THE EFFECT OF SUPPLEMENTATION PERIOD OF A BETA-AGONIST (ZILPATEROL), ELECTRICAL STIMULATION AND AGEING PERIOD ON MEAT QUALITY CHARACTERISTICS

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Background

Zilpaterol hydrochloride is a beta-2 agonist, pharmacologically speaking, and its action is reflected particularly at the level of muscle metabolism. Its weak affinity for specific receptors indicates <u>moderate activity</u> as repartitioning agent. Consequently Zilpaterol has a significant positive effect on growth performance and carcass yield with no significant effect on muscle tenderness, provided that the supplementation period is limited to 30 days (Strydom *et al.*, 1998). However, there was concern that under commercial conditions meat tenderness may be impaired when recommended supplementation periods for Zilpaterol are exceeded and slaughtering procedures are not well controlled, e.g. no electrical stimulation and limited *post mortem* ageing. Previously, Zilpaterol was tested under ideal slaughter and post-slaughter conditions, while the effects of different post-slaughter practices were never taken into account. In South Africa, these conditions may vary to a large extent, depending on the abattoir, wholesaler and the final purchaser (restaurant, consumer, etc.).

Objectives

This study intended to test a whole spectrum of scenarios with various supplementation periods for Zilpaterol, combined with different slaughter and processing practices (electrical stimulation/ no stimulation and various periods of ageing) in order to verify the interactive effect of these different combinations on meat quality; specifically tenderness.

Methods

One hundred and twenty crossbred steers (average weight = $262.6 \text{ kg} \pm 19.2$) were selected from a larger group of feedlot animals on feed for approximately 70 days. These animals were stratified into three groups by weight and randomly assigned to the following treatment groups (n=40 per treatment): supplementation with 0.15 mg Zilmax®/kg live weight for the final 30 and 50 days in the feedlot, until 48 hours before slaughter; or no supplementation (C) with Zilmax®. At the abattoir, twenty carcasses per treatment were electrically stimulated (ES: 400 V for 90 seconds) directly after exsanguination, while the others were not stimulated. The wingrib containing the *M. longissimus thoracis* (LT) and the *M. semitendinosus* (ST, silverside cut) of both sides of a carcass were sampled and aged for either three or 10 days and evaluated for sensory meat quality. The LT and ST were prepared according to a dry heat and moist heat cooking method, respectively. A 10-member panel of trained judges evaluated cooked samples (70°C internal endpoint temperature) of the two muscles for aroma intensity, juiciness (2 aspects), tenderness (3 aspects) and flavour intensity.

Results and discussion

For all the different characteristics tested, mostly those related to meat tenderness (first bite, overall tenderness and residual tissue) varied greatly among treatments. Therefore, only overall tenderness will be used as main attribute to illustrate the treatment effects.

Interaction between Zilpaterol treatment, ES and ageing (Figure 1): The effects of ES and ageing were more pronounced for Zilpaterol treatments than for the Control for both LT and ST. Consequently, significant differences in tenderness between unstimulated Zilpaterol and Control carcasses were eliminated by electrical stimulation. Ageing an additional seven (7) days also significantly improved tenderness scores for the LT, regardless of the treatment groups (Control, 30 days and 50 days Zilpaterol), while the effect of ageing the ST muscle was less than that of ES, but still significant. In contrast to previous trials (Strydom *et al.* 1998), different supplementation periods of Zilpaterol (30 or 50 days) had no significant effect on meat tenderness. Previous results showed a significant reduction in meat tenderness of the LT when Zilpaterol was supplemented for 45 days or longer.

Electrical stimulation (ES) and extended ageing had an additive effect on the improvement in meat tenderness of the Zilpaterol treated carcasses. Figures 2 compare the differences in tenderness scores for the LT and ST muscle of Zilpaterol treated carcasses (30-days supplementation) and the Control. Poorest meat tenderness results were obtained with carcasses of Zilpaterol treated animals that were not electrically stimulated and that were aged for only 3 days: a difference of 0.78 units and 0.6 units on the eight-point category scale for the LT and ST respectively. Electrical stimulation (aged and unaged pooled) decreased this difference from 0.67 to 0.36 units for the LT and from 0.4 to 0.15 units for the ST, while ageing (pooled for electrical stimulated and non-stimulated) reduced the effect on tenderness from 0.59 to 0.44 for the LT and from 0.4 to 0.15 for the ST. The additive effect of ES and ageing is demonstrated by the reduction in the difference in tenderness between electrically stimulated and aged Zilpaterol treated and Control LT and ST muscles to 0.3 and 0.1 tenderness score units, respectively.

The improvement in meat tenderness due to ES and ageing tended to be less for the ST than the LT, but then the effect of Zilpaterol treatment was also less for the ST than for the LT (Figure 1).

Conclusions

- The negative effect of the beta-agonist, Zilpaterol, on muscle tenderness seems to be a function of the slaughter and post-slaughter procedures such as electrical stimulation and *post mortem* ageing.
- Since both procedures of ageing and electrical stimulation seem to have a greater positive effect on Zilpaterol treated carcasses than
 on Control carcasses (especially LT), attention to slaughter and post-slaughter procedures will ensure an acceptable meat
 tenderness level when Zilpaterol is utilised as growth promoter.
- The effect of Zilpaterol on meat quality seems to be muscle specific, which is in agreement with previous trials.



Figure 1: The significance of interaction between Zilpaterol treatment and electrical stimulation or ageing period on overall muscle tenderness (sensory) of the M. longissimus thoracis (loin) and the M. semitendinosus (silverside)



M. longissimus thoracis (loin)

M. semitendinosus (silverside)

Figure 2: The effect of different slaughter and post-slaughter scenarios on tenderness of the M. longissimus thoracis (loin) and the M. semitendinosus (silverside) of Zilpaterol 30 days treatment relative to that of the untreated Controls

References

Strydom, P.E., Osler, E.H., Nel, E & Leeuw, K-J (1998). The effect of supplementation period of a beta-agonist (Zilpaterol) on growth performance, carcass yield and meat quality characteristics. Proc. of 44th ICoMST, Barcelona, Spain...