

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Medical Care for Humans in Space (3)

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MISSION BEYOND: THE NUTRISS EXPERIMENT ON BOARD THE INTERNATIONAL SPACE
STATION

Abstract

Energy balance maintenance is a crucial point to preserve astronaut's wellness and quality of life in space. Human spaceflight and experimental bed-rest highlights the relevance of nutritional intervention to counteract the microgravity (micro-g) detrimental effect on skeletal muscle mass and metabolism.

NutrISS (Nutrition monitoring for the International Space Station) is an Italian Space Agency (ASI) biomedical experiment investigating patho-physiology of changes in body composition during long-term spaceflight. It will be executed on the ISS (July-December 2019), during the Beyond mission sponsored by European Space Agency. The goal of this proof-of-concept is to monitor the body composition of astronauts and, if needed, to provide nutritional advices during the mission.

The payloads selected for the mission "BEYOND" are funded and coordinated by ASI, resulting from a public call open to the industrial and scientific research communities. ASI, in the frame of its national mission of promoting and fostering the culture of space across the Country, provides access to the ISS as a laboratory in space to the Italian research community. The utilization support services are provided thanks to a contract, awarded by ASI, to ARGOTEC/Telespazio (UTISS Team). This team supports safety evaluation and payload manifesting and qualification process leading towards a safe and efficient delivery, utilization, integration on board the ISS and recovery of the payload, allowing scientists to access and retrieve experimental data and instruments after they return to Earth.

For the NutrISS experiment, the Italian astronaut Luca Parmitano will be subjected to Baseline Data collections before leaving for his six-months mission. Body composition, anthropometric evaluation and energy and metabolic assessment will be performed by the scientific team (Università degli Studi di Trieste). Body composition will be assessed with a COTS Bio-Impedance Analyzer (BIA) device manufactured by Akern. The selected BIA has been modified by Kayser Italia (Payload Developer) to fulfill the space requirements and has undertaken a test campaign to achieve the full space certification. BIA can estimate FatFree Mass (FFM) considering resistance/reactance to low intensity current, delivered by electrodes and passing through the human body.

In order to maintain crew in near neutral energy balance, the science team will monitor monthly the astronaut body mass during the entire space flight period with the Body Mass Measuring Device (BMMD) and body composition by BIA. Changes in fat mass will trigger advices to the astronauts for changing the energy intake, discussed and harmonized with the nutritional community and the flight surgeons.