

# THE IMPACT OF LONG DURATION SPACEFLIGHT ON THE FUNCTION OF PLASMA CELLS

G. Spielmann<sup>1</sup>, J. Campbell<sup>1</sup>, B.E. Crucian<sup>2</sup>, M. Laughlin<sup>3</sup> and R.J. Simpson, FACSM<sup>4</sup>

<sup>1</sup>School of Kinesiology, Louisiana State University, Baton Rouge, LA, USA; <sup>2</sup>NASA-Johnson Space Center, Houston, TX, USA; <sup>3</sup>Laboratory of Integrated Physiology, Department of Health and Human Performance, University of Houston, Houston, TX, USA; <sup>4</sup>University of Arizona, Tucson, AZ, USA.

Long duration spaceflights have been associated with profound dysregulation of the immune system, which could jeopardize crew safety and mission success. Recent studies have examined the impact of long-duration spaceflight on specific markers of adaptive and innate immunity, but no study to date has characterized humoral immunity and serological markers of B-cell function. **Purpose:** The aim of this study was to characterize acute and chronic changes in polyclonal Free Light Chains (FLC) and in Immunoglobulin class switching, indicative of overall B-cell function, by retrospectively analyzing archived plasma samples collected during long-duration spaceflight studies. **Methods:** Plasma samples were collected before flight, during ("Early flight", "Mid-flight" and "Late flight"), immediately upon return and during a recovery period (R+18, R+33 and R+66) from 23 astronauts and 6 age/gender-matched healthy ground-based controls. Plasma Kappa and Lambda Free Light Chains were measured using commercially available ELISA kits (Abingdon Health, Oxford, UK), and changes in renal function were identified by calculating Cystatin C-derived estimates of Glomerular Filtration Rate (eGFR). Finally, Immunoglobulin isotype switching was assessed by measuring changes in total plasma IgA, IgG and IgM throughout the mission using ELISA kits (eBioscience, San Diego, CA, USA). Maximum likelihood linear mixed models (LMM) were used to determine main effects of time on the concentration of serum FLC, Immunoglobulins and Cystatin C. **Results:** There was no difference in serum Kappa and Lambda FLC between pre-flight samples and either in-flight or recovery samples ( $p>0.05$ ). Furthermore, serum levels of IgA, IgG and IgM remained unchanged during and after spaceflight, when compared to pre-flight values ( $p>0.05$ ). Finally, there was no difference in eGFR ( $p>0.05$ ) between before, during and after flight, suggesting that kidney function was not affected by spaceflight. **Conclusion:** These preliminary findings indicate that free light chains and whole immunoglobulin output from plasma cells are unaffected by long-duration spaceflight, indicating that plasma cell immune competency is maintained in microgravity and risk of infection does not appear to be magnified.