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Effects of acute hypoxic exercise on TRPV4 channels in prefrontal cortex of rats

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Objective At the early stage of high altitude training, the decrease of motor ability caused by hypoxia makes it impossible for the training to be carried out normally. Since 90s, researchers have focused more on the decrease of the cardiopulmonary function and muscle oxygen utilization capacity, but there are few studies on cerebral hemodynamic factors, and no related mechanism studies. This study will take this as a starting point, to study the acute hypoxic exercise and its biological mechanism for brain hemodynamic effects of prefrontal cortex, providing a new target in order to improve the athletes at the beginning of the plateau duration and decreased exercise capacity problems.

Methods In order to explore the changes of the TRPV4 channels protein in rat prefrontal cortex induced by exercise under hypoxic exposure, this study used HE staining and immunohistochemical method to analyze the pathological changes and TRPV4 channel protein expression of prefrontal cortex in rats during incremental exercise in different oxygen concentration environment.

Results The results showed that cortex lesions characterized by venous congestion and neuronophagia, when exercise to level 5 under the condition of the simulated 4500 meters altitude, which was similar to normoxia exercise to level 8. With the increasing of exercise load, the expressions of TRPV4 in rat prefrontal cortex were significantly increased. And the TRPV4 expressions of every groups in the simulated 4500 meters altitude were significantly higher than those in normoxia groups.

Conclusions The results indicate that increased load exercise in acute hypoxia can lead to pathological changes of brain tissue much earlier than in normoxia condition, and increase the expression of TRPV4 channel protein in brain tissue. This study will provide valuable data for the study of the role of Ca²⁺ channels in the membrane of central nervous system in the phenomenon of the centers fatigue appearing earlier in hypoxic exercise.