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Research in Graubünden

In free fall

Cells and genes under the influence of weightlessness



The TEXUS-55 research rocket launched from Esrange Space Center in northern Sweden in May 2018. Image credit: Thomas Jauss/University of Freiburg.

Kendra Wernlé's passion for biology and space developed at an early age when she watched the American TV science program "Cosmos". At the University of Zurich, the American-born scientist can combine her passion for both fields of research. Wernlé is part of the team of the research group "Gravitational Biology" led by UZH Space Hub director Oliver Ullrich and scientific department head Cora Thiel. The research group is primarily interested in how weightlessness affects cells of the human immune system and how altered gravity affects genes. Wernlé has been pursuing a doctorate at the Private University in the Principality of Liechtenstein since 2022, in collaboration with the UZH Space Hub: "My dissertation provides a contribution to Professor Ullrich's 'T-REXx' project. 'T-REX' stands for 'T-cell gene regulation experiment'. The project is funded by ESA. I am investigating how epigenetic mechanisms are affected when we expose cells to altered gravity."

Altered gravity, meaning anything that does not correspond to the Earth's gravity of 1g, can be generated with parabolic flights or sounding rockets, for example. Originally, the flight of the sounding rocket TEXUS-59 in May 2023 was supposed to provide research material for her dissertation, Wernlé reports: "For the planned launch, the preparations of the Ullrich/Thiel team in the laboratory at the Esrange base in northern Sweden were already in full swing. Unfortunately, a week earlier TEXUS-58 landed in Norway by mistake. This led to an investigation by the authorities. Therefore, the launch of TEXUS-59 was postponed to early 2024. Setbacks and delays are not unusual in spaceflight. They are always to be expected. Until TEXUS-59 launches, I will evaluate sample material from other missions."

Wernlé describes the usual procedure for a rocket mission: “A few weeks before the planned launch date of the sounding rocket, we set up at the Esrange base and prepare the human T cells and reagents that are to go on board the rocket and test the technical equipment with our hardware partner Airbus Space and Defense. We need to make sure our cells are in top shape and in the right numbers and concentrations. In case of launch delays, we grow appropriate reserve cultures. This is all very time-consuming and labor-intensive. The cells are cultivated at 37 degrees Celsius and installed in the experimental device a few hours before the launch. The device is then integrated into the rocket. The rocket climbs about 260 kilometers into the air and goes into weightless free fall after the second engine stage is switched off. The flight itself takes about twenty minutes. After the rocket is recovered, we immediately prepare the cells for the various analyses and then freeze them. This is how we transport them to Zurich, where they are further processed and analyzed in the laboratory.” Wernlé can take something positive out of the postponement of the launch of the TEXUS-59 rocket: “This means I can be at the launch in Sweden myself in 2024.”

Kendra Wernlé and Daniela Heinen



Kendra Wernlé. