

Challenges of Life Support/Medical Support for Human Missions (8)
Challenges of Life Support/Medical Support for Human Missions (2) (2)

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EFFECTS OF SUNLIGHT SIMULATOR LIGHTING SYSTEM ON SEROTONIN, MELATONIN AND
PHYSIOLOGICAL PARAMETERS RELATED WITH CIRCADIAN CLOCK OF THE ANALOG
ASTRONAUT CREWS PERFORMING SIMULATION OF SPACE MISSION IN THE AATC HABITAT
IN POLAND.

Abstract

Artificial light used on spaceships is different from the natural sunlight on the Earth. It strongly influences the function of biological clocks of the astronaut crews, especially during long-term missions. There are multiple papers describing effects of health problems in space, which are strongly related with desynchronisation of astronauts circadian rhythms. To solve this problem, we developed a sunlight simulator lamps to synchronise biological clock in humans, especially those living in sunlight deprived locations.

Prototypes of sunlight simulator lamps were developed based on the concept described by Kolodziejczyk et al. [1], in the frame of RD project realised by Qlab [2] and implemented in the AATC habitat in Poland [3]. The habitat was isolated from natural light and transformed to the chronobiological laboratory. The base was equipped with multiple environmental sensors to sustain the experiment in constant repeatable conditions controlled by the Habitat Operation System [4]. Two voluntary crews of analog astronauts performed 6-week long lunar mission simulations. Analog astronauts were exposed to 3 different types of lighting: standard artificial LED lighting (control), artificial daylight with IR, and artificial daylight with UV. Each type of lighting exposure lasted 2 weeks. Physiological parameters such as temperature, body mass, water metabolism, heart rate, levels of serotonin, melatonin, cortisol, testosterone, stress responses and sleep quality were analysed for each analog astronaut participating in the project. Obtained results were based on laboratory analysis of saliva, urine and serum samples and also written by us applications, for example STP Test for the analysis of induced time perception in humans [5].

We observed positive effects of using sunlight simulator lamps in isolated spaces, especially resulting in increased work efficiency levels and astronaut mood. Actually we apply our knowledge in production of functional sunlight simulator lamps, which will be commercially available on the market for everyone.

Bibliography:

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