28th ECSS Anniversary Congress, Paris/France, 4-7 July 2023

Effect of the ACTN3 R577X polymorphism on the association between CK levels and Sprinting times during game in Brazilian Professional Soccer Players

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INTRODUCTION:
The ACTN3 R577X (rs1815739) polymorphism is associated to sports performance, where the R allele is related to muscle strength and power, and the X allele to muscular endurance. Previous studies also suggested the association of this polymorphism with the risk of sports injury, that can be different depending on populations and modalities. Therefore, this study aimed to evaluate the relationship between post-game Creatine Kinase (CK) levels and the number of sprints performed, and the influence of the ACTN3 genetic polymorphism on this response in Brazilian Professional Soccer Players.
METHODS:
A total of 23 professional soccer players (25 ± 3.9 years old; 77 ± 5.6 kg; 180 ± 4.7 cm) belonging to first division of the Brazilian Championship were sampled through blood collection. The DNA was extracted by the Salting out method and the polymorphisms genotyped by Polymerase Chain Reaction (PCR) and Restriction Fragment Length Polymorphism (RFLP) with restriction enzyme. The post-game CK level was measured 48h after official games of Brazilian Championship, and the number of Sprints during each competition was estimated with Global Positioning System (GPS). The data was collected accordingly to the number of times the player participated at official games, average of 10 ± 4.8 measures per player. For each player, the 5 median CK measures were used for analysis together with their respective GPS data (≥60 min/game), totalizing 115 combinations of GPS+CK data analyzed.
RESULTS:
From the 23 players, 13 were RR genotype and 10 were X allele carriers (RX and XX genotypes). Athletes ACTN3 RR had significantly higher mean weight (RR 78.8 ± 4.9 kg, X 74.6 ± 5.6 kg, $p<0.001$) and height (RR 181 ± 4.6 cm, X 179 ± 4.6 cm, $p=0.02$), while X athletes were significantly older (RR 24.5 ± 2.3 years old, X 25.8 ± 5.2 years old, $p=0.04$). A significant positive correlation was seen between the number of sprints (>19 km/h) performed during the game and the CK levels ($p=0.009$). When divided by the ACTN3 genotypes, athletes with the RR allele had higher CK levels as more sprints were performed ($p=0.017$). However, X allele carriers did not present significant relationship ($p>0.05$). The RR athletes also had a significantly higher mean of CK levels compared to X individuals (RR=876 ± 598, X=536 ± 211, $p<0.001$). However, there was no significant difference in the number of sprints between the genotypes (RR 24.8 ± 18.3 times, X 20.6 ± 16.8 times, $p>0.05$)
CONCLUSION:
Our results suggest that the number of sprints is directly related to the concentration of the extracellular biomarker of muscle damage, where the greater the number of sprints, the greater the levels of CK in the blood, especially in athletes with RR genotype. Hence, RR genotype can be more susceptible to microlesions due to a better physical performance in high intensity activities, requiring a better control of workloads and recovery time in order to prevent the development of chronic severe conditions as a consequence of repeated microinjuries.

Topic: Molecular Biology and Biochemistry

Presentation Oral