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Medical Care for Humans in Space (3)

Author: Mr. Oscar Ojeda
Cydonia Foundation, Colombia

Dr. Bruno Sarli
NASA GSFC, United States
Ms. Dana Martin
Cydonia Foundation, Colombia
Mr. Tarek Rivas Granados
Cydonia Foundation, Colombia

ANALOG SPACEFLIGHT MEDICINE: AN OPPORTUNITY FOR MEDICAL RESEARCH FOR
HUMAN SPACEFLIGHT ON TERRESTRIAL ANALOG STATIONS

Abstract

Human medical science in space is a major area of interest for future endeavors in spaceflight. There are, however, areas that still require research in order to fill gaps in the current knowledge. These areas go beyond the in-space human physiology, and focus on treatment of medical emergency events while in space. With a view to contribute to the expansion of crewed commercial spaceflight and deep-space long-duration missions to the Moon and Mars, this research will focus on drafting protocols for in-space treatment of illness and trauma. One of the challenges in analyzing spaceflight medical data is the low number of samples. In addition, this data comes from patients that have gone through a stringent selection process and, as a result, have excellent health. The advent of commercial space will see a rising number of participants of a diverse background and, perhaps, not as healthy. Moreover, empirical knowledge of deep space medical response is currently limited to the data of the Apollo astronauts. Analog research appears as an effective alternative to help to bridge this gap. Analogs are natural or artificial environments on Earth that aim to mimic, in one or more ways, an extraterrestrial situation or location. While the fidelity of analog research may be limited on aspects such as microgravity and radiation exposure, it presents areas of opportunity where relevant medical research can be undertaken. Additionally, it presents a good environment to test and practice medical emergency protocols, which can be later incorporated into future human spaceflight as well as defining an implementation roadmap to analog stations. The research is conducted in four steps. First, it performs a comprehensive literature review on documented in-space medical and trauma emergencies outlining the most common occurrences thus far. Second, it uses the information in step one, to define: (1) a drug kit that addresses the most common medical emergencies; (2) simple steps to assess and treat medical ailments utilizing the drug kit; and (3) adapts ground trauma procedures to in-space occurrences. Third, it drafts simple protocols for in-space medical and trauma response. Finally, fourth, it presents how a pilot of these draft protocols were implemented and tested in the HAdEES-C analog station in a series of operational tests aimed to provide a first order validation.