Space Radiation and Risks to Human Health

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The radiation environment in space poses significant challenges to human health and is a major concern for long duration manned space missions. Outside the Earth's protective magnetosphere, astronauts are exposed to higher levels of galactic cosmic rays, whose physical characteristics are distinct from terrestrial sources of radiation such as x-rays and gamma-rays. Galactic cosmic rays consist of high energy and high mass nuclei as well as high energy protons; they impart unique biological damage as they traverse through tissue with impacts on human health that are largely unknown. The major health issues of concern are the risks of radiation carcinogenesis, acute and late decrements to the central nervous system, degenerative tissue effects such as cardiovascular disease, as well as possible acute radiation syndromes due to an unshielded exposure to a large solar particle event. The NASA Human Research Program's Space Radiation Program Element is focused on characterization and mitigation of these space radiation health risks along with understanding these risks in context of the other biological stressors found in the space environment. In this overview, we will provide a description of these health risks and the Element's research strategies to understand and mitigate these risks.