The Stress and Antibiotic Response of Clinical Isolate *Pseudomonas aeruginosa* PA 14 to Altered Gravity Conditions

Spaceflight induces many changes in both human immune response and microbial virulence. *Pseudomonas aeruginosa* is a ubiquitous, opportunistic bacterial pathogen that astronauts and equipment will likely encounter in the microgravity environment of spaceflight. Studying *P. aeruginosa* in a modeled microgravity environment will help elucidate the underpinnings of the virulence shift and provide clues as to how the organism adapts to a low shear, microgravity environment. The HARV (high aspect ratio vessel) is a spaceflight-analogue system designed by NASA to create a low shear environment that models microgravity. Rotating the vessel perpendicular to the gravity vector creates the low shear modeled microgravity (LSMMG) environment. In previous studies, bacteria grown under LSMMG have an increased virulence phenotype, such as increased tolerance to salt or ethanol treatment. Here we present work characterizing the impact of LSMMG on clinically-relevant *P. aeruginosa* strain PA 14, investigating quantitatively the phenotype and gene expression of target genes in response to stressors (heat, ethanol, salt, acid, and various classes of antibiotics). In contrast to other phenotype-based findings, we find after systematic experimentation that elevated virulence is not always a consequence of LSMMG growth. However, gene expression of particular genes, such as those in the pathway for catalase and alginate production, is altered by growth in the LSMMG environment. Findings such as these will aid in directing research for the prevention of *P. aeruginosa* infections in astronauts as well as lead to strategic development of improved decontamination of biofouled equipment such as water recycling systems.