Chapter 6
Space Medicine and Education

Sibsankar Palit
Carver Space Education Working Group, LIFE-To & Beyond Foundation, India

Subhajit Hazra
https://orcid.org/0000-0001-9502-183X
Tsiolkovsky Space Life Sciences Working Group, LIFE-To & Beyond Foundation, India

Subhrajit Barua
Tsiolkovsky Space Life Sciences Working Group, LIFE-To & Beyond Foundation, India

Thais Russomano
InnovaSpace Ltd., UK

Saswati Das
Atal Bihari Vajpayee Institute of Medical Sciences, India & Dr. Ram Manohar Lohia Hospital, India

ABSTRACT

Space medicine studies health challenges related to human spaceflight, focusing on the physiological and psychological effects of altered gravity. As humanity plans settlements on the Moon, Mars, and beyond, understanding space medicine is crucial. Healthcare professionals must be trained to handle medical crises and mitigate health risks during space missions. However, there is a global gap in standardized training programs, particularly as space travel becomes commercialized. Space medicine advancements also benefit Earth, such as research on amyloid fibrils aiding Alzheimer's treatment. Barriers to space medicine education persist, espe-

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cially in low-income countries, where programs are limited or costly. This chapter addresses these barriers and discusses efforts to ensure inclusive, comprehensive space medicine education for future missions.

INTRODUCTION

Space medicine is a specialized field of subspecialty focus that intends to preserve human health and performance in the extreme environment of outer space based on our current understanding of the current aerodynamic effects of the external environment on human physiology (Shirah & al Talhi, 2021). In brief, the study ranges from understanding the physiological and psychological effects of spaceflight, working on medical protocols for humans in space (i.e., astronauts), and building technologies to monitor and manage human health in altered gravity (i.e., microgravity or hypergravity) environments and also the development of countermeasures to the hostile aspects of a space flight. As humanity moves beyond our planet Earth, for potential settlements on the Moon, Mars, and beyond, a strong foundational understanding of space medicine becomes crucial. Therefore, the educational aspects of space medicine gain importance. Thus, healthcare professionals need to be trained to recognize and address such unique health risks of space travel related to altered gravity and be acquainted with the management protocol, or countermeasures for related medical emergencies. Hence, upon understanding the importance of space medicine, institutions are now beginning to integrate space medicine into their curricula. However, globally, there remains a significant gap in standardized training programs that could prepare future healthcare providers for space missions, evident with the commercialization of space travel and the unprecedented increase in the number of citizen astronauts. Moreover, advanced medical technologies developed as space spinoffs during medical research conducted in the extreme space environment benefit people on Earth. For instance, the Amyloid study (JAXA, or Japan Aerospace Exploration Agency) and the Amyloid Aggregation (ASI, Italian Space Agency) study analyzed how amyloid fibrils formed in microgravity and revealed that fibrils form distinct structures and grow more slowly in microgravity, hence making the space station an ideal environment for detailed analysis of the mechanisms on how they form and evolve (Yagi-Utsumi et al., 2020; Berrone et al., 2020). Such analysis could also contribute to the development of new pharmaceuticals aimed at inhibiting amyloid fibril formation and possibly begin to be used for the treatment of Alzheimer's disease. Consequently, given the above gap in the education sector pertaining to space medicine, globally, several initiatives are underway to enhance space medicine education. Training programs have been set up for astronaut candidates by prominent government space agencies, like NASA,