

Effects of exercise preconditioning on neuronal damage induced by hypoxia

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Our nervous system is the most vulnerable tissue when exposed to hypoxia insult. Neurological diseases like stroke, head trauma and acute mountain sickness (AMS) are normally associated with hypoxia and cause neurotoxicity or even neuronal cell death.

The hypoxia-induced neurotoxicity can be attributed to either oxidative stress or inflammation responses. It has been reported that hypoxia cause increased cellular oxidative stress possible through the endogenous formation of peroxynitrite anion (ONOO⁻) and induce subsequent neuronal damage. Moreover, upon hypoxia insult, there are increases in inflammation response such as reactive microglia and up-regulation of iNOS. One protective way to attenuate neuronal damage caused by sever hypoxia is to precondition neurons with mild hypoxia exposure. Physical exercise has been regarded as a state of relative hypoxia. However, whether exercise pre-conditioning can attenuate hypoxia induced neuronal damage still needed to be elucidated. In this study, the four-week-old male Wistar rats were trained on treadmill exercise for 4 weeks (0.8 - 0.9km/hr, with the duration 40 - 60min/day, 5 days/week) before subjected to hypoxia - insult for 7 hours (the partial pressure of oxygen was 30% of 1 atm). The brain cortexes of rats were dissected for further assays. Our data indicated that for the exercise group, the expression of nNOS, iNOS and GFAP of the brain cortexes were decreased when compared with the non-exercise group, implying protective effects from exercise training.