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NEURONGRAV: CHARACTERIZING NEURONAL RESPONSES IN ALTERED GRAVITY VIA GLIDER-BASED PARABOLIC FLIGHTS

Abstract

Experiments in an altered gravity environment are a fundamental part of many branches of applied sciences, including biology, physiology, and space medicine. In this scope, either earth-bound weightlessness or hypergravity conditions are typically achieved by means of parabolic flights. Recently, gliders have been proposed as a practical and cost-efficient alternative to classical microgravity platforms, such as airliners and light aircraft. However, their relevance and usability for biology experiments have not been demonstrated yet. Here, we present the results of the NeuronGrav (Neuronal responses in altered Gravity) experiment. Its main aim is to characterize adaptative alterations induced on human neuronal-like cells by short exposures to altered gravity. Previous studies have demonstrated modulation of neuronal plasticity, changes in neurite network, neuron morphology and viability, and induced autophagy through mitochondrial dysfunction, followed by fast recovery processes upon short periods of exposure to microgravity. Our main contribution is to discuss the possibility to reproduce and further characterize these observed effects during parabolic flights performed with a glider. Using a custom framework, which allows to host an incubator and several cell lines during the flight, we measure cellular viability and toxicity, cytoskeletal alterations, and quick onset biochemical alterations in response to altered gravity in neuronal-like cell cultures. Overall, we aim at validating gliders as an adequate altered gravity platform for biology and medicine experiments.