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FLAVONOID LUTEOLIN AMELIORATED OXIDATIVE STRESS AND COGNITIVE DYSFUNCTION UNDER SIMULATED MICROGRAVITY

Abstract

Space travel produces profound changes of neuronal activity due to microgravity reflecting stress in the brain. Oxidative stress and cognitive impairment induced by space flight or microgravity may influence astronauts' health and decrease work efficiency. It is critical to elucidate the mechanism for development of some protective measures against these disturbances. In previous study, using a clinostat to simulate microgravity, we have found flavonoid luteolin (extracted from Chinese hawthorn leaves) could prevent oxidative damage in neuronal cells. The present study aimed at investigating the effects of microgravity on oxidative stress and cognitive function in tail-suspended rats, exploring the protective role of luteolin, as antioxidant and memory enhancer. The results showed that the ability of learning and memory was impaired both in the shuttle box test and the morris water maze test after 7d, 14d, 28d hindlimb suspension respectively, involving with changes of NR1/2B-CaMKII-CREB signaling pathway; protein oxidative damage and lipid peroxidation were increased, and antioxidase activity was decreased in rat hippocampus. Luteolin could reduce oxidative stress through regulating antioxidase activity, glutathioneperoxidase and superoxide dismutase, inhibiting lipid peroxidation, the overproduction of malondialdehyde, and could inhibit oxidative stress of neuronal cells via the PI3K–Akt–NF-B–ERK- dependent pathway. Treatment of rats with luteolin also significantly attenuated learning and memory dysfunction. Together, these results reveal the protective effects of luteolin against microgravity-induced oxidative stress and cognitive dysfunction, shedding light on the potential application of flavonoid luteolin as nutrient supplement during space flight. Acknowledgements: This work was supported by the National Science and Technology Major Project (NO. 2012ZX09J12201), and Medicinal Science and Technology Research Project. (NO. BWS11J052) Key words: oxidative stress; cognitive impairment; simulated microgravity; luteolin