

ABSTRACT

Histochemical properties of skeletal muscles in Japanese cattle and their meat production ability

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The compositional characteristics of the three basic types of myofiber, namely type I (slow-twitch oxidative), type IIA (fast-twitch oxidative glycolytic) and type IIB (fast-twitch glycolytic), are clarified in the skeletal muscles of Japanese Black cattle. The myofiber composition, which is characteristic of the muscles of Japanese Black cattle, markedly changes during their growth, when some type IIA myofibers are transformed into type I or IIB, depending on the different muscles. Independent of these changes with growth, inter- and intramuscular variations of myofiber type distribution is evident. The small extensor muscles in deep regions around bone contain a lot of type I myofibers, whereas the large muscles at surface regions have many type II myofibers. Japanese Black cattle have typical white muscles such as the Longissimus thoracis and Semitendinosus, containing half the myofibers as red (type I + IIA). The muscles of Japanese Black cattle show a tendency to contain a higher percentage of type I myofibers than other breeds over an intrabreed variation of the myofiber type composition. In the big muscles such as the Longissimus thoracis and Biceps femoris, a great diversity of myofiber type composition is observed among the different regions. When fattened, heifers produce Longissimus thoracis and Biceps femoris muscles of smaller weight than steers, but in heifers the myofiber size in each type is rather larger. In the Psoas major, Vastus lateralis and Serratus ventralis muscles, heifers contain a higher frequency of red (type I + IIA) myofibers with no differences in myofiber size. Among the several muscles of fattened Japanese Black steers, the percentage distribution of type I myofibers has a positive correlation with the percentage amount of intramuscular fat. From these results, the high potential of Japanese Black cattle to produce marbled beef could be based on the histochemical properties of myofibers in their skeletal muscles.