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CARDIOVASCULAR HEALTH, RADIATION EXPOSURE RELATED CARDIOVASCULAR
CONCERNS AND LONG-DURATION SPACE FLIGHTS

Abstract

Managing and sustaining health is crucial for any human space mission. Major space agencies as well as emerging space nations now looking towards sending humans on long-duration space travel, returning to the moon and eventually Mars. The focus now have been to ensure appropriate healthcare for astronauts in order to cater to the upcoming challenges.

The World Health Organization states that Cardiovascular diseases are the leading cause of death globally. The concern of the impact of space travel and the effects of microgravity on cardiovascular health have been a concern for a long time. Challenges associated with cardiovascular health in microgravity is well known and involve muscular atrophy of the heart and also blood flow challenges.

Another area of concern for long-duration space flight is radiation exposure. On Earth, radiation-induced cardiovascular disease is a well known complication of radiation exposure. Dugas and Eisenberg stated that radiation causes fibrosis of the heart and significantly increases the risk of arrhythmias, coronary artery disease, cardiomyopathy and pericardial disease.

Radiation exposure in space increases the lifetime risk for degenerative diseases, and cancer, central nervous system effects. Deep space radiation is also a concern for cardiac disease. Vernice and colleagues stated exposure to proton and heavy ion deep space radiation results in coronary artery degeneration, aortic stiffness, carotid thickening and accelerated atherosclerosis.

Various countermeasures have been established to address the challenges and limit the strains of space in order to maintain cardiovascular health and fitness. However, as we now prepare for long-duration space flights, it is pertinent to ensure we continue to maintain general cardiovascular health and also radiation exposure related cardiovascular concerns.

We analyzed and discuss the current concerns related to cardiovascular health in microgravity and space radiation exposure associated consequences on the heart, and our findings recommend priorities and countermeasures to tackle the general cardiovascular related concerns, as well as the radiation exposure associated cardiovascular concerns for long-duration space missions.