PRERIGOR SKELETAL ALTERATION TO IMPROVE BEEF MUSCLE TENDERNESS

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Introduction

For the consumer, tenderness is one of the most important properties of beef meat. The main factors controlling meat tenderness occur after slaughtering (Dransfield, 1994). If the ageing effect on meat tenderness is widely known and usually used in the meat industry, others factors like Pelvic Suspension (PS), despite its efficiency on tenderness in different hind limb muscles, is not as widely used as ageing is. Perhaps because of its constraints (equipment and extra time requirement, heavy carcass fall risk), many countries do not use it at all. The effects of prerigor cutting bone techniques on tenderness have been investigated in the past. This treatment, the Tender Cut (TC) technology, could be an interesting alternative to stretch muscles without using Pelvic Suspension. But, the results on tenderness were various according the authors (Wang *et al.*, 1993; Ludwig *et al.*, 1997; Shanks *et al*, 2002). The first objective of this investigation was to evaluate the effect of TC at 2 ageing stages on meat tenderness of eight muscles, and secondly, to evaluate the relative importance of TC and ageing on tenderness.

Materials and Methods

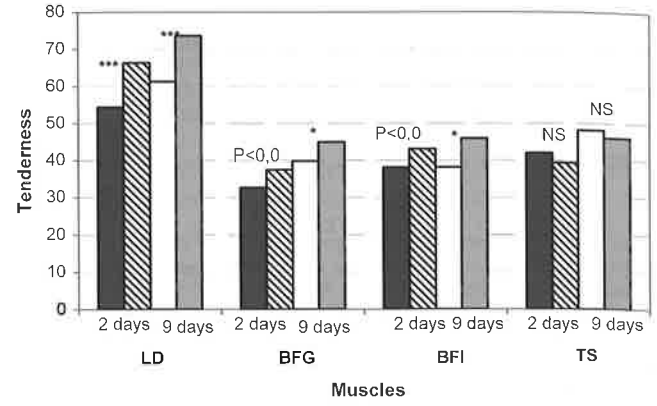
Fifteen cows were slaughtered (3.5 to 9 years old, weight carcasses from 231 to 363kg). The mean carcass score was P+3 according to the EUROP grading system. Electrical stimulation was not used. Carcass sides of these animals were randomly allocated to one of the two pre rigor treatments: classical treatment, without any tender stretch alteration (NTC) – or tender stretch by the Tender Cut process (TC). One side from each carcass was skeletal cut approximately 60 minutes after bleeding while the other side served as control (NTC) under industry conditions. For implementing TC technology, 3 skeletal cuts were given (Claus *et al.*, 1991): at the 12th vertebrae, through the *ischium* on the pelvic bone and at the junction between the 4th/5th sacral vertebrae. The carcasses were chilled (at 2°C) until cutting 2 days after slaughtering. pH was measured in the centre of the *Longissimus dorsi* at the 13th rib.

The 8 major muscles of the hindquarter were removed: *Longissimus dorsi* (LD), *Tensor fascia latae* (TF), *Vastus lateralis* (VL), *Semi tendinosus* (ST), 2 parts of the *Semi membranosus* (*Ischium* side SMI and the *Gastrocnemius* side SMG) and 2 parts of the *Biceps femoris* (*Ischium* side BFI and the *Gastrocnemius* side BFG). All 8 muscles removed from each carcass sides were cut in 2 parts before vacuum-packaging. One side was directly frozen while the other side was aged for 7 additional days at 2°C before freezing (-24°C). After thawing, each muscle was cubed and cooked in an oven at 310°C for 7 minutes, until the internal end-point temperature of approximately 57°C was reached. A selected and trained panel of 12 judges performed the sensory analysis. The samples (4 in each plate) were served to the judges who compared and scored them for tenderness on a scale from 0 (tough) to 100 (tender). From the same carcass and the same muscle each plate contained the 4 samples corresponding to all treatments: non-tender cut with 2 days ageing (NTC2), non-tender cut with 9 days ageing (NTC9), tender cut with 2 days ageing (TC2) and tender cut with 9 days ageing (TC9).
Statistical evaluation was performed using the procedure MIXED in SAS.

Results and Discussion

The sensory evaluation results showed as found by Claus, JR *et al.* (1997), that tenderness was improved by TC as compared with the NTC treatment on LD, and to a lesser degree on BFI and BFG whatever the ageing duration (Figure 1). The tenderness of TF, VL, ST, SMI and SMG was not affected.
According to previous works, as compared with NTC treatment, TC resulted in stretching or not stretching muscle fibres and respectively more tender or unchanged meat, depending upon the muscle anatomical position. The particular positive effect performed on LD became from the especially strong stretching muscle, which was due to the weight of the fore quarter.

As Ludwig *et al.* (1997) showed, the TC process, combined with ageing, resulted in an additional effect on tenderness. TC plus 9 days ageing gave a higher gain in tenderness than this obtained with one of the two treatments (TC or ageing) applied alone (Figure 1).



* P<0,05 ** P<0,01 *** P<0,001 NS : non significant

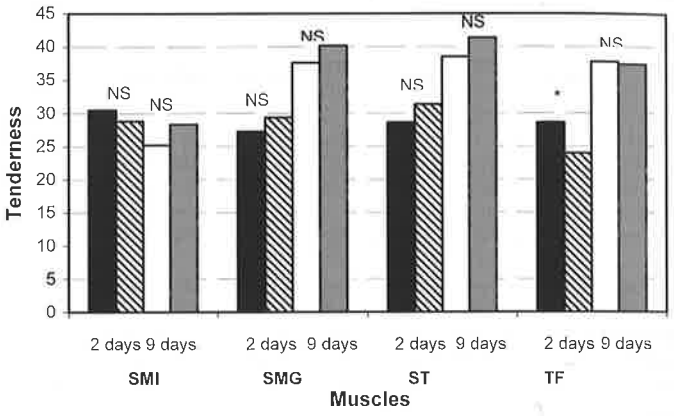


Figure 1: Comparative effects of TC and NTC on meat tenderness from different muscles after 2 and 9 days ageing.

Conclusion

TC treatment significantly improved tenderness in LD similar to 1.7 week ageing. This process could easily be used in the meat industry to improve tenderness in this muscle or to reduce the ageing period whilst preserving tenderness.

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