

SPACE LIFE SCIENCES SYMPOSIUM (A1)
 Medical Care for Humans in Space (3)

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RHODIOLA ROSEA IMPROVES MUSCLE ATROPHY AND EXERCISE CAPACITY DURING 45
 DAY HEAD-DOWN BED REST

Abstract

Purpose: Muscle atrophy caused by weightlessness stress is a challenging problem for astronauts during space flight. However, countermeasures against weightless muscle atrophy have not been developed yet. Rhodiola rosea (RR), a Chinese traditional herb medicine, has been proved its potential in enhancing endurance exercise capacity. The main objective of this study is to investigate the role of RR in preventing the muscle atrophy and exercise capacity decline induced by simulated weightlessness. **Methodology:** A double blind placebo-controlled randomized study (n=15) was performed. Fifteen male subjects were randomly selected for the placebo (PL, n=8) and the Rhodiola rosea (RR, n=7) groups, respectively. The whole bed rest included 45 day head-down bed rest (HDBR), and 10 days before HDBR as control and 10 days after bed rest as intensive care monitoring periods (recovery). The subjects in the RR group take Rhodiola rosea 0.50 g per day from 1 to 7 day HDBR, then 1.0 g per day from 8 to 45 day HDBR period. The subjects in PL group had the same done placebo at the same time. We used magnetic resonance imaging (MRI) to determine the maximum cross section area (CSA) of soleus before and 1 day after HDBR. All subjects were examined the peak torque (PT) in knee joint by the isokinetic contractile test at pre, 15, 30, 45 day HDBR and 10 day after HDBR. The aerobic capacity (max O₂ consumption) was also tested before and 1 day after HDBR. **Results:** There were less decrease in the CSA of soleus in RR group compared with that in PL group (-14.93%vs -20.72%) although there was no statistical difference between groups (P>0.05). We also found that there was a continuous decrease in PT since 15

day HDBR in both groups ($P < 0.05$), and such tendency lasted until 10 day after HDBR in PL group ($P < 0.01$), whereas a dramatic turnover in RR group at 10 day after HDBR ($P = 0.056$). Furthermore, the aerobic capacity markedly decreased ($P < 0.01$) in PL group after HDBR compared with before HDBR, but there hardly change in RR group ($P > 0.05$). Conclusions: Collectively, these findings demonstrated the important role of *Rhodiola rosea* in attenuating the muscle atrophy and declined exercise capacity during 45 day head-down bed rest. The future research will investigate the mechanisms of *Rhodiola rosea* effects and develop it as a novel therapeutic drug for intervention of muscle atrophy and exercise capacity decline during space flight.