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ACTN3 genotype influences ACTN3 protein expression level and myosin heavy chain composition in the vastus lateralis muscle in Japanese college-level male sprinters

(ACTN3 遺伝子多型は日本人大学生男子スプリンターにおける外側広筋の ACTN3 タンパク質発現量および MyHC 組成に影響を与える)

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Abstract

The purpose of this study was to determine whether alpha-actinin-3 (ACTN3) genotype influences ACTN3 protein expression level and myosin heavy chain (MyHC) composition in Japanese college-level male sprinters. Thirteen Japanese college-level male sprinters participated in this study. They were genotyped for ACTN3 R577X using a real-time polymerase chain reaction method. Muscle biopsies were obtained from the vastus lateralis muscle. ACTN3 protein expression level was analyzed by Western blot. The composition of MyHC isoforms was determined by sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE). ACTN3 protein expression level was higher in subjects with the RR genotype compared with those with the RX genotype (RR vs. RX; 1.00 ± 0.14 vs. 0.67 ± 0.22 , $p < 0.05$). There was no difference in the proportion of type I and II MyHC isoforms between RR and RX genotypes (RR vs. RX: type I; $27.1 \pm 2.7\%$ vs. $26.3 \pm 6.0\%$, type II; $72.9 \pm 2.7\%$ vs. $73.7 \pm 6.0\%$). However, the proportion of type IIx MyHC isoforms was significantly higher in the RR genotype compared with the RX genotype (RR vs. RX; $32.4 \pm 5.1\%$ vs. $23.0 \pm 4.6\%$, $p < 0.01$) and the proportion of type IIa MyHC isoforms was significantly higher in the RX genotype compared with the RR genotype (RR vs. RX; $40.5 \pm 6.2\%$ vs. $50.7 \pm 6.0\%$, $p < 0.05$). In addition, a significant positive correlation was found between the proportion of type IIx MyHC isoforms and ACTN3 protein expression level ($r = 0.698$, $p < 0.01$). These results suggest that ACTN3 genotype may influence ACTN3 protein expression level and the proportion of type IIx MyHC isoforms in Japanese college-level male sprinters.