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OPERATION OF BIOLOGICAL EXPERIMENTS IN THE BIOLAB FACILITY ON BOARD COLUMBUS

Abstract

Biolab is a multi-user payload facility for biological experiments, that was launched on board of the Space Shuttle Atlantis with the Columbus laboratory on the 7th of February 2008. Since then the facility is accessible to the scientific community. A number of experiments by different project teams have been performed and research is still ongoing. Biolab is operated under ESA contract by the Microgravity User Support Center (MUSC) at DLR in Cologne, Germany.

Biolab offers two centrifuges inside an incubator (capable of controlling temperatures from 18C up to 40C) to allow experiments with organisms under micro gravity conditions but also under simulated gravity of up to 2G as an in-orbit control run. Additionally, most scientists perform a ground reference experiment in their laboratories. For the experiments two types of experiment containers are available: up to 12 small standard experiment containers or up to 4 bigger advanced experiment containers. On-orbit, experiment containers are inserted into Biolab for processing. A typical experiment can run from one day to three months. MUSC as the Facility Responsible Centre for Biolab, has the overall responsibility to operate it according to the needs of the scientists. The scientists can monitor the processing of experiments from own User Home Bases in real-time. After an experiment run two temperature-controlled units are available for post cold stowage from -20C to +10C until download of the samples.

In the frame of **Cytoskeleton** (Dec.2021/Jan. 2022), measurements of morphology, cytoskeleton, gene expression and signaling of mammalian fibroblast and osteoblasts were performed. The **Arthrospira-B** experiment (Dec. 2017/Jan. 2018), measurements of growth, oxygen production and photosynthesis of the cyanobacteria Arthrospira were investigated. **TripleLux A** (April 2015) and **TripleLux B** (March 2013) investigated the bioluminescence of reactive oxygen species production in mammalian and invertebrate immune cells during immune response. In addition, Biolab provided cold stowage in support of the experiments Extremophiles, CrISStal and **Seedling Growth-3**.

Future experiments such as **Suture in Space**, **Lux in Space**, **WAPS** or **Arthrospira-C** are still planned in the near-term future. A major Biolab upgrade is planned to expand its capabilities and support of more experiments. The paper will give a survey on Biolab operations at MUSC over the last decade and provide an outlook for future Biolab planning.