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Life and Physical Sciences under reduced Gravity (7)

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REDUCED PSEUDOMONAS AERUGINOSA CELL SIZE OBSERVED ON PLANKTONIC CULTURES
GROWN IN THE INTERNATIONAL SPACE STATION**Abstract**

Bacterial growth and behavior have been studied in microgravity in the past, but little focus has been given to cell size, despite its impact on myriad processes, including biofilm formation which is of impact for crew health. To interrogate this characteristic, supernatant aliquots of *P. aeruginosa* cultured on different materials and media on board the International Space Station (ISS), as part of the Space Biofilms experiment, were analyzed. For that experiment, *P. aeruginosa* was grown in microgravity – with matching Earth controls – in modified artificial urine medium (mAUMg hi-Pi) or LB Lennox supplemented with KNO₃, and its formation of biofilms on six different materials was assessed. After one, two, and three days of incubation, the ISS crew terminated subsets of the experiment by fixation in paraformaldehyde, and aliquots of the supernatant were used for the planktonic cell size study presented here. The measurements were obtained post-flight through the use of phase contrast microscopy under oil immersion, a Moticam 10+ digital camera, and the FIJI image analysis program. Statistical comparisons were made to identify which treatments caused significant differences in cell dimensions, using the Kruskal-Wallis and Dunn tests. There were statistically significant differences as a function of material present in the culture, in both LBK and mAUMg hi-Pi. Along with this, data was also grouped by gravitational condition, media, and days of incubation. Comparison of planktonic cells cultured in microgravity showed reduced cell length (from 3.87% to 10.4% depending on the material) and diameter (from 1.10% to 10.3% depending on the material) with respect to their matching Earth controls, with the caveat that the cultures may have been at different points in their growth curve at a given time. In conclusion, smaller cells were observed on the cultures grown in microgravity, and cell size changed as a function of incubation time and the material upon which the culture grew. We here describe these changes and possible implications for human space travel in terms of crew health and potential applications.

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