

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

Author: Prof.Dr. Sofia Pavanello
University of Padova, Italy, sofia.pavanello@unipd.it

OCCUPATIONAL EXPOSURES TO EXTREME ENVIRONMENTS: EFFECTS ON HEALTH AND
TRANSLATIONAL ASPECTS IN SPACE

Abstract

Research exploring how physiology copes with challenges of time spent in extreme environments on the Earth may bear significant translational relevance to clinical situations in space and other planets for beyond-Earth habitation. As living beings start to move out of Earth into space, they will have to change their biology and adapt to new conditions. The preparation prior-to-space travel could be carried out by adapting and living in a high altitude environment. The number of people working, living and travelling at high altitude is constantly increasing, driven by multifactorial causes such as improved access, growing populations, job availability, changing economies and increased popularity of mountain recreation. There are however currently no clear indications or guidelines regarding the assessment of suitability for work at high altitude. Conversely, the international literature on high altitude pathology is very rich. Requests for specific assessments are increasingly frequent not only for the tourism or sports-related stay at high altitude, but also and above all for carrying out work activities at altitude.

High altitude is extremely challenging environments and a potential health hazard due to their intrinsic characteristics such as low temperatures, high UV radiations, and hypobaric hypoxia induced stress. Exposure to these factors often lead to the development of high-altitude pathologies such as cognitive impairments associated with neuroinflammation, and higher muscle catabolism. Furthermore, biological aging is often affected by environments that can induce oxidative stress and inflammation, such as in hypobaric hypoxia, though a specific assessment in case of extreme altitudes exposition has not yet been described. Strenuous and hazardous work may contribute to loose years of good health in later life, which has implications for individuals' quality of life as well as healthcare use and labour market participation. To implement targeted health surveillance and activate effective prevention of high altitudes related pathologies, the creation of actual accredited guidelines, which may also have international value and relevance, are needed.

We evaluate in subjects exposed to 10 days of acute exposure to hypobaric-hypoxia at 4000mslm 1) biological aging 2) neurocognitive alteration 3) neurofilaments and agrin 4) visuospatial and reasoning abilities, and processing speed.

During 10 days expedition in Puna de Atacama region, we expect these parameters to be altered by extreme conditions, namely by acute hypobaric-hypoxia exposure. We hope to contribute to the exploration of this particular domain that hasn't been thoroughly studied yet, and may open new perspectives on further Earth-Moon-Mars studies for human adaptation.