COMPARATIVE EFFECTS OF PELVIC SUSPENSION AND AGEING ON BOVINE MEAT QUALITY

Didier Bastien[1], Paul Tribot Laspière[2]

[1] Institut de l'Elevage, Monvoisin, BP 85225, 35652 Le Rheu Cedex, France
[2] Institut de l'Elevage, Route d'Epinay, 14310 Villers-Bocage, France

Background

For the consumer the tenderness is one of the most important properties of meat. The main factors controlling meat tenderness occur after slaughtering (Dransfield, 1994). Pelvic suspension (PS) and ageing are two of those factors. Several studies have shown pelvic hanging improved meat tenderness in different muscles in the hind limb (Hostetler,1970, 1973, 1975). According to Bouton (1972) and O'Halloran (1998) when applied to the carcass pre-rigor, PS places tension on the major leg and loin muscles which either minimises shortening, or stretches the muscles with subsequent improvement in tenderness. On the other hand ageing effect on meat tenderness is widely known and usually used in meat industry.

Objectives

The main objective of this investigation is to evaluate PS vs ageing effect. Thus the first objective was to identify the muscles (of the hind limb) on which the PS improves meat tenderness, and secondly, to evaluate the relative importance of PS and ageing.

Methods

Twenty carcasses were selected on the slaughter line : 16 cows (4 to 10 years old, 263 – 401 kg) and 4 young bulls (312 – 391 kg). The mean carcasses score were O3 according to the EUROP grading system. Electrical stimulation was not used. Carcass sides of these animals were randomly allocated to one of the 2 hanging methods : by Achilles Tendon (AT) – or Tenderstrech by the pelvic ligament (PS). One side from each carcass was re-hanged by the pelvic ligament approximately 60 minutes after bleeding while the other side was left hanging by the Achilles tendon. Half 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.

In the first experiment, the 8 major muscles of the hindquarter of 10 animals were removed : *Longissimus dorsi* (LD), *Glutaeus medius* (GM), *Adductor* (Ad), *Semi membranosus* (SM), *Gluteobiceps* (Gb), *Tensor fascia latae* (TF), *Semi tendinosus* (ST), *Rectus femoris* (RF). Psoas major was not selected because a lot of studies (Hostetler 1970, 1972, 1973, 1975; Hwang 2002) have shown the negative effect of PS in meat tenderness on this muscle. Muscles were vacuum-packaged and aged for 7 days at 2°C before freezing (-24°C).

After unfreezing each muscle was cubed and cooked in an oven at 310°C during 7 minutes, until the internal end-point temperature of 57°C was approximately reached. A selected and trained panel of 12 judges performed the sensory analysis. The samples (2 in each plate) were served to the judges who compared and scored them for tenderness on a scale from 0 – 100. From the same carcass and the same muscle each plate contained the 2 suspending carcass sides treatment (PS vs AT).

In the second experiment, the 5 muscles the tenderness of which was improved by PS, were selected from 10 other animals. All 5 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 unfreezing, cubing and cooking from the same animal and the same muscle, each plate was served to the judge and contained 4 samples corresponding in all treatment : AT with 2 days ageing (AT2), AT with 9 days ageing (AT9), PS with 2 days ageing (PS2), PS with 9 days ageing (PS9),

Statistical evaluation was performed using the procedure MIXED in SAS.

Results and Discussion

The results from sensory evaluation in the first experiment confirmed earlier results (Hostetler, et al. 1970; Fisher, 1994) showing that tenderness is improved by PS as compared to the AT suspension on LD, Ad, GM, Gb and SM (figure 1). On the other hand the results identified the muscles the tenderness of which is not affected by the suspension method: RF, ST. At last, PS method resulted in tougher meat than AT method only for TF.

According to previous work, as compared with AT suspension, PS resulted in stretching or shortening muscles fibres and respectively more tender or tougher meat, depending upon the muscle anatomical position.

The results of the 2nd experiment are shown in the figure 2. For SM, Ad and Gb, Pelvic Suspension during 2 days (PS2) improved tenderness at the same level than 9 days ageing with the Achilles Tendon suspension (AT9). For LD and GM the gain is twice more important. Then for all of the 5 muscles, pelvic suspension during 2 days could easily match one week ageing with AT suspension.

At last when pelvic suspension is associated with one week ageing, effects in improving tenderness add up : all muscles (except Gb) showed a gain in tenderness up to three times larger than could have been obtained with 9 days ageing alone (AT9).

