

ABSTRACT

Adipocyte fatty acid-binding protein and mitochondrial enzyme activities in muscles as relevant indicators of marbling in cattle¹

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Marbling is an important criterion for beef quality grading in many countries. The purpose of the current study was to utilize the natural genetic variation to identify major metabolic indicators of marbling in cattle differing in genotypes. Rectus abdominis (RA, oxidative), semitendinosus (glycolytic), and longissimus thoracis (LT, oxidoglycolytic) muscles were taken from steers of different genotypes that expressed high [Angus, n = 16; and crossbred (Angus x Japanese Black), n = 10] or low (Limousin, n = 12) levels of marbling in their meat. Muscles from Angus and crossbred steers were characterized, as expected, by a greater triacylglycerol (TAG) content (P < 0.001) and also by greater protein contents of fatty acid-binding protein specific for heart and muscles (H-FABP; P < 0.001 for RA and P < 0.05 for LT muscle) or for adipocytes (A-FABP; P < 0.001 for RA and LT muscles). Moreover, oxidative enzyme activities (beta-hydroxyacyl-CoA dehydrogenase, citrate synthase, isocitrate dehydrogenase, cytochrome-c oxidase) were greater (P < 0.01 to 0.001) in the 3 muscles studied, whereas glycolytic enzyme activities (phosphofructokinase and lactate dehydrogenase) were lower (P < 0.001) in RA muscle in Angus and crossbred steers compared with Limousin steers. Significant correlations were observed between TAG content and H- and A-FABP protein contents, and oxidative ($r > \text{or} = +0.55$, P < 0.001) or glycolytic enzyme activities ($r > \text{or} = -0.47$, P < 0.001), when the 3 genotypes and muscles studied were considered as a whole. In addition, A-FABP protein content and some oxidative enzyme activities were significantly correlated with TAG content independently of the genotype and muscle effects. In conclusion, A-FABP protein content, as well as oxidative enzyme activities, may be used as indicators of the ability of steers from extreme genotypes to deposit intramuscular fat.

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