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THE ESSENTIAL GENETIC FACTORS OF MUSCLE FIBER ADAPTATION

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Annotation: Sport genetics is the science about factors which are essential in sport activities. Today it is possible to study the human genome due to the development of genetic facilities which allowed to determine adaptation in physical exercises, not only the predisposition of an individual to certain sports.

Endurance, strength and speed are three criteria which form the base for the general evaluation of the athlete's potential. There are a lot of genes that are known today which are able to affect these characteristics. Furthermore, some gene mutations can be cause of body dysfunction which will lead to increased traumatism risk or early disability. Therefore, it is possible to predict the best types of sport activities according to the athlete`s genotype that will be adequate to person`s adaptive abilities and may help to avoid consequences, such as the injury, traumatical disability etc.

Keywords: AMPD1, CNTF, IL15RA, muscle adaptation, sport genetics, gene polymorphism.

Results and discussion. The AMPD1 is a gene which locates on chromosome 1 (1p13). AMPD (adenosine monophosphate deaminase) is encoded by this gene. AMPD that is mostly pronounced in muscle fibers of the rapid type of contraction regulates energy metabolism in the muscle tissue during stress exercises. AMPD converts AMP to inosine monophosphate and shifts the balance of the myokinase response to ATP production (2 ADP ↔ ATP + AMP). Moreover, this reaction is initial in the purine nucleotide cycle and plays a central role in the preservation of adenine nucleotides. Important functions of the purine nucleotide cycle are amino acid deamination and regulation of the glycolytic pathway with the formation of ammonia and IMP. It is known that AMPD1 activity reduces after stress exercises, which decreases contractility of the skeletal muscle. Pranculis et al. has shown reducing of the contractile ability of skeletal muscle due to decrease of AMPD1 activity [1].

CT, TT and CC are three possible polymorphisms of this gene. Deficiency of the enzymes has been defined at the heterozygous population of CT. Although this variant occurs with mostly asymptomatic carriers, in contrast, people with more pronounced weakness after prolonged exercises carry the CT and TT genotypes. Kiah McCabe et al. found that players with the TT genotype had significantly more ankle, knee, and general injuries than players with the CC / CT genotypes [2,3]. The C allele is defined as a genetic marker of strength and endurance, it also accelerates the recovery of muscle energy reserves. It is noted that in an independent study, athletes with the most common genotype of CC have the best endurance, with the genotype of CT - intermediate, and people with the genotype of TT have a low level of energy supply to skeletal muscle [4].

The CNTF gene is locates in the short arm of chromosome 11 (11.q12.1). Its length is 11 kb, contains one intron [5]. Although CNTF synthesis is associated with peripheral nerves CNTF activity requires a specific binding subunit of the CNTF receptor (CNTF-α receptor), which is overexpressed in skeletal muscle [6].

The CNTF receptor also includes a specific binding subunit, known as the α-CNTF receptor (CNTFRα), attached to the membrane via a glycosylphosphatidylinositol bond [7].

It is also known that individuals with the GG genotype has higher post-workout muscle cross-sectional growth compared to groups with the AA and GA variants. Besides, the level of muscle damage indicators in the serum of other groups was significantly higher than in the serum of individuals with genotype GG. That`s why groups with GA and AA genotype has worser muscle adaptation than individuals with the GG genotype [8].

The IL15RA gene is located on the long arm of chromosome 10 at position 15.1 (10q15.1). Molecular arrangement of base pairs 5,990,855-6,020,150 on chromosome 10. The size is 29,296 bases [9]. This gene encodes a cytokine receptor that specifically binds high affinity interleukin 15 (IL15). IL15 and IL2 receptors share two subunits, beta IL2R and gamma IL2R, and this receptor is a component of the plasma membrane heterotrimeric receptor for the pleiotropic cytokine IL-15. IL-15 is a pleiotropic cytokine in lymphoid and non-lymphoid tissues. IL-15 was classified as an interleukin based on its 4-α-helical secondary structure and its ability to mimic the functions of IL-2 in vitro [10]. The plasma membrane receptor for IL-15 was initially characterized as a three-dimensional structure consisting of the IL-2 β (IL-2Rβ) receptor, the common γ-chain, and the specific IL-15Rα chain [11,12].

