

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

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ISS EXPERIMENT BP REG: AN INFLIGHT TEST OF RISK FOR FAINTING AFTER
LONG-DURATION SPACEFLIGHT**Abstract**

The return to Earth's gravity after long-duration spaceflight can cause marked reductions in arterial blood pressure (BP) with dizziness or fainting in some astronauts. Currently, it is not possible to predict which astronauts might be at greatest risk for orthostatic intolerance. The BP Reg experiment developed a method to cause a drop in BP that is independent of gravity through the application of large thigh cuffs to occlude circulation to the legs then to rapidly release the cuff. Here we report on the comparison of thigh cuffs and standing on Earth as well as preliminary data from five male astronauts before, during and after spaceflight. The control studies were conducted in 9 healthy young subjects. Cardiovascular responses in the transition from supine to standing were compared with response to leg cuff deflation after 3 min arterial circulatory occlusion. Pre-flight, astronauts completed a supine to sit to stand transition and three repetitions of the leg cuff deflation. In-flight, the ESA Leg-Arm Cuff System (LACS) was used in combination with the continuous blood pressure device linked through the CardioLab to the Pulmonary Function System enabling real-time ground monitoring of the response. In the control studies, the reduction in BP was not different between supine-stand and leg cuff: nadir diastolic BP was 46.9 ± 9.4 vs. 45.6 ± 7.9 mmHg. The reduction in diastolic BP for the astronauts in pre-flight testing was also similar between the stand and leg cuff. The peak reduction in DBP for the stand test from supine baseline was 13.5 ± 3.4 mmHg for pre-flight and 17.0 ± 2.5 mmHg post-flight, a mean response change for these 5 astronauts of 3.5 mmHg. The peak reduction in DBP for the leg cuff test was 15.2 ± 1.9 mmHg pre-flight and 13.9 ± 1.8 mmHg in-flight. These preliminary results in the first 5 of 8 subjects show that the BP dip-and-recovery response to leg cuff deflation persists in zero gravity. These results provide proof-of-concept for using the ESA LACS system to test the arterial baroreflex response inflight as a prediction of potential post-flight orthostatic hypotension. This protocol provides a sensitive tool for assessing risk for orthostatic intolerance and for guiding assignment of appropriate end-of-flight countermeasures. Supported by CSA.