Conclusion

This results obtained on 5 muscles emphasize how pelvic suspension could be beneficial for hind limb in meat industry either to improve efficiently meat tenderness or to reduce ageing period with preserving tenderness.

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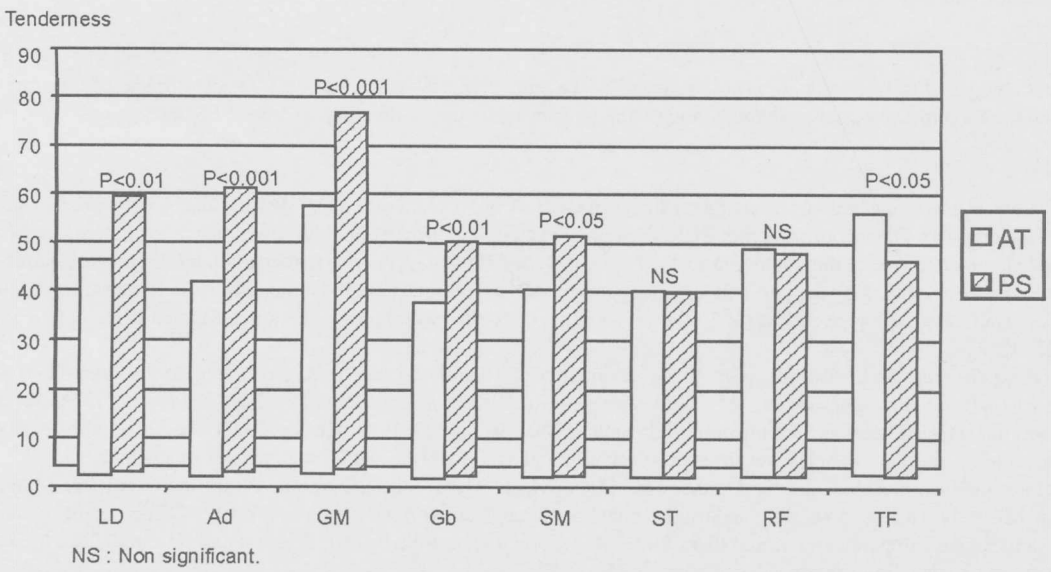

Figure 1 : Comparative effects of TA and PS on meat tenderness from different muscles after 2 days suspension and 7 days ageing

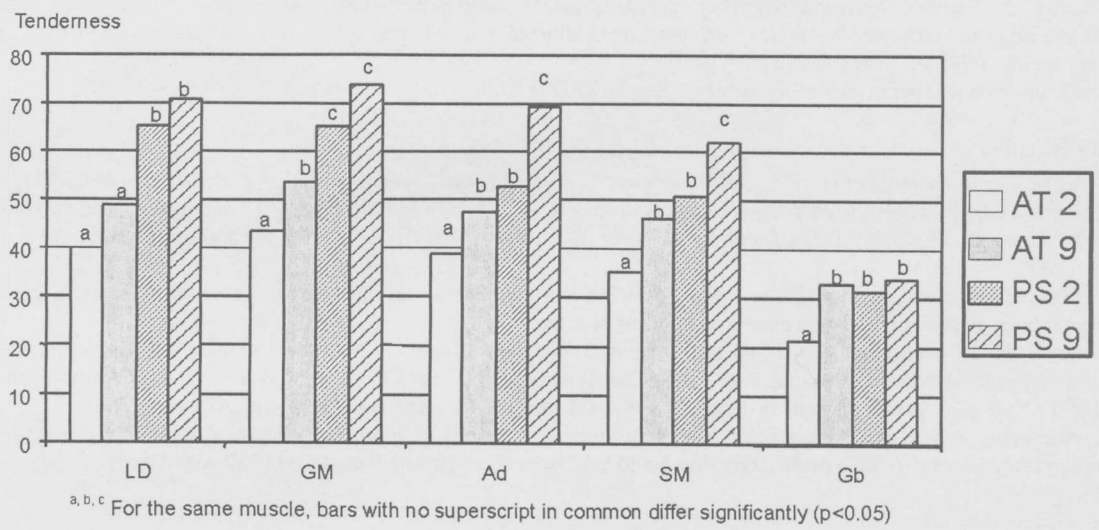

Figure 2 : Comparative effects of the 2 suspension method (AT or PS) and 2 ageing time (2 or 9 days) on 5 muscles meat tenderness