TG, GG and TT are three polymorphism of IL15RA. It was found out in the work of Quinn L. S. et al. that in response to increasing physical activity athletes with the TT genotype adapt better than those with GG and TG genotypes [13].

Conclusions. On the basis of the received genotypes the estimation of genetic predispositions to physical qualities was carried out.

We revealed that complex of genotypes CC (AMPD1), GG (CNTF) and TT (IL15RA) can become a genetic marker of adaptation, as each individual homozygous genotype manifests itself better compared to other genotypes in the adaptation concept.

This study is based on scientific papers, the topics of which are at the stage of active study. Therefore, to establish a clearer correlation between genotype and predisposition to certain sports, as well as to form accurate conclusions, requires deeper study, more thorough research with a large sample of subjects, with many variables such as age, gender, sport, nationality, etc. In addition, it should be noted that the formation of various features of the body is influenced by lifestyle, environment and so on. Because of this, the presence of genetically determined qualities does not guarantee their development without any effort on the part of the athlete. Conversely, even in the absence of genetic predisposition, you can succeed in sports.

REFERENCES.

1. Ginevičienė V., Jakaitienė A., Pranculis A. et al. (2014). AMPD1 rs17602729 is associated with physical performance of sprint and power in elite Lithuanian athletes. *BMC Genetics,* 1-9. doi: 10.1186/1471-2156-15-58 .
2. McCabe K., Collins C. (2018). Can Genetics Predict Sports Injury? The Association of the Genes GDF5, AMPD1, COL5A1 and IGF2 on Soccer Player Injury Occurrence. *MDPI,* 1-10. doi: 10.3390/sports6010021.
3. Norman B., T. A. Nygren, Nowak J. (2018). The Effect of AMPD1 Genotype on Blood Flow Response to Sprint Exercise. *SpringerLink,* 173–180.doi 10.1007/s00421-008-0683-0.
4. Collins C. (2017). Resistance Training, Recovery and Genetics: AMPD1 the Gene for Recovery. *Journal of Athletic Enhancement,* 1-9. doi: 10.4172/2324-9080.1000256.
5. Gene Cards. *The Human Gene Database*. [Електронний ресурс]. – Режим доступу: https://www.genecards.org/cgi-bin/carddisp.pl?gene=CNTF.
6. Garatachea N., Lucía A. (2013). Genes and the ageing muscle: a review on genetic association studies. *AGE,* 207-233. doi: 10.1007/s11357-011-9327-0WHO | World Health Organization.

7. Guillet C., Auguste P., Mayo W., et al. (1999). Ciliary Neurotrophic Factor is a Regulator of Muscular Strength in Aging. *Journal of Neuroscience*, 1257-1262. doi: 10.1523/JNEUROSCI.19-04-01257.

8. Zhang L, et al. (2013). Relationship between CNTF gene polymorphism and athletes training adaptation of muscle tissue . *Zhonghua Yi Xue Za Zhi*, 2969-2971. doi: 10.3760/cma.j.issn.0376-2491.2013.37.014.

9. Gene Card. *The Human Gene Database*. [Електронний ресурс]. - Режим доступу: https://www.genecards.org/cgi-bin/carddisp.pl?gene=IL15RA.

10. Grabstein KH., et al. (1994). Cloning of a T cell growth factor that interacts with the beta chain of the interleukin-2 receptor. *Science*, 965–968.

11. Giri JG., et al. (2005). Identification and cloning of a novel IL-15 binding protein that is structurally related to the alpha chain of the IL-2 receptor. *EmboJ*, 3654–3663.

12. Giri JG, et al. (2010). Utilization of the beta and gamma chains of the IL-2 receptor by the novel cytokine IL-15. *Embo J*, 2822–2830.

13. Quinn LS, Haugk KL, Grabstein KH. (2005). Interleukin-15: a novel anabolic cytokine for skeletal muscle. *Endocrinology*, 3669–3672.

14. Furmanczyk PS, Quinn LS. (2003). Interleukin-15 increases myosin accretion in human skeletal myogenic cultures. *Cell Biol Int*, 845–851.