Paper ID: 49136
student

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Medicine in Space and Extreme Environments (4)

Author: Ms. Katie Harris
International Space University (ISU), France

Dr. Lonnie Petersen
University of California, San Diego, United States
Prof. Volker Damann
International Space University, France
Dr. Jonathan Scott
Wyle Labs, Germany
Dr. Tobias Weber
ESA, European Astronaut Centre (EAC), Germany

EFFECTS OF LOWER-BODY NEGATIVE PRESSURE (LBNP) ON FLUID DISTRIBUTION DURING GRAVITATIONAL UNLOADING

Abstract

During spaceflight, astronauts undergo numerous physiological changes due to the microgravity environment. One of the most effects is the redistribution of fluid from the legs to the torso, which may significantly impact the cardiac and neuro-ocular systems. Lower Body Negative Pressure (LBNP) is a technique that can be used to restore the 1G distribution of fluid within the body during spaceflight by drawing the fluid back into the legs using a pressurized chamber sealed at the iliac crest. As numerous space actors plan for extended deep space missions, effective countermeasures to combat the possible negative effects of fluid shifting are required. Currently, LBNP is used actively by Russian cosmonauts in the form of the Chibis suit as a countermeasure before reentry, while American and European space programs primarily use LBNP as a testing and research tool on the ground. A narrative review was undertaken under the supervision of Professor Volker Damann (ISU), Dr. Jonathan Scott (EAC), and Dr. Tobias Weber (EAC), to determine the current standing of LBNP research regarding the efficacy of LBNP as a countermeasure, as well as the general understanding of causal links between LBNP pressures and fluid movement. The review indicates that while there is significant ground-based research that links a step-down protocol of LBNP pressures to heart rate and eventual orthostatic tolerance in astronauts, the literature pertaining to the movement of fluid specifically is sparse. This presentation will outline the research conducted, and the critical gaps found in LBNP fluid movement research that must be addressed in order to proceed with adapting LBNP as a practical, comfortable, and effective countermeasure for long duration space flight.