Journal of Space Exploration
ISSN: 2319-9822
Journal of Space Exploration
Perspective | Vol 11 Iss 2

Long-Term Space Flight on the International Space Station Alters Astronauts' Nutritional Status

Philippe Winkler*

Editorial Office, Journal of Space Exploration, United Kingdom

***Corresponding author:** Philippe Winkler, Editorial Office, Journal of Space Exploration, United Kingdom, Email: winkler.p@gamil.com

Received: February 4, 2022, Manuscript No. tsse-22-63713; **Editor assigned:** February 6, 2022, PreQC No. tsse-22-63713 (PQ); **Reviewed:** February 16, 2022, QC No. tsse-22-63713 (Q); **Revised:** February 18, 2022, Manuscript No. tsse-22-63713 (R); **Published date:** February 27, 2022, DOI: 10.37532/2319-9822.2022.11(2).200

Introduction

Maintaining proper food intake during space flight is critical not just to fulfilling astronauts' nutritional demands, but also to help counteract the deleterious effects of space travel on the human body. Food also has psychosocial advantages throughout a mission, in addition to these tasks. Data on dietary consumption from numerous space projects are addressed, including the Space Shuttle and the International Space Station. These figures come from medical monitoring of nutritional consumption and crew health, as well as research procedures examining the effect of diet in preventing bone loss and other health problems. Studies on the ground are being carried out to better understand some of the negative aspects of space flight. Extended-duration bed rest research, vitamin D supplementation experiments in Antarctica during 6-month winterovers, and 10- to 14-day saturation diving missions on the ocean floor are examples of ground-based investigations. It is stated how weighed food records, diet diaries, barcodes, and meal-frequency surveys are used to measure the nutritional intake of space crewmembers. Food and nutrition are critical for numerous bodily systems in space travel, including the cardiovascular, musculoskeletal, endocrine, and immunological systems. Loss of body mass, bone and muscle loss, radiation exposure and oxidative damage, nutrition intake during spacewalks (extravehicular exercise), depletion of nutrient storage, and insufficient food intake are all major concerns during long-duration space flight. Food and nutrition are being used as a countermeasure in preliminary research studies to help mitigate these problems. For long-duration space exploration missions, determining adequate nutritional needs is crucial. There is very little information available on such nutrient needs. The study's main purpose was to learn more about the dietary alterations that occur during long-duration space travel. We looked at 11 astronauts' body composition, bone metabolism, haematology, general blood chemistry, and blood levels of specific vitamins and minerals before and after a long-duration (128-195 day) space journey aboard the International Space Station. During the trip, dietary intake and biochemical measurements were taken. The crew ingested an average of 80% of their recommended calorie intake, and their body weight was lower (P=0.051) on landing day than before the trip. Hematocrit, serum iron, ferritin saturation, and transferrin were all lower after the flight (P=0.05), whereas serum ferritin was higher. Other acute-phase proteins remained constant after a flight, indicating that alterations in iron metabolism are unlikely to be primarily due to an inflammatory response. After the flight, the concentration of urine 8-hydroxy-2′-deoxyguanosine was higher and RBC superoxide dismutase was lower (P=0.05), indicating enhanced oxidative damage. Despite taking a vitamin D supplement throughout the flight, serum 25 hydroxycholecalciferol levels dropped (P=0.01). Several indicators showed that bone resorption increased after flying. Several indicators of bone growth did not consistently rise 1 day after landing. These findings show that bone loss, low vitamin D levels, and oxidative damage are all serious dietary problems for long-term space travellers.

Citation: Winkler. P, Long-Term Space Flight on the International Space Station Alters Astronauts' Nutritional Status, UK, J Space Explor. 2022;11(2).200.

Exploration expeditions have often succeeded or failed based on how well nutrition was considered and/or understood throughout history. Scurvy is a typical example of how a single dietary deficit resulted in more sailor deaths than all other causes of mortality combined, including shipwreck, during the so-called era of sail. Given that no food would be obtained by travelers on these excursions, the need for nutrition on space exploration missions will be much more vital. The mission's food supply will need to be meticulously prepared to guarantee that there will be adequate food and that the micro-and macronutrients will stay consistent throughout.

A failure of packing or oxidation of macronutrients might make the difference between a successful mission and a mission ending early. As a result of the microgravity environment, space flight is linked to a variety of physiological changes; including space motion sickness, fluid shifts, congestion, and changing taste and smell. Nutrition and dietary needs for long-duration missions can be affected by the spaceship environment (including the spacecraft cabin, radiation, absence of UV light exposure, carbon dioxide exposure, and the spacesuit atmosphere). Because nutritional status is influenced by so many factors, it is critical to monitor nutritional status during long-duration space missions (>30 days) to maintain crew health and productivity, as well as mission success.

After returning to Earth, astronauts aboard the International Space Station (ISS) may experience physiological issues as a result of their adaptation to the space environment. As a result, developing healthcare technology for astronauts is critical. We investigated the possibility of assessing gene expression changes in response to spaceflight adaptation using hair follicles, a widely available material. Hair follicles from ten astronauts were studied using microarray and real-time qPCR to study gene expression alterations in human hair follicles during spaceflight. Human hair follicle gene expression is altered by spaceflight, according to our findings. Individual differences in gene expression were discovered to exist. Hair growth genes such as FGF18, ANGPTL7, and COMP were increased in certain astronauts during flight, suggesting that spaceflight decreases cell proliferation in hair follicles.

Long-term stays aboard the International Space Station (ISS) (up to 6 months each mission) have become commonplace in recent years and will be required for future Mars missions. When humans spend lengthy periods in space, their bodies adapt to their surroundings. Muscle atrophy and bone calcium loss are two physiological changes noticed in astronauts during long-term flights. Furthermore, radiation reactions and negative psychological impacts are major issues. Astronauts lose aerobic power and muscle strength, as well as their emotional and psychological status, on return to Earth, these modifications might cause health issues. As a result, developing astronaut-specific healthcare solutions is critical. To do this, a greater knowledge of the physiological changes brought on by space environments including microgravity and space radiation is required. Understanding changes in protein and gene expression, in particular, is critical for designing remedies to the negative impacts encountered by astronauts on long-duration missions in space. The Japan Aerospace Exploration Agency (JAXA) has been examining hair samples from ISS crewmembers that have been in space since December 2009 to explore the impact of long-term spaceflight on gene expression and mineral metabolism. This HAIR experiment involved ten astronauts from the ISS crew. Hair is one of the best biological specimens for examination since it is usually collected using non-invasive and simple processes. As a result, the goal of this experiment is to learn more about how the hair follicle reacts to the environment in space. This knowledge might aid in the development of diagnostic tools for assessing astronauts' health during space missions.

The public's enthusiasm for space travel has been reignited in what has been dubbed the "new space race," which aspires to send people to Mars in the 2030s. This sort of Earth-independent deep space mission poses several issues for astronaut nutrition that are not currently being faced by our presence in low earth orbit. For example, delivering adequate food with sufficient nutritious content, bioavailability, and longer shelf life poses technological hurdles. Environmental stresses can influence physiology and, as a result, nutritional status. Increased radiation exposure, for example, induces changes in the stomach and liver that may make nutritional shortage more likely.

Nutrients' positive impact on reducing the negative consequences of spaceflight exposure has also been investigated. Such countermeasures will be required to keep astronauts healthy on long-duration trips, allowing us to continue pushing the limits of space exploration.

Citation: Winkler. P, Long-Term Space Flight on the International Space Station Alters Astronauts' Nutritional Status, UK, J Space Explor. 2022;11(2).200.