

The ESA-NASA '*CHOICE*' Study: Winterover at Concordia Station, Interior Antarctica, A Potential Analog for Spaceflight-Associated Immune Dysregulation

B. E. Crucian¹, R. P. Stowe², S. K. Mehta³, H. Quiriarte⁴, D. L. Pierson⁵,
C. F. Sams⁵

¹Wyle, Houston, Texas, ²Microgen Laboratories, Houston, Texas, and ³EASI, Houston, Texas, ⁴JES Tech, Houston, Texas, and ⁵NASA-Johnson Space Center, Houston, Texas

BACKGROUND

For ground-based space physiological research, the choice of terrestrial analog must carefully match the system of interest. Antarctica winter-over at the European Concordia Station is potentially a superior ground-analog for spaceflight-associated immune dysregulation (SAID). Concordia missions consist of prolonged durations in an extreme/dangerous environment, station-based habitation, isolation, disrupted circadian rhythms and international crews. The ESA-NASA *CHOICE* study assesses innate and adaptive immunity, viral reactivation and stress factors during Concordia winterover deployment. Initial data obtained from the first study deployment (2009 mission; 'n' of 6) will be presented, and logistical challenges regarding analog usage for biological studies will also be discussed.

RESULTS

The total WBC increased, and alterations in some peripheral leukocyte populations were observed during winterover at Concordia Station. Percentages of lymphocytes and monocytes increased, and levels of senescent CD8+ T cells were increased during deployment. Transient increases in constitutively activated T cell subsets were observed, at mission time points associated with endemic disease outbreaks. T cell function (early blastogenesis response) was increased near the entry/exit deployment phases, and production of most measured cytokines increased during deployment. Salivary cortisol demonstrated high variability during winterover, but was generally increased. A 2-point circadian rhythm of cortisol measurement (morning/evening) was unaltered during winterover. Perceived stress was mildly elevated during winterover. Other measures, including in-vitro DTH assessment, viral specific T cell number/function and latent herpesvirus reactivation have not yet been completed for the 2009 winterover subjects.

CONCLUSION

Based on the preliminary data, alterations in immune cell distribution and function appear to persist during Antarctic winterover at Concordia Station. Some of these changes are similar to those observed in Astronauts, either during or immediately following spaceflight. Based on the initial immune data and environmental conditions, Concordia winterover may be an appropriate analog for some flight-associated immune changes.

Representative data, 'n' 6 subjects, winterover 2009:

