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Importance of ACE polymorphisms for endurance performance

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The skeletal muscle renin-angiotensin system (RAS) plays an important role in exercise metabolism. A functional insertion (I)/deletion (D) polymorphism in the angiotensin I- converting enzyme (ACE) gene (rs4646994) has been associated with ACE activity. The ACE DD genotype is associated with increased circulating ACE levels, which are generally two times as high as those found for II genotypes. Although most reports suggest that the I allele predisposes to human endurance (1) the literature also contains some opposite data (2). These inconsistencies from genetic association studies relating to the ACE gene and its I/D polymorphism maybe attributable, partially, to epigenetic factors that have been reported to influence ACE activity. Indeed, if both copies of the ACE D/D gene are transiently methylated, ACE increased levels associated with this polymorphism, may be down-regulated. However, there have not been any reports that address whether epigenetic regulation of the ACE gene is specifically involved in modifying human endurance, but, importantly, the human ACE gene promoter has been shown to harbor CpG islands. It is well established that environmental factors may modify the epigenetic profile and that nutrition training, muscle unloading and mechanical stimulation significantly impact on performance, playing an epigenetic role . Hence, it is conceivable that some of these factors might influence the CpG islands within the ACE promoter affecting its expression. The present study is aimed at modulating the epigenetic pattern of the ACE promoter by administering arginine to professional soccer players. ACE (DD, ID, and II) will be genotyped by PCR, then the epigenetic profile of ACE (gene promoter methylation) will be determined by bisulfite method, the serum levels of angiotensin 2 will be measured by ELISA. Hence, we compare the performance capacity of soccer players exhibiting different ACE polymorphisms, by strength, speed, and endurance tests. Subsequently, we will split the subjects under study in 2 groups: group 1 will follow a mediterrean diet, group 2 will follow the same mediterrean diet supplemented with arginine. After six months we will analyze if an epigenetic regulation of the ACE gene has occurred, modulating endurance performance.

References

[1] Puthucheary et al. Sports Med. 2011;41:433-48.
[2] Kim et al.Int J Sports Med. 2010;31:65-71.

Keywords

ACE polymorphisms; epigenetic factors; muscle metabolism; endurance.