

ABSTRACT

Structural Changes in Intramuscular Connective Tissue During the Fattening of Japanese Black Cattle: Effect of Marbling on Beef Tenderization¹

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We investigated changes in structures and mechanical properties of the intramuscular connective tissue during the fattening of Japanese Black steers, using the cell maceration method for scanning electron microscopy. During the early fattening period, from 9 to 20 mo of age, collagen fibrils of the endomysium in longissimus muscle associated more closely with each other, and collagen fibers in the perimysium increased in thickness and their wavy pattern became more regular. These changes were closely related to the increase in mechanical strength of the intramuscular connective tissue and resulted in a toughening of the beef during the period. The shear force value of longissimus muscle decreased after 20 mo of age, concomitantly with the rapid increase in the crude fat content. Scanning electron micrographs of the longissimus muscle dissected from 32-mo-old steers clearly showed that the adipose tissues were formed between muscle fiber bundles, that the honeycomb structure of endomysia was partially broken, and that the perimysium separated into thinner collagen fibers. In semitendinosus muscle, in which the crude fat content was lower ($P < .05$) than that in longissimus muscle, the structure of the intramuscular connective tissue remained rigid at 32 mo of age. The shear force value of the muscle increased even in the late fattening period, from 20 to 32 mo of age. Thus, the development of adipose tissues in longissimus muscle appears to disorganize the structure of the intramuscular connective tissue and contributes to tenderization of highly marbled beef from Japanese Black cattle during the late fattening period.

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