Paper ID: 44888
interactive
student

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Interactive Presentations - IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (IP)

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EFFECT OF MICROGRAVITY ON BREAST CANCER CELLS

Abstract

Purpose The aim of this project is to study the changes that happen to MCF7 breast cancer cells in the microgravity environment, using simulation devices, parabolic flights and a sounding rocket. We are particularly interested in studying changes in morphology and the cytoskeleton during microgravity.

Methodology The parabolic flight experiment will be performed starting from Bordeaux-Merignac in France with an Airbus A310. Each parabolic flight offers 31 parabolas, each offering 22 seconds of microgravity. MCF-7 cells will be seeded in T-75 Flasks. Some flasks will be fixed by RNAlater after the first parabola and the other flasks will be fixed after the last parabola. RNA will be extracted from the cells to study the RNA transcription changes during weightlessness. Moreover, MCF-7 cells will be seeded into Slide Flasks and the cells will be fixed with PFA after the end of the 31 parabola. These cells will be stained by immunofluorescence and examined under the confocal microscope to study the morphological and protein expression changes.

The sounding rocket experiment will be performed in Kiruna, Sweden. MCF-7 cells, expressing Lifeact-GFP marker protein for the visualization of F-actin, will be on board the sounding rocket. The cells will be examined by life cell imaging, using the FLUMIAS microscope. The FLUMIAS microscope was used on a previous sounding rocket mission performed by our lab with thyroid carcinoma cells (Corydon et al. 2016). Moreover, MCF-7 cells will be seeded on 18 well Ibidi slides and the cells will be fixed with PFA after the end of the microgravity phase. The fixed cells will be examined by confocal microscopy. Finally, they will be compared to the fixed cells on the parabolic flight.

Results In the parabolic flight, we expect an up-regulation of cytoskeletal genes after the 31st parabola. And we expect that the FLUMIAS microscope will show significant changes of the cytoskeleton similar to the changes that happened to the FTC-133 cell in the previous sounding rocket mission (Corydon et al, 2016). These changes are the disturbance of F-actin bundles, the appearance of filopodia- and lamellipodia-like structures and cellular detachment.

Conclusions Studying the changes occurring in MCF-7 cells exposed short-term microgravity during a parabolic flight and a sounding rocket mission can provide more insight in morphological and cytoskeletal

alterations. In addition, knowledge about changes in cell adhesion and migration behavior of the cells is helpful for future long-term space experiments.