Intro

HYPOTHESIS: We predict that the space-flown twin will experience a space flight-induced alteration in proteins and peptides related to fluid balance, fluid control and brain injury as compared to his pre-flight protein/peptide signatures. Conversely, the trajectory of these protein signatures will remain relatively constant in his ground based co-twin.

METHODS: We are using proteomic and standard immunoelectrophoresis techniques to delineate the change in protein signatures throughout the course of a long duration space flight in relation to the development of VIIP. We are also applying a novel cell-based metabolomic organ system assay ("Organs on a Plate") to address how these circulating biomarkers affect physiological processes at the cellular and organ level which could result in VIIP symptoms. These molecular data will be correlated with physiological measures (eg. extra and intracellular fluid volume, vascular filling/flow patterns, MRI, and Optic Coherence Tomography).

DISCUSSION: Pre- and in-flight data collection is in progress for the space-flown twin, and similar data have been obtained from the ground-based twin. Biosamples will be batch processed when received from ISS after the conclusion of the 1-year mission. Omic and Physiological measures from the twin astronauts will be compared to similar data being collected on twin subjects who participated in simulated microgravity study. bed rest study.