Effect of fluid shear on Pseudomonas aeruginosa biofilm morphology grown under different gravity regimes

Biofilms, communities of bacteria encased in a self-produced extracellular matrix, can be extremely problematic during space travel as biofilm cells can obstruct pipes and pose a health risk to the passengers. These risks are difficult to mitigate as biofilm cells display increased resistance to a variety of stressors, including shear stress. Shear stress is the force exerted when liquids move against a solid. Under Earth's gravity, shear stress increases biofilm growth. How shear stress affects biofilm formation under different gravity conditions is currently unknown. Here we aim to test the effect of fluid shear on biofilm morphology grown under different gravity regimes, using the opportunistic human pathogen *Pseudomonas aeruginosa* as our model organism. We hypothesize that changes in microgravity will not affect the biofilm morphology, but changes in shear stress will. To investigate the effects of shear stress on *P. aeruginosa* biofilm formation under different gravity regimes, the biofilms are grown combinatorially under three shear conditions (0.5 mPa, 2.5 mPa, and 5.0 mPa) and three gravity conditions (~0 g to mimic low Earth orbit,1 g to mimic Earth, and 0.38 g to mimic Mars). Earth's gravity (1 g) with 2.5 mPa shear stress is a control, as *P. aeruginosa* biofilms grown under these conditions have been previously characterized. Confocal laser microscopy is used to image the biofilms after 72 hours of growth, and Volocity software is used to quantify biofilm characteristics.