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Author: Dr. Hannah Nazri
University of Oxford, United Kingdom, hannah.m.nazri@gmail.com

Ms. Ashley Tsai
University of Oxford, United Kingdom, ashley.tsai@linacre.ox.ac.uk
Mr. Mohammad KaramiNejadRanjbar
University of Oxford, United Kingdom, mohammad.karaminejadranjbar@imm.ox.ac.uk
Mr. Daniel Sors Raurell
Open cosmos Ltd., United Kingdom, dani@open-cosmos.com

THE EFFECT OF MICROGRAVITY AND COSMIC RAYS ON IMMORTALISED HUMAN CELL LINES IN A SUSPENSION CULTURE CONDITION ON A NANOSATELLITE PLATFORM.

Abstract

Previous experiments have investigated the effects of microgravity on embryogenesis and stem cell differentiation, and the effects of cosmic radiation on genomic integrity and cell survival. These experiments were performed on the International Space Station (ISS) or relied on simulated situations such as parabolic flights and random positioning machines (RPMs). The paucity of data may be in part due to the high cost of performing experiments on the ISS and the limitations (e.g. short timeframe) of simulated situations. Nanosatellites, on the other hand, can provide a relatively low-cost, accessible way to perform biological experiments in a real space environment.

We propose a simple biological experiment to be carried out in a nanosatellite designed and controlled by Open Cosmos. The overall aim of the study is to understand the effect of microgravity and cosmic rays on the growth and apoptosis rate of immortalised human cell lines in a suspension culture condition on a nanosatellite platform. The results will have implications for human health in space, and for platforms for future biological experiments in space.

The nanosatellite will carry immortalised human B cells in T12.5 culture flasks that are filled to capacity with carbon dioxide-equilibrated RPMI medium to provide sufficient nutrient for an extended period of time. Heating pads and temperature sensors will ensure that the cells are maintained at a conventional cell culture temperature of 37C. One set of cells will be exposed to cosmic radiation, whereas another set will be protected with aluminium shielding. Geiger counters will record the difference in radiation exposure between the two groups of cells. Cameras on board the nanosatellite will regularly take and transmit images of the cells. These images will be analysed to investigate the effects of microgravity and cosmic radiation on cell morphology, division, and apoptosis.