

SOD2 gene polymorphism and muscle damage markers in elite athletes

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Abstract

Exercise-induced oxidative stress is a state that primarily occurs in athletes involved in high-intensity sports when pro-oxidants overwhelm the antioxidant defense system to oxidize proteins, lipids, and nucleic acids. During exercise, oxidative stress is linked to muscle metabolism and muscle damage, because exercise increases free radical production. The T allele of the Ala16Val (rs4880 C/T) polymorphism in the mitochondrial superoxide dismutase 2 (SOD2) gene has been reported to reduce SOD2 efficiency against oxidative stress. In the present study we tested the hypothesis that the SOD2 TT genotype would be underrepresented in elite athletes involved in high-intensity sports and associated with increased values of muscle and liver damage biomarkers. The study involved 2664 Caucasian (2262 Russian and 402 Polish) athletes. SOD2 genotype and allele frequencies were compared to 917 controls. Muscle and liver damage markers [creatine kinase (CK), creatinine, alanine transaminase (ALT), aspartate transaminase (AST), alkaline phosphatase (ALP)] were examined in serum from 1444 Russian athletes. The frequency of the SOD2 TT genotype (18.6%) was significantly lower in power/strength athletes ($n = 524$) compared to controls (25.0%, $p = 0.0076$) or athletes involved in low-intensity sports ($n = 180$; 33.9%, $p < 0.0001$). Furthermore, the SOD2 T allele was significantly associated with increased activity of CK (females: $p = 0.0144$) and creatinine level (females: $p = 0.0276$; males: $p = 0.0135$) in athletes. Our data show that the SOD2 TT genotype might be unfavorable for high-intensity athletic events. © 2014 Informa UK, Ltd.

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Keywords

Biomarkers, Creatine kinase, Creatinine, Gene polymorphism, MnSOD, Muscle damage