

INFLUENCE OF BREED ON THE COLLAGEN CONTENT IN *LONGISSIMUS DORSI* OF LAMB

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Background

In the last past years, Brazil has been increasing the importation of meat producing sheep breeds as Ile de France, Hampshire, Suffolk and Texel for crossbreeding with the existing breeds, e.g. Corriedale and Ideal. As an effect of the resulting heterosis, there has been an increase in the mutton production leading to heavier and larger muscles along with a smaller fat quantity (MONTEIRO et al, 1996; OSÓRIO et al, 1996). However, there still is lack of knowledge about the effect of the crossbreeding in the connective tissue. This structural matrix gives form and sustain cell components, transmitting and absorbing the strength generated by muscle contraction. Collagen is the main protein of the connective tissue related to meat texture and tenderness and is distributed in three layers: epimysium, perimysium and endomysium. The epimysium is the connective tissues that encloses the whole body of the muscle, sustaining the fibres and helping locomotion; the perimysium is a tridimensional net that surrounds the muscle fibre and in which deposits of lipides are found. The endomysium is the connective layer that encompasses the individual muscle fibre. There is a positive correlation between the total visible connective tissue (epimysium) and the level of toughness, mainly in animals of the same age. On the other hand, there are studies demonstrating that the main route of fracture and mechanical degradation of the meat occurs in the perimysium, probably in the perimysium-endomysium junction (BENDALL & RESTALL, 1983; BAILEY & LIGHT, 1989; McCORMICK, 1994; LIU et al, 1996).

Objective

To evaluate the amount of collagen and of perimysium in the *Longissimus dorsi* of lambs that have resulted from the crossbreeding between the Ile de France x Corriedale (F1) and pure Corriedale lambs.

Material and Methods

Animals and Management.

This experiment was conducted at Departamento de Patologia, Faculdade de Veterinária and Departamento de Ciência dos Alimentos, Faculdade de Ciências Farmacêuticas, Universidade de São Paulo, São Paulo, Brasil. The lambs used in this paper were from a private farm, located in São Paulo, Brasil. Two experimental groups of non castrated male sheep were used, ten from Corriedale breed (Corriedale ♂ x Corriedale ♀), and ten resulting from the absorbent crossing in the first generation F1 (Ile de France ♂ x Corriedale ♀). Ewe and lambs on a native pasture improved with *Cynodon dacylon* cv. Coast-cross, *Chloris gayna* and *Brachiaria humidicola* grass with 20-25 animals/hectare. Twenty lambs were selected from the herd: ten Corriedale and ten Ile de France x Corriedale (F1), identified, weighted, and slaughtered at the average age of 150 days with mean live weight of 33.08 (\pm 1.20) and 26.40 (\pm 1.20) kg, respectively. Before slaughter, the animals were kept on hydric diet for twenty hours in the slaughter house. After slaughter, the carcasses were identified and kept in a refrigerating chamber for 24 hours at the temperature of -2°C . Total collagen was carried out on samples of *Longissimus dorsi*, free of external fat, and taken from individual carcasses.

Collagen analysis

The hydroxyproline concentration was determined colorimetrically and collagen concentration was calculated assuming that collagen weighed 8 times the measured hidroxyproline weight (WOESSNER, 1961).

Histochemical analyses

From each carcass, samples of the *Longissimus* muscles were taken one hour after of slaughter and immediately frozen and stored in liquid nitrogen until analysis (DALL PAI, 1995). The intramuscular connective tissue (perimysium) were stained with Sirius Red (JUNQUEIRA et al, 1982). The slides were observed with CarlZeiss-III, Olympus BH2 microscope equipped with polarization. The perimysium were measured in the microcope optics equipped with Image Corporation - USA, along with the programme OPTIMUS 4.0. Results were submitted to a Student's t test to verify the level of significance between the means (CURI, 1997).

Results and Discussion

The contents of total collagen (g%) in the *Longissimus dorsi* were 0.84 (\pm 0.04) and 0.78 (\pm 0.12) for IF x C (F1) and C, respectively and did not differ ($P>0.5$). When comparing these levels of collagen with other reported findings, it can be seen that they are lower than the ones described by PINHEIRO (1989), who evaluated the level of collagen in culled Corriedale ewes and found, for the *Longissimus*, values of 2.5 g% while BISCONTINI (1995) found 2.7 g% in the *Latissimus dorsi* from cattle. The histochemical analysis, by the histochemical picosirius method, with polarization (Figures 1,2) showed in the perimysium, the presence of red fibres with strong bi-refrigent appearance, typical of collagen, separating the muscular fibres. In the cross bread Ile de France x Corriedale (F1) the perimysium was thicker 3.00 (\pm 0.24) mm than that of the Corriedale breed 1.00 (\pm 0.09) mm and these differences were significative ($P<0.03$).

Conclusions

The perimysium participates with about 90% of the intramuscular connective tissue and it is considered as the main contributor in the level of toughness of the meat. It is made of collagen types I and III, and this appears in a smaller proportion in the endomysium. The main route of fracture and mechanical degradation of the meat occurs in the perimysium, in probably in the perimysium-endomysium junction.

Results obtained in this study indicated that breed type could cause significant differences in the amount of perimysium and consequently in cooked meat texture. However, since the number of animals within each breed was relatively small, these data may be of limited value for characterising the collagen of specific breed types.

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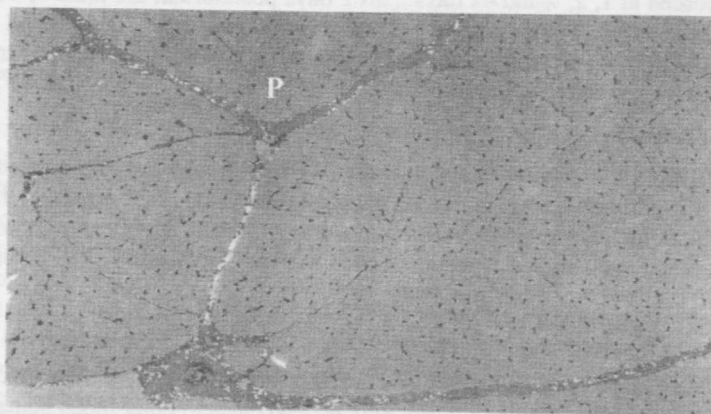


Figure 1 Transverse sections of the *Longissimus dorsi* of the lambs crossbred (IF x C, F1); picrosirius- polarization method, (P) perimysium.



Figure 2. Transverse sections of the *Longissimus dorsi* of lambs Corriedale; picrosirius- polarization method, (P) perimysium..