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Author: Ms. Nadia Lizbeth Zenteno Perez
Mexico, nadia.zentenop@gmail.com

Mr. Rivaldo Carlos Duran Aquino
Universidad Nacional Mayor de San Marcos, Peru, rivaldo.duran@unmsm.edu.pe

Mr. Julio Abraham Rizo Churape
University of Guadalajara, Mexico, julioabrahamrizo@gmail.com

Ms. Diana Karen Hernández Araujo
Universidad de Valle de México Campus Coyoacán, Mexico, dkha.0900@gmail.com

Ms. Mónica Ortiz Álvarez
The University of Edinburgh, United Kingdom, monicalvort@gmail.com

Ms. Ingrid Marian Dominguez Juarez
Astroland Agency, Mexico, inmadoju_99@hotmail.com

Ms. Arlette Pamela Silva Hernandez
Consejo de Ciencia y Tecnología del Estado de Guerrero, Mexico, arlettesilva0197@gmail.com

Ms. Laura Guadalupe Barajas Martell
Universidad Autónoma del Estado de Hidalgo (UAEH), Mexico, lauramartellb@gmail.com

Dr. Nataly Andrea Rojas Barnett
Universidad Nacional Mayor de San Marcos, Peru, natalyandrearojasbarnett@gmail.com

THERMODYNAMIC AND BIOPHYSICAL EFFECTS OF EXTREME CONDITIONS ON ANALOG
ASTRONAUTS IN THE ASTROLAND INTERPLANETARY HABITAT: A STUDY OF THE FIRST
LATIN AMERICAN ANALOG MARS RESEARCH MISSION USING SUSTAINABLE SMART SOCKS

Abstract

The exposure to extreme conditions in the underground analog habitat of the Astroland Interplanetary Agency caused participating analog astronauts to experience psychological alterations during the execution of the First Latin American Mars Analog Research Mission. After multiple analyses, considerable differences in their main clinical values were evident.

Nowadays, it is anticipated that with the expansion of future human colonization and the establishment of sustainable settlements on the Martian and Lunar surfaces, humans must have the ability to adapt mentally and physiologically to the thermodynamic changes and pressure differences inherent in extraterrestrial space. One of the greatest challenges in the development of the Space Sector is known to be the extreme conditions faced in the International Space Station and during space flights. As a result, the study and investigation of this data are proposed as the first phase, along with recent analog research missions in extreme terrestrial environments. During the course of this research, it is proposed to use the values obtained from the Principia mission, based on clinical data such as: the variability of blood pressure, and SpO₂, same values, intervene as a determining factor in the alteration of the circadian cycle (for the absence of sunlight and the changes within the analog environment). These ailments similarly occur in astronauts during long periods aboard the ISS or in extreme extraterrestrial environments.

Accordingly, this research approaches the study of space stress from a deductive-experimental methodology, applying the pioneering development of smart textiles with sustainable fibers inspired by the natural

ability to achieve homeostasis. Hence, these smart socks allow for the non-invasive monitoring of physiological parameters and provide sensory stimuli to counteract stress. Through these sustainable technologies, a disruptive and responsible solution is addressed, which, through the thermodynamic, biophysical, and smart textile perspectives, lays the groundwork to ensure a psychologically safe environment in space for future generations.

To summarize, the study of space medicine from its relationship with thermodynamics and biophysics, faces the challenge of ensuring the health of astronauts in the extreme conditions of space. As we explore the possibility of colonizing other planets, the Moon or simply ensuring a sustainable life within Earth, it is essential to adopt a sustainable responsibility approach that considers both the physical and psychological needs of astronauts and humans on Earth hand in hand with environmentally friendly products.