Chapter 9
The Space Environment and Its Effects on the Human Body:
Overview of the Space Environment and Its Challenges

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ABSTRACT

On Earth, we are shielded by the planet's magnetic field and atmosphere from the majority of particles that make up the space radiation environment. Even so, everyone on Earth is exposed to low levels of radiation every day, from the food we eat to the air we breathe. But in space, astronauts are exposed to varied and increased levels of radiation that are different from those on Earth. Three major sources contribute to the space radiation environment: particles trapped in Earth's magnetic field, solar energetic particles from the Sun, and galactic cosmic rays. The primary focus of Artemis missions from a space radiation perspective is developing the capability to accurately monitor the deep space radiation environment and its effect on the human body. Artemis missions will provide a unique opportunity to evaluate the hazards astronauts will face in a true deep space environment, before embarking on the years-long journey to Mars.

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ARTEMIS: MOON MISSIONS AS AN ASTRONAUT TEST BED FOR MARS

Figure 1. International space station in low-Earth orbit to deep space destinations on and around the Moon, and beyond

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Deep Space Radiation- A key concern of deep space radiation, which comes from the Sun and elsewhere in the universe, and is a hazard of space travel that increases the risk of cancer and degenerative diseases later in life. It is difficult to study the effects of deep space radiation on Earth or at the space station, because the radiation exposure on Earth's surface and in low-Earth orbit is different than what crews will encounter in deep space (Harvey & Mann, December.2022). The scientists at the NASA Space Radiation Laboratory in Upton, New York, assess the risks of space radiation to humans using simulated cosmic rays, but cannot exactly replicate the kind of exposure astronauts will receive on a Mars mission. The Moon is beyond Earth's protective magnetosphere and lacks a magnetic field of its own, making it an ideal place to study the effects of deep space radiation (Cranford & Turner, 2021).