

CATALASE ACTIVITY IN MEAT FROM MERTOLENGA YOUNG BULLS

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Joao.Almeida@mail2.ineti.pt**Background**

The demand for meat produced from rustic/native cattle breeds increased in the last 5 years on the Portuguese retail market. This trend is, objectively, related to its excellent "eating quality" and also due to the environmentally friend production system in use for animal's rearing. Concerning the former aspect, intramuscular lipids and heme pigment oxidative stability profiles during meat ageing are considered of relevance to flavours/odours development and potential self-life determination (Harel *et al.*, 1990; Renerre *et al.*, 1996). Antioxidant enzymic defence exist in different compartments of muscle cell. Among them, catalase ensures the decomposition of H₂O₂ and fatty acid hidroperoxides (Renerre *et al.*, 1996), which action mechanisms depend on various parameters such as muscle temperature, O₂ pressure and pH. However, the information available concerning the influence of other factors is scarce.

Objectives

The present study was undertaken to follow up catalase activity and stability in beef from Mertolenga breed young bulls, over a ageing period of 20 days, in relation to the age/weight of the animals and muscle type. The effect of the breed phenotypes and meat quality condition (DFD vs Normal) was also evaluated.

Material and methods

26 young bulls aged from 15 to 30 months, representing a carcass weight range from 190 to 310 Kg were used. After 24 hours chilling, *Longissimus dorsi* (Ld), *Semitendinosus* (St) and *Supraspinatus* (Ss) muscles were excised from the carcasses, vacuum packaged and stored at 2°±0.1°C, during 5, 11 e 20 days before analysis.

The catalase activity was determined by the procedure of Aebi (1983) adapted by (Pradhan, *et al.*, 2000). Ground muscle (10g) was homogenized (Ultra Turrax at 10000 rpm - 10sec work /30sec waiting/10sec work) with 50ml of phosphate buffer (0.05M pH=7). The homogenate was centrifuged at 4°C for 20min at 7000 g. 0.1ml of the supernatant was reacted with 2.9ml of 30mM H₂O₂ in phosphate buffer, and the absorbance (240nm) measured every second for 30 sec. A unit of catalase was defined as the amount of catalase needed to decompose 1µmol H₂O₂/min/g muscle.

Results and discussion

The overall - over storage time, animal slaughter age, breed phenotype and meat quality status - catalase activity in Mertolengo muscles with distinct locations is shown in fig. 1. Ss muscle presented higher catalase activity mean values (p<0.001) than Ld and St, which do not differ significantly. Jenkins and Tengi (1981) state that slow oxidative muscles show greater catalase activity than fast oxidative muscles. This trend has not been confirmed in our study. Despite the close similarity on fiber type composition between Ld and Ss from Mertolengo young bulls, the last muscle showed slightly less type I and more type IIb fibres (Roseiro, personal communication).

Vacuum packed Mertolengo beef showed remarkable catalase stability over a 20 days storage period at +2°C (Fig. 2), in agreement to the results obtained by Renerre *et al.* (1996). Regardless of the increasing on catalase mean values with the storage time, differences between samples were not significant. However this relationship depended on the muscle type (Fig. 3). While in Ss muscle the catalase activity increased significantly with the storage time, the results in Ld and St, contrarily, slightly decreased. The different behaviour of Ss muscle when compared to Ld and St could be due to its higher oxidative stress susceptibility.

Meat from older animals showed significantly higher catalase activity (Fig. 4). Again, the differences were more expressive in Ss muscle (Fig. 5). According to Renerre *et al.* (1996) muscles show an increased capacity for aerobic metabolism with age, and a lower colour stability as well. The higher catalase activity could then represent a feed back mechanism of defence.

Differences between the 3 dominant breed phenotypes are presented shown in fig. 7. The "Malhado" group presented lower catalase activity (p<0.001) than the others phenotypes. The quality status only affected the catalase activity in St muscle, with the normal condition presenting significantly lower mean values (Fig. 8).

Conclusions

Beef from Mertolengo young bulls, ranging from 15 to 30 months of age at slaughter, presented irrespective of muscle metabolic characteristic, an excellent catalase stability over a 20 days storage at +2°C. This intrinsic capacity contributes to prevent off-oddour/flavour formation and colour degradation on meat's ageing and retail sales period.

References

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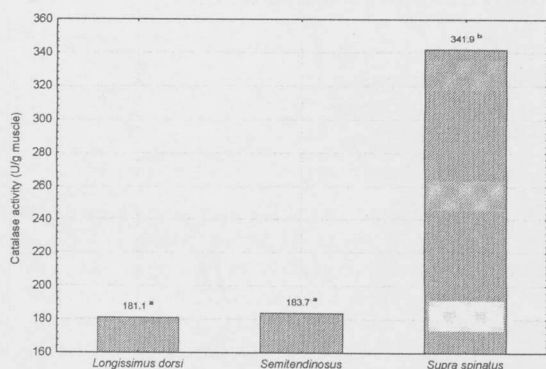


Figure 1. Effect of muscle type on Catalase activity (F=320.0 ***).

