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Behaviour, Performance and Psychosocial Issues in Space (1)

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IMPACT OF MIRNAS ON THE PSYCHOPATHOLOGY OF DEPRESSION UNDER SIMULATED SPACE COMPLEX ENVIRONMENTAL MODEL

Abstract

Long term space travels impact deleterious biological and psychological effects on astronaut's health, which ultimately lead to serious behavioral and physiology abnormalities. Unfortunately, pathological causes of these disorders are still unexplored. Some attributed to high demanding environmental conditions in space including far distance, noise, isolation and microgravity etc. Thus, linking stress as a cause of mood disorders. Depression is considered a type of mood disorder, and it is experienced by sixty percent astronauts during space travel, which impacts negatively on brain functioning. This is especially synaptic plasticity by triggering changes in the trophic factors, neuron morphology and neurogenesis in the adult hippocampus. This accounts for impairment in the learning and memory processes. It is plausible then, that stress alternates signal transduction cascades and gene regulation in hippocampus, thus results in malfunctioned neuroplasticity. Having that in mind, miRNAs has gained significant importance in regulating post-transcriptional regulation of gene expression and participate in various hippocampus dependent functions. In this paper we will present the results of a study performed in a simulated environment to address the impact of miRNAs regulating brain functioning and psychology of astronauts under high demanding space environmental conditions. In total 20 rats, control group (n=10) and simulated space complex model group (n=10) were exposed to space model for 21 days in contrast with control group. Initially behavioral tests were conducted to analyze depression by determining their body weight, sucrose preference rate, open field test score and force swimming score. Hippocampus samples were obtained for the determination of candidate miRNAs. The results of this study displayed significant reduced body weight ($p<0.01$), sucrose preference rate ($p<0.01$), open field score ($p<0.05$) and forced swimming score ($p<0.05$) in SSM model. Reactive oxygen species test presented significant differential values in SSM model as compared to the control group. SSE exposed hippocampus displayed upregulated miR-16 and miR-132 expression ($p<0.005$) as compared to control group. Our in-silico analysis identified various biological functions influenced by miR-16 and miR-132 which includes memory, behavior,

nervous system development and function, axon extension, growth and neuron migration. Furthermore, our in-silico study provided a landscape of potential miR-16 and miR-132 targets along with relevant canonical pathway related to axonal guidance signaling and P13K-Akt signaling pathway. Hence, due to the potential role of miRNA in the psychopathology of depression, this study provided a milestone for the use of miRNA as biomarkers for the early diagnosis of mood disabilities and neurological abnormalities, thus provide great insight for future health sciences and space health care.