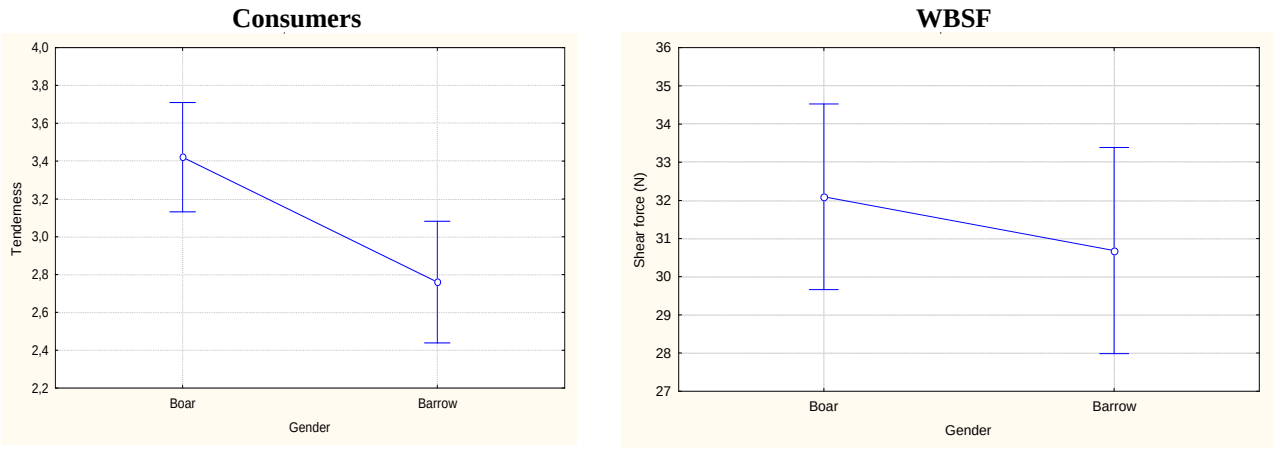

Figure 1. Average value ± st. dev. of meat tenderness based on consumer evaluation (left) and WBSF measurement (right) for entire males and barrows.

The WBSF method revealed a higher shear force for 110 kg compared to 90 kg (p<0.001), but no significant differences between the three breeds were found (p=0.467). Consumer evaluations on the other hand, did not reveal a difference between the two slaughter weights (p=0.302), but pork from Belgian Landrace Stress Negative was judged to be tougher than that from Large White (p=0.003) (Fig. 2).

Shear force of pork (from barrows and gilts) from Belgian Landrace genotype was found to be higher compared to hybrids, Large White and Piétrain x Belgian Landrace (De Smet *et al.*, 1996, Van Oeckel *et al.*, 1999). Moreover, Piétrain x Large White meat and Piétrain x Seghers Hybrid meat has been evaluated as more tender than Piétrain x Belgian Landrace (Verbeke *et al.*, 1999). This is in line with the differences found by the consumer panel in the present study. The previously reported negative correlation between tenderness and age or slaughter weight (Thornton *et al.*, 1968, Verbeke *et al.*, 1999), was confirmed by the WBSF measurements in the present study.

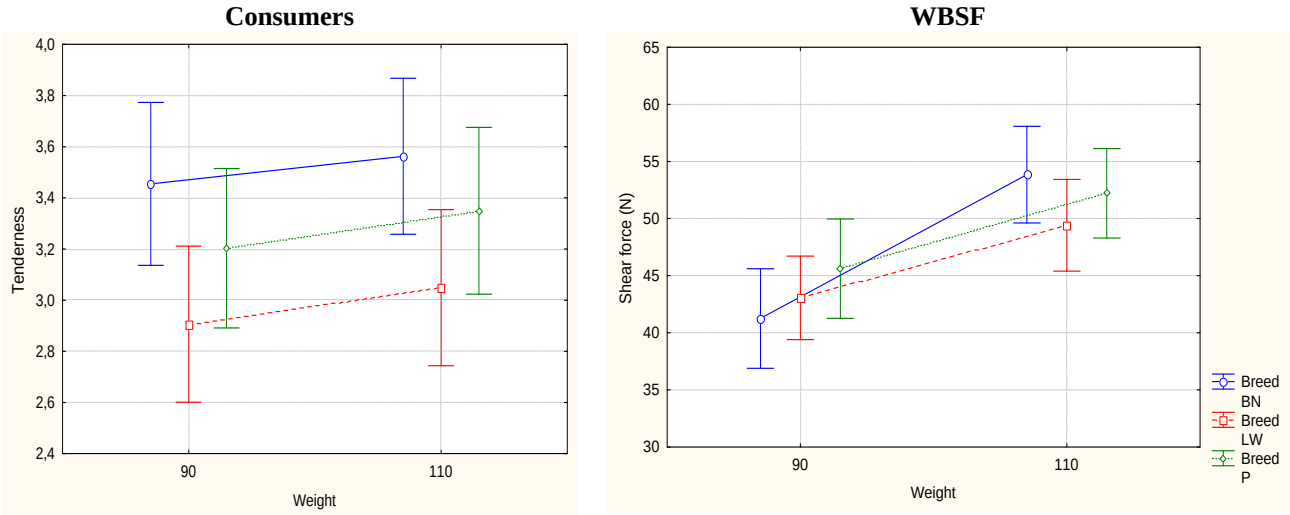

Figure 2. Average value ± st. dev. of meat tenderness based on consumer evaluation (left) and WBSF measurement (right) for entire males of Piétrain (P), Belgian Landrace Stress Negative (BN) and the Large White (LW) breed slaughtered at 90 and 110 kg.

WBSF gives the maximal force needed to shear a cylindrical core of boiled meat. The higher this force, the tougher the meat. This method is often used as a measure of tenderness and good correlations (range r=0.32-0.94) have been found with sensory evaluations of tenderness by trained taste panels. However, the variability of this correlation depends on muscle type, sample preparation, cooking method, shear apparatus, measurement procedure and panel type (Destefanis *et al.*, 2008). Correlation between WBSF and our consumer panel was low (0.19, p=0.016). This can be due to the use of a consumer panel instead of a trained panel. Correspondence between WBSF versus sensory evaluations of meat tenderness by consumer/expert panels might also be increased by determining WBSF on grilled instead of boiled samples, as Van Oeckel *et al.* (1999) described an increased correlation between WBSF and panel scores of 0.54 compared to 0.39 due to this adaptation.

Conclusions

The consumers evaluations and WBSF measurements did not result in the same conclusion about the effects of castration, breed and slaughter weight on the meat from male pigs. Based on consumer studies, barrow meat is considered to be more tender than meat from entire males. This difference could not be explained by differences in shear force. Consumers scored the meat of Large White entire males considerably better than the meat of Belgian Landrace Stress Negative entire males. Shear force values indicated a bigger toughness for entire males at a heavier slaughter weight, but this was not noticed by the consumer panels.

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