

IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Life and Physical Sciences under reduced Gravity (7)

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PLAN.A - CONCEPT OF RESEARCH ON THE EFFECT OF STIMULATION ON BONE CELL
CULTURES UNDER LONG-TERM MICROGRAVITY USING LAB-ON-CHIP DEVICES

Abstract

The Plan.A is a project for a biological experiment utilizing lab-on-chip devices. It was qualified for the Orbit Your Thesis! 2020 Selection Workshop organized by the European Space Agency. The major objective of the project is to develop a 1-2 U payload to examine the effect of microgravity on the human cell cultures of bone cell lines (osteoblasts). Compact size, universality, and modularity allow to consider performing this experiment not only on the Space Station but also as a payload of sounding rockets or satellites. The main focus of the works lies in the design and fabrication of a miniaturized, remotely controlled laboratory unit, basing on the use of analytical microsystem techniques. The miniaturized laboratory, so-called lab-on-chip device, will allow creating special culturing microenvironments (optimal temperature, uniform lighting, and gas/liquid flow, etc.) and conducting long-term studies (at least 11 days) of the bone cell culture lines. Additionally, data analysis of the biological sample images through the optical detection system will be conducted. On that basis, the evaluation of population development and cells' morphological characterization will be done. As it has been mentioned, the proposed experiment will cover the investigation of the microgravity influence on the osteoblasts culture. One of the research innovations here will be the use of special culture stimulants, which in the Earth conditions increase the number of osteoblasts and the secretion of non-collagen bone proteins. It is highly anticipated that these stimulants will sustain and even boost the proliferation of the osteoblasts' colony in the microgravity as well. However, any other behavior of the cells to be observed will be scientifically interesting. As the vast majority of information about the influence of microgravity on the bone cells comes from research carried out onboard the ISS. This could be a next great occasion to experiment on that topic using this facility.