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Life and Physical Sciences under reduced Gravity (7)

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PAYLOAD PROPOSAL FOR EVALUATING THE EFFECT OF HYPERGRAVITY/MICROGRAVITY ON ANTIBIOTIC RESISTANCE

Abstract

The growing number of bacterial species that can withstand high concentrations of antibiotics or not succumb to them is of great concern to the World Health Organization (WHO). For this reason, the work that studies the factors that produce resistance to antibiotics has increased. At first, it was believed that it was a phenomenon of genetic adaptation; however, recent studies report an influence of factors such as severity on bacterial resistance. In 2014, it was reported (Cabral et al., 2014), in a modified gravity experiment, a decrease in microbial growth was shown. However, an acceleration in the logarithmic stage leaves the question of whether there is an enhancing effect on bacterial colony stability by engaging bacterial numbers to optimize nutrient uptake under hypergravity stress. On the other hand, in a microgravity process, the population increases due to the decreased efficacy of the applied drugs (Horneck, Klaus, Mancinelli, 2010), showing an obvious risk to public health. These two works allow us to discover the effects of modified gravity in microorganism systems. However, there is still a need to evaluate data under microgravity and hypergravity conditions to assess antibiotic resistance under stress conditions. Therefore, the proposal aims to develop a non-animal model in a lab-on-chip system. This system allows us to assess bacterial growth and resistance accurately. Lab-on-chip allows us to cultivate two bacteria (gram-negative and gram-positive) genetically modified with GFP (GREEN FLUORESCENT PROTEIN) and RFP (RED FLUORESCENT PROTEIN) for easy recognition employing a camera to record and evaluate the number of cells at a certain point in the growth curve. Likewise, the system that is intended to be developed will allow us to evaluate, for a maximum period of 12h, the resistance behaviour of 3 different concentrations of antibiotics, allowing us to find the minimum inhibitory concentration of an antibiotic.