

PPAR γ /Pgc-1 α -Fndc5 pathway up-regulation in Gastrocnemius and Heart muscle of exercised, branched chain amino acid diet fed mice

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Branched Chain Amino Acids (BCAAs), including Leucine, Isoleucine, and Valine, are essential amino acids that body is unable to synthesize and needs to be provided by the diet. BCAAs play a significant role in energy homeostasis as they are important for the maintenance of skeletal muscle. A great proportion of BCAAs metabolism occurs in skeletal muscle, where metabolism is regulated. In the present investigation, we have attempted to address whether a combination of BCAAs supplement consumption with aerobic exercise could elaborate the expression of PPAR γ , Pgc-1 α and Fndc5 genes and mitochondrial biogenesis in gastrocnemius muscle and heart tissue of male C57BL/6 mice.

Thirty-six young male mice with an average weight of 16 \pm 2g were selected. Mice were randomly assigned to 6 groups: 20 mg/mL of BCAAs consumption with simultaneous exercise-training (20BCAAs/Ex), 60 mg/mL of BCAAs consumption with simultaneous exercise-training (60BCAAs/Ex), exercise-trained with no BCAAs consumption group (EX), 20 mg/mL BCAAs without exercise-training (20BCAAs), 60 mg/mL BCAAs without exercise-training (60BCAAs), and untrained mice without BCAAs consumption (sed).

The findings showed 20BCAAs/Ex group significantly increased Fndc5, PPAR γ , Pgc-1 α genes expression in

skeletal and heart muscles. In additional, circulating Irisin levels in 20BCAAs/Ex group were increased ($p < 0.05$). Furthermore, we assessed the expression of mitochondrial genes in gastrocnemius and heart muscles. BCAAs were increased the expression of mtDNA transcription factor A (Tfam), Cox4i1, a and b subunits of the mitochondrial H⁺-ATP synthase (a-F1-ATPase, b-F1-ATPase) in both of gastrocnemius and heart muscles. However, the maximum enhancement was yielded when BCAAs at concentration of 20 mg/mL was supplemented. Notably, we found that Sirt1 mRNA was increased in 20BCAAs/Ex group, the same as Fndc5 mRNA in gastrocnemius and heart muscles. Interestingly, plasma urea and lactate levels were significantly enhanced in 60 mg/mL BCAAs administrated mice which performed exercised ($p < 0.05$).

Speaker Biography

Navid Abedpour has acquired his MSc degree in the field of Nutrition and Sport. Currently, he is the senior researcher on a project tackling unraveling of the molecular mechanisms of several miRNAs, lnc RNA and Circular RNA to progress in diabetic and inactivity mouse that induce with advanced glycation end products diet in Royan Institute (Genetics Lab).

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