SPACE LIFE SCIENCES SYMPOSIUM (A1)
Human Physiology in Space (2)

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THE EUROPEAN THESEUS ROADMAP: TOWARDS HUMAN EXPLORATION OF SPACE

Abstract

Past space missions in Earth orbit have demonstrated that humans can survive and work in space for long durations. However, there are pending technological, medical and psychological issues to be solved before adventuring in longer duration missions. Technological breakthroughs in life support systems and recycling technologies are also required to reduce the costs of these expeditions to acceptable levels. Solving these issues will need scientific and technological breakthroughs of interest for clinical and industrial applications and also allow identifying the relevance of these questions to health issues on Earth.

The THESEUS (Towards Human Exploration of Space – a EUropean Strategy) project was supported by the European Commission 7th framework Programme running from 1 January 2010 to 31 March 2012. This project had for objective to i) identify disciplinary research priorities; (ii) focus on fields with high terrestrial application potential; and (iii) build a European network as the core of this strategy.

The core of THESEUS was represented by 14 disciplinary Expert Groups organised in 5 clusters (integrated systems physiology; psychology and human-machine systems; space radiation; habitat management and health care). A total of 123 international experts participated in these Experts Groups . Through physical meetings as well as a wide online consultation, THESEUS Expert Groups identified a set of 99 Key Issues required to be addressed to enable a further step in human space exploration. For each Key

Issue, knowledge gaps were identified and suggestions for research activities were proposed. The outcomes and findings of the THESEUS expert groups have been published in five cluster reports.

Findings from the Expert Groups have been integrated into a roadmap proposing a programmatic structure to be implemented over the next decade. This structure is articulated around three themes and would allow to properly addressing (in an integrated manner) the current knowledge gaps required to be filled to further perspectives in human space exploration. The three overarching THESEUS Roadmap Themes detailed in the manuscript and presentation are:

- Theme 1: Develop an integrated view of human adaptation to the space environment;
- Theme 2: Develop an integrated view of countermeasures to multiple stressors;
- Theme 3: Developan integrated view of tools and methods