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Life science in space: How it is/can be done and what has been achieved so far

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The European Space Agency (ESA) is an organization of 22 member states. ESA's mandate is to provide and to promote, exclusively for peaceful purpose, the cooperation among ESA member states in space research and technologies, as well as their space applications. This includes life science research on the International Space Station (ISS) in particular within the Columbus module. One of ESAs very successful equipment is to conduct life science experiments in space is KUBIK, a 37x37x37 cm³ temperature controlled box, which was designed and developed in 2004. Since 2006, KUBIK is operating as a centre-isle unit inside of the Columbus module. It allows scientists to conduct experiments fully automated under microgravity conditions. Samples are returned to ground and the effects of exposure to the environmental conditions on the ISS can be investigated in the home laboratory. KUBIK has, over the years, hosted experiments on bacteria, fungi, human white blood cells, stem cells of various types, plant seedlings and live tadpoles. A currently pending experiment will examine how microbial biofilms interact with rock surfaces across different gravity levels (weightlessness, Mars and Earth gravity). Results have been published by the scientists in various journals. Because biological experiments are very valuable, experiment preparation is a crucial part of the work. The careful planning of the experiment accounting for the 'upload-' and 'download scenarios' and the 'no access to sample' requires thorough testing upfront. Special designed hardware needs science verification testing to ensure samples are turned to the science laboratory in useful quality.

Biography

Jutta Krause is a Payload System Engineer working at the European Space Research and Technology Centre of the European Space Agency [ESA/ESTEC] since 2002. Since 2013, she is responsible for hardware development for KUBIK life science experiments. She has completed her Engineering Degree in Chemistry with a specialization in Biochemistry and Biotechnology at Fachhochschule Niederrhein in 1998.

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