SPACE LIFE SCIENCES SYMPOSIUM (A1)
Applications of Space Medicine to Earth-Related Health Issues (3)

Author: Dr. Lina Qu
Astronaut Center of China, China, linaqu@263.net

PROTECTION OF ISORHAMNETIN AND LUTEOLIN AGAINST SIMULATED MICROGRAVITY-INDUCED OXIDATIVE STRESS IN SH-SY5Y CELLS

Abstract

Microgravity is known to produce a number of neurological disturbances during space flight which is of unknown etiology but may involve increased oxidative stress. In the present study, we screened in some flavonoids to prevent oxidative stress because of their antioxidant activities. Isorhamnetin and luteolin were found to be most effective on H2O2-induced cytotoxicity in SH-SY5Y cells among 24 flavonoids and their prosurvival effects were in concentration-dependent manner with suitable concentration. Both isorhamnetin and luteolin improved the disorder of cell morphology, decreased the generation of intracellular reactive oxygen species (ROS) and lipid peroxidation product (MDA), and reversed the decrease of total antioxidant capacity (TAC) following H2O2 exposure; they also partly rescued the unbalanced cell morphology and attenuated accumulation of NO when cells were subjected to SIN-1. Using clinostat to simulate microgravity, we also found that isorhamnetin and luteolin suppressed oxidative stress induced by simulated microgravity (SMG) in SH-SY5Y cells including the recovery of level of intracellular ROS, nitric oxide (NO), 3-nitrotyrosine and TAC. Expression of iNOS was significantly upregulated following SMG and inhibited by isorhamnetin or luteolin. Selective inhibitor of iNOS resulted in the downregulation of oxidative stress following SMG. In addition, Isorhamnetin and luteolin increased the level phosphorylation of p38 MAPK following SMG. Inhibition of phosphorylation of p38 MAPK precluded the neuroprotection and the downregulation of expression of iNOS induced by flavonoids under SMG. In conclusion, these results suggest that flavonoids such as isorhamnetin and luteolin protect against SMG-induced oxidative stress and two important biomolecules, iNOS and p38 MAPK, participate in the protection of flavonoids. These two flavonoids might be useful for prevention of oxidative stress induced by space flight or simulated microgravity.