26-1

CENTRAL NERVOUS SYSTEM (CNS) NEOPLASMS IN MICROGRAVITY

Lydia Johnson Kolaparambil Varghese[1], Alex P. Michael[2], Terje Saehle[3]

[1]*Università degli Studi di Perugia/ ESAM- Space Medicine Group, Italy*
[2]*Weill-Cornell Medical Center, New York Presbyterian Hospital, New York City, NY, USA*
[3]*Norwegian Civil Aviation Authority/European Space Agency/ESAM-Space Medicine Group, Norway*

lydia.kolaparambil@gmail.com

Introduction: Central Nervous System (CNS) neoplasms are rare yet universal malignancies that arise de novo or are induced by radiation. Modern space missions of increasingly long duration have uniquely positioned humans to study the effects of microgravity and ionizing radiation on CNS neoplasms. So far, only a few on-ground studies have been conducted to analyse the behaviour of CNS neoplasms in microgravity and ionizing radiations.

We aim to confront the molecular mechanisms of tumorigenesis and tumour suppression on-ground and in space (simulated microgravity and HZE). No experiment in space -LEO, deep space, or Martian surface-has been executed so far, leaving open questions about the precise behaviour of tumour cells in space: how will the tumour-suppression properties of microgravity interact with the carcinogenetic characteristics of ionizing radiations?

Methods: A literature review has been conducted using PubMed as the database of reference (May 2021). Search words employed were: “Central nervous system neoplasm AND microgravity;” “Central nervous system neoplasm AND spaceflight;” “Solid tumour AND Microgravity;” “Cancer stem cell AND microgravity;” “Glioblastoma AND microgravity;” “Glioblastoma AND spaceflight;” “Cancer Stem Cell AND spaceflight;” “Tumour suppression AND spaceflight;” “Tumour suppression AND microgravity.”

Results: The search strategy returned 124 references. Of these, 26 were eliminated as duplicates, and a further 82 were excluded at the title and abstract screening stage. The remaining 16 papers were included for full-text review. Of these 16 papers, 7 were included in the study. An additional study was included through citation searching. The majority of the studies in simulated microgravity suggest an inhibition in the glioma cell malignancy, which could contribute to the development of therapeutical possibilities. Conversely, ionizing radiation is deemed to enhance carcinogenesis.

Conclusions: Currently, experimental results in simulated microgravity seem to be auspicious for possible usage of microgravity as a tool for therapies. The role of microgravity in space is hypothesized to be akin to simulated microgravity. The correlation between microgravity effects and space radiation remains obscure, given the speculated propensity of a carcinogenesis enhancement under ionizing radiation. Several questions still remain open.

Further research is essential to comprehend the exact behaviour of cancer in space and the combined effects of microgravity and space radiation.