

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

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PRELIMINARY DATA OF CHANGES IN THERMOREGULATION IN ASTRONAUTS ON ISS USING
A NEW NON-INVASIVE HEAT FLUX DOUBLESSENSOR

Abstract

Introduction: Studies on thermoregulatory adaptations of humans during space flight have been very limited to date or are even missing due to methodological constraints. Body core temperature (BCT) is one of the important parameters which influences several physiological and biochemical key pathways of the organism. With the new heat flux DoubleSensor technology, developed by the German Draeger-Werke in close cooperation with the Charité University of Medicine Berlin and which is currently part of different running and future studies on the International Space Station (ISS), it is possible to measure BCT non-invasively. Here, we will report about the changes in core temperature during a submaximal exercise test performed on ISS in astronauts. We hypothesized that heat balance and thermoregulation are altered in humans. **Methods:** The study started in February 2009 on ISS and until 2012 in total 12 subjects will be analysed. The astronauts are instrumented with DoubleSensors on the head and sternum, recording BCT pre-, in-, and post-flight during exercise in conjunction with submaximal VO₂ max testing in astronauts. **Results:** Out of 12 we have collected full data sets from 4 Astronauts; another is currently on-going on the ISS. During pre-flight exercise (L-270, L-60, L-30) BCT amplitude increased about 2.0C compared to baseline; similar increases were observed in a control group. On day FD15 and FD45 we recorded a decrease in temperature amplitude of BCT during exercise; it differed only by 1.0C. But on day FD135 and FD165 BCT amplitude increased up to 3.5C compared to base line. On all FD measurement points we recorded a prolonged elevation of BCT during the rest period. Post-flight BCT amplitude and elevation under rest and exercise was not re-adapted compared to baseline and did not reach pre-flight levels in R+1, R+10, and R+30. **Conclusions:** The new heat flux DoubleSensor is able to monitor BCT in humans under rest and exercise under microgravity conditions. Furthermore, thermoregulation seems to be attenuated due to changes in heat transfer, fluid shifts along the body axis as well as cardiovascular and autonomous nervous system adaptations. We conclude a higher load in BCT in astronauts during long term space flight which might have an impact on human physiological and biochemical regulation.