



Exercise Biochemistry Review

Proceedings of IBEC 2018, Beijing, China, October 23-25
PO-203

Across generations maternal exercise in hypoxic environment on mitochondrial biosynthetic factors in rat skeletal muscle

HELONG Quan^{1,2}, Yong Zhang^{1,2}, Zhouxiang Shan³, Lei Ji^{1,2}, Changhyun Lim^{2,4}, Changkeun Kim^{2,4}

1.College of Physical Education and Health Sciences, Zhejiang Normal University, Jinhua, China

2.Exercise and Metabolism Research Center, Zhejiang Normal University, Jinhua, China

3.Anhui Sports Institute of Science and Technology, Hefei, China

4.Human Physiology, Korea National Sport University, Seoul, Korea

Objective Environmental and maternal exercise experienced even during the very earliest stages of life has the potential to cause developmental changes. The growing evidence demonstrated that diverse environmental stressors affect offspring in various aspects in early stage of life and can be transmitted directly or indirectly by both parental lines. The purpose of the present study was to investigate the effect of across generations maternal exercise training under the hypoxic environment on mitochondrial biogenesis and angiogenesis related protein expressions of skeletal muscle in offspring of multiple generations.

Methods The experimental groups were divided into four groups as NCON (control in normoxia), NEXE (exercise in normoxia), HCON (control under hypoxia), HEXE (exercise under hypoxia), and studied for three generations. Exercise groups were run on animal treadmill at 60%-75% VO_{2max} for one hour per day, five times per week for 10 weeks (seven weeks before conception and during conception for three weeks). Animals were sacrificed at a given time table and assayed mitochondrial biogenesis and angiogenesis related protein expressions using western blotting.

Results The major findings from the present study were firstly, maternal exercise training before and during conception under hypoxic environment increase in mitochondrial biogenesis and angiogenesis related proteins expressions in both maternal and offspring skeletal muscles, secondly, long term of exposure to hypoxic environment without exercise training increase in mitochondrial biogenesis and angiogenesis related proteins expressions in offspring skeletal muscles, and further increased when exercise training performed at hypoxic environment, lastly, there was no cumulative benefit by consecutively exposure for three generations under hypoxic environment, which is indicating world winning runners from high altitude dwellers may not rely on the duration of sojourn under hypoxic environment, but rather selection and training related factors.

Conclusions In summary, maternal exercise training before and during conception under hypoxic environment increase in mitochondrial biogenesis (PGC-1 α , COX-IV, NRF-1, mtTFA) and angiogenesis (HIF-1 α , VEGF_{total}) related proteins expressions in both maternal and offspring skeletal muscles, especially exercise training stimulated the protein expressions under hypoxic environment than normoxic condition. Therefore, exercise capacity may be endowed by both hypoxic environment and exercise training at hypoxic environment.