Immune health in space

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With a new crew arriving at the International Space Station, astronauts will be relieved to know that they won't have to worry about a major aspect of their immune system being compromised. While researchers know a lot about astronauts' skeletal and muscular health during spaceflight and when they return to Earth, much less is known about how spaceflight affects immunity. It has been generally thought, until now, that spaceflight has a detrimental impact on all aspects of the immune system.

"Long-duration orbital spaceflights are associated with increased levels of psychological stress, acute and chronic exposure to space radiation and microgravity-induced changes, all of which are known to detrimentally impact the immune system. However, the effects of spaceflight on B-cell immunity—a major arm of the immune system—has remained unclear," said Guillaume Spielmann, LSU School of Kinesiology assistant professor and co-author of a new study on spaceflight's effects on a major part of the immune system.

The successful implementation of exploration-class missions to Mars or other near-Earth objects requires a better understanding of the impact of long-duration spaceflight on the immune system in order to evaluate the risks of adverse health events associated with immune dysregulations for the crew.

Until now, due to spaceflight's logistical constraints, the majority of space immunology has been conducted during short-duration missions or by comparing pre- to post-flight measures of immune function. Last week, Spielmann and University of Bath Department for Health's John Campbell published their results from a long duration spaceflight study that aimed to shed light on any alterations in human B-cell function in astronauts who lived on the International Space Station, or ISS, for 6 months.

B-cells are an essential type of white blood cells responsible for producing antibodies that will target harmful pathogens. Optimal B-cell immunity is crucial to ensure long-term protection against disease-causing bacteria and viruses and is the cornerstone of vaccine efficacy.

"This is the first study to comprehensively show that long-duration spaceflight in human astronauts has limited effect on B-cell frequency and antibody production," Campbell said.

Blood samples were collected from astronauts before, during and after 6 months living on the ISS. The results suggest that B-cell immune competency was unaffected by time spent on the ISS. These findings may support the use of in-flight vaccine-based countermeasures to protect astronauts from immune dysregulation and symptomatic latent viral reactivations that are known to occur in longer duration missions, such as eventual travel to Mars.

This study provides novel insights on B-cell immunity during a 6-month mission in the ISS. The team behind it suggest future studies are still required to ensure that astronauts' ability to produce functional antibodies will remain unaltered during longer missions.

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More information: Guillaume Spielmann et al. B-cell homeostasis is maintained during long duration spaceflight, *Journal of Applied Physiology* (2018). DOI: 10.1152/japplphysiol.00789.2018

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