

We Choose to go to Mars

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The human gut microbiota: How Bacteria Change in Astronauts' Digestive Systems

Universidad del Cauca
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"Elegimos ir a Marte"

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RISKS OF BEING AN ASTRONAUT: SPACE HEROES

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The gastrointestinal microbiota plays an important role in mammalian health by interacting with host immune, metabolic, and neuropsychiatric functions.

Several studies have demonstrated that space travel affects the astronauts' immune systems and have shown some evidence suggesting that changes in their microbiomes occur as well. NASA has studied the effects of microgravity on mice's biological processes for many years. Because the human microbiome plays a key role in human health, it is important to assess the effect of long duration space exploration on the microbial population that inhabits the human body.

Researchers have discovered space flight also belongs on that list. Space flight can affect the bacteria in a mouse's gut microbiome, which may have larger implications for human astronauts. Radiation definitely has an effect on the gut microbiome, but those effects do not look like what we saw in spaceflight.

During a mission to space, astronauts are subject to many stressful conditions (g-forces, radiation, microgravity, anxiety, etc.) that can have a negative impact on their health. Bacteria in the gut microbiome can be affected by a lot of things, like dietary habits and physical health.

Recommended Reading

Characterization of the total and viable bacterial and fungal communities associated with the International Space Station surfaces

https://microbiomejournal.biomedcentral.com/articles/10.1186/s40168-019-0666-x

The human microbiome, the collection of microbes that live in and on the human body, plays an important role in human health contributing to the processing and absorption of nutrients in the human body, and/or playing a protective role (for example) by competing for resources with pathogenic organisms. Changes in the dynamics or composition of the human microbiome may lead to altered human metabolic function or pave the way for the colonization of the human body by opportunistic pathogenic microorganisms. Bugs are winning out, and that's a good thing according to NASA's Human Research Program. As part of NASA's One-Year Mission, researchers are studying how microbes living on astronauts' skin, inside their bodies and on the International Space Station impact their health.

Recommended Reading

https://www.ncbi.nlm.nih.gov/pubmed/23051761?dopt=Abstract

Infection prevention and control during prolonged human space travel.

The Microbiome experiment examines the impact of space travel on both an individual's microbiome, which is the community of microorganisms that literally share our body space, and the human immune system. Researchers are collecting various samples (gastrointestinal, saliva, blood, potable water, perspiration, swabs of the body, and equipment) to determine how microgravity, environment, diet, and stress affect the microbiome and immune system.

https://www.nasa.gov/feature/microbiology

Microbiology 101: Where People Go, Microbes Follow

https://www.nasa.gov/mission_pages/station/research/news/microbiology-101-space-station-microbes-research-iss



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The human gut microbiota: How Bacteria Change in Astronauts' Digestive Systems

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To prepare for a journey to Mars, it is important to understand how long-duration spaceflight affects microorganisms because changes to this complex ecosystem could be detrimental to future missions. In addition, microgravity affects virulence, growth kinetics, and biofilm formation of potential microbial pathogens.

A comprehensive catalogue of the bacteria and fungi found on surfaces inside the International Space Station (ISS) is being presented in a study published in the open access journal Microbiome. Knowledge of the composition of the microbial and fungal communities on the ISS can be used to develop safety measures for NASA for long-term space travel or living in space. Microbiome, 2019; 7 (1) DOI: 10.1186/s40168-019-0666-x

Study of the Impact of Long-Term Space Travel on the Astronauts' Microbiome; the number of Firmicutes increased while Bacteroidetes decreased, this shift was among the greater compositional change that the researchers noted in microbiome, long-Term Space Travel on the Astronauts' Microbiome.

Prolonged human spaceflight to another planet or an asteroid will introduce unique challenges of mitigating the risk of infection.

The researchers found that microbes on the ISS were mostly human-associated. The most prominent bacteria were Staphylococcus (26% of total isolates), Pantoea (23%) and Bacillus (11%). They included organisms that are considered opportunistic pathogens on Earth, such as Staphylococcus aureus(10% of total isolates identified), which is commonly found on the skin and in the nasal passage, and Enterobacter, which is associated with the human gastrointestinal tract.

On Earth, they are predominant in gyms, offices, and hospitals, which suggests that the ISS is similar to other built environments where the microbiome is shaped by human occupation.

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Recommended Reading

An Alarming Discovery in an Astronaut's Bloodstream
http://anmdecolombia.net/index.php/52-de-la-literatura/747-an-alarming-discovery-in-an-astronaut-s-bloodstream

MENTAL DISORDERS IN SPACE, PERSPECTIVES OF A CHANGE
http://anmdecolombia.net/index.php/52-de-la-literatura/746-mental-disorders-in-space-perspectives-of-a-change

EXPLORING HEART CELLS IN MICROGRAVITY: METABOLIC ANDCELLULAR RISKS IN CARDIOMYOCYTES
http://anmdecolombia.net/index.php/52-de-la-literatura/742-exploring-heart-cells-in-microgravity-metabolic-and-cellular-risks-in-cardiomyocytes



The Gut in Space: How Bacteria Change in Astronauts' Digestive Systems
https://www.space.com/astronaut-gut-bacteria-changes-in-space.html