Exercise Biochemistry Review

Proceedings of IBEC 2018, Beijing, China, October 23-25
OR-017

Supplementation of Ala-Gln inhibits protein breakdown of skeletal muscle in rats with altitude training through TNF-α/NF-κB/MuRF1 pathway

Qiguan Jin,Yahao Tao,Yulong Hu
School of Physical Education，Yangzhou University

Objective Objective: To explore the effects of alanyl-glutamine（Ala-Gln）or glutamine（Gln）supplementation on protein metabolism in rat skeletal muscle during simulated altitude training，and compare the intervention of Gln or Ala-Gln to provide the necessary experimental basis for finding nutritional interventions to inhibit skeletal muscle protein degradation during altitude training.
Methods Methods: Forty SD rats aged 6 weeks were randomly divided into normoxic control group（NC group，n=10），hypoxic exercise group（HE group， n=10），hypoxic exercise + glutamine + alanine group（HEG group，n=10）， hypoxic exercise + alanyl glutamine group（HEAG group，n=10）. Rats were subjected to 6 weeks of 13.6% hypoxic exposure and 90% lactic acid threshold intensity weight-bearing swimming（load weight of 2.1% of body weight）exercise training，30 minutes after the end of each training，the mixed solution of Ala and Gln was administered according to the dose of 0.75g/Kg body weight in HEG group，and the solution of Ala-Gln was administered in the HEAG group at a dose of 1.5 g/kg body weight. After 6 weeks，the contents of rat skeletal muscle total protein（Pro），myosin heavy chain（Myo），tumor necrosis factor-α（TNF-α），nuclear transcription factor-κB （NF-κB），NF-κB inhibitory protein α（IkBα），and mRNA expression of muscle atrophy box F gene（MAFbx），muscle ring finger gene 1（MuRF1），and inhibitor of kappa B kinase complex-beta（IKKβ）were measured.
Results Results:（1）Compared with NC group，the content of Pro and Myo in skeletal muscle in HE group was significantly decreased（P<0.05，P<0.01），and the mRNA expression of MAFbx and MuRF1 in skeletal muscle was significantly increased（P<0.05，P< 0.01），the levels of TNF-α and NF-κB were significantly increased（P<0.05），the content of IkBα was significantly decreased（P<0.05），and the expression of IKKβ mRNA was significantly increased（P<0.01）.（2）Compared with HE group，the content of Pro and Myo in skeletal muscle in HEG group increased，but there was no significant difference（P>0.05）. The expression of MuRF1 mRNA and the content of TNF-α and NF-κB in skeletal muscle decreased，IkBα content increased，there were no significant difference，but mRNA expression of MAFbx and IKKβ was significantly decreased（P<0.05， P<0.01）.（3）Compared with HE group，the content of Pro and Myo in skeletal muscle in HEAG group increased significantly（P<0.05），mRNA expression of IKKβ，MuRF1 and MAFb（P<0.01）and TNF-α，NF-κB content（P<0.05）in skeletal muscle was significantly decreased，and the IkBα content was significantly increased（P<0.05）.
Conclusions Conclusion:（1）Simulated altitude training can activate TNF-α/NF-κB/MuRF1 pathway and enhance the catabolism of skeletal muscle protein，which is one of the important mechanisms for the reduction of skeletal muscle protein content caused by altitude training.（2）Supplementation of Ala-Gln during altitude training can significantly reduce the activation of TNF-α/NF-κB/MuRF1 pathway in skeletal muscle，and reduce the catabolism of skeletal muscle protein during altitude training，which plays a very important role in preventing the loss of skeletal muscle

protein caused by altitude training. supplementation of Gln monomer during altitude training has little inhibitory effect on the activation of TNF-α/NF-κB/MuRF1 pathway in skeletal muscle.