

# Research highlights ways to protect astronaut cardiovascular health from space radiation

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Space: the final frontier. What's stopping us from exploring it? Well, lots of things, but one of the major issues is space radiation, and the effects it can have on astronaut health during long voyages. A new review in the open-access journal *Frontiers in Cardiovascular Medicine* explores what we know about the ways that space radiation can negatively affect cardiovascular health, and discusses methods to protect astronauts. These include radioprotective drugs, and antioxidant treatments, some of which

are more common than you might think.

Space is incredibly inhospitable. Outside of [low earth orbit](#), astronauts are bombarded with radiation, including galactic cosmic rays, and 'proton storms' released by the sun. This radiation is harmful for the [human body](#), damaging proteins and DNA, and is one of the major reasons that we haven't yet been able to send anyone to Mars, or beyond.

These issues inspired Dr. Jesper Hjortnaes of the Leiden University Medical Center in the Netherlands to investigate what we know about the harmful effects of [space radiation](#). "If we want to see human long distance space travel, we need to understand the impact of space-induced disease and how to protect our bodies from it," said Hjortnaes. However, Hjortnaes has an interest in a specific aspect of space radiation: its cardiovascular effects.

You may be surprised to learn that aside from the illnesses we typically associate with radiation, such as cancer, it can also have serious effects on the cardiovascular system. Suffering from cardiovascular illness would be catastrophic for crew members on long-haul space missions, and so it's important to identify what the risks are, and how to reduce them.

Hjortnaes and colleagues reviewed the evidence to establish what we know about the cardiovascular risks of space radiation. Much of what we know comes from studying people who have received radiation therapy for cancer, where [cardiovascular disease](#) is a common side-effect, or from mouse studies of radiation exposure.

So, what are the effects? Radiation can cause myocardial remodeling, where the structure of the heart begins to change, and tough, [fibrous tissue](#) grows to replace healthy muscle, potentially leading to heart failure. Other effects include atherosclerosis in blood vessels, which can

cause stroke or heart attack. Radiation exerts its effects by causing inflammation, oxidative stress, cell death and DNA damage.

Researchers have also investigated potential ways to protect astronauts. These include drugs that an astronaut could take to protect themselves from space radiation, and antioxidants. Interestingly, an antioxidant diet, including [dairy products](#), green vegetables such as spinach, and antioxidant supplements such as vitamin C, has potential in protecting astronauts from the damaging reactive oxygen molecules produced during radiation exposure.

Overall, the review revealed that so far, research has only scratched the surface of space radiation and the best methods to protect astronauts from it. There is little conclusive evidence of radiation-induced cardiovascular disease in astronauts themselves, as so few of them have ever gone further than low earth orbit, and mouse studies aren't an exact match for humans.

These issues prompted Hjortnaes and colleagues, who develop human cardiac tissue in the laboratory, to conclude that we need further research into these issues, and new research methods, such as organ-on-a-chip testing technologies.

"We need to develop human-based tissue platforms, such as heart-on-a-chip systems, that can simulate real human disease, outside of the human body, to unravel the mechanisms at play in [space radiation](#)-induced cardiovascular disease," said Hjortnaes.

**More information:** *Frontiers in Cardiovascular Medicine*, [DOI: 10.3389/fcvm.2021.631985](https://doi.org/10.3389/fcvm.2021.631985) , [www.frontiersin.org/articles/10.3389/fcvm.2021.631985/full](https://www.frontiersin.org/articles/10.3389/fcvm.2021.631985/full)

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