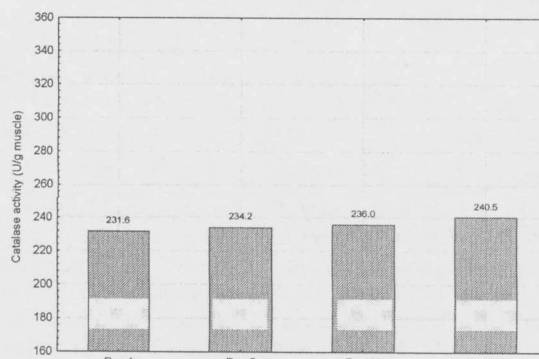


Figure 2. Effect of time post mortem at 2°C on Catalase activity different maturation (F=0.39 ^{ns}).

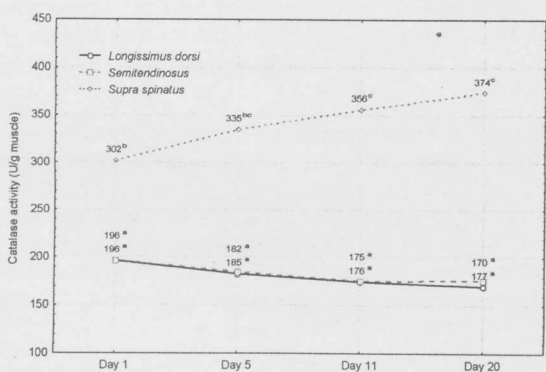


Figure 3. Effect of time post mortem and muscle type on Catalase activity (F=5.37 ***).

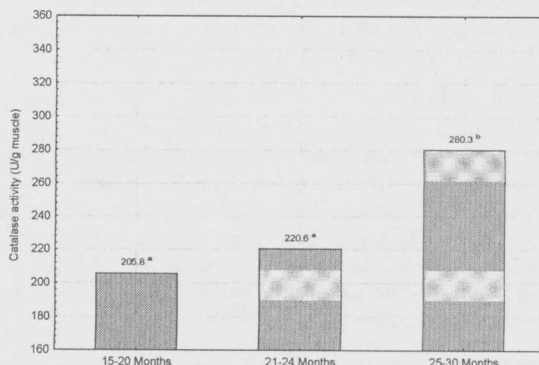


Figure 4. Effect of age of animals on Catalase activity (F=61.9 ***).

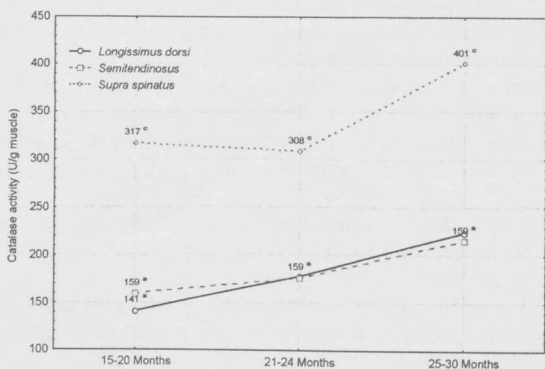


Figure 5. Effect of age of animals and muscle type on Catalase activity (F=3.28 *).

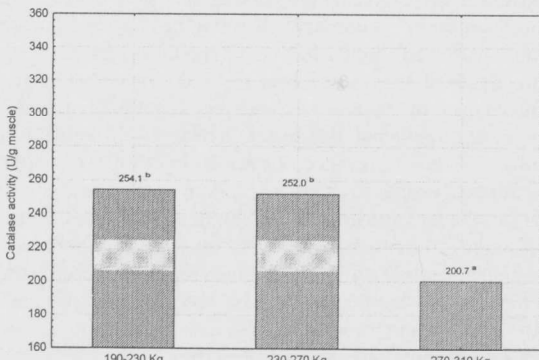


Figure 6. Effect of weight of animals on Catalase activity (F=35.1 ***).

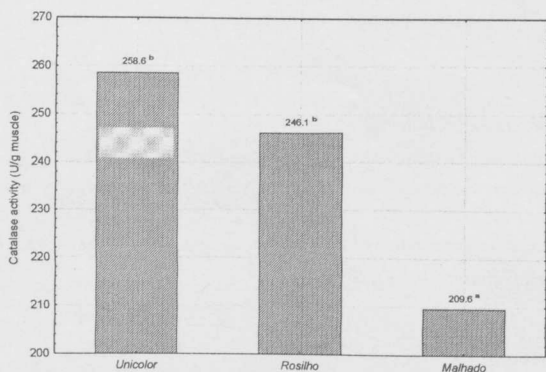


Figure 7. Effect of Mertolenga breed phenotypes on Catalase activity (F=11.5 ***).

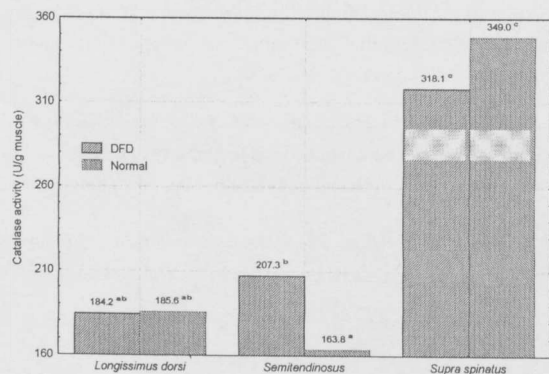


Figure 8. Effect of status quality and muscle type on Catalase activity (F=6.92 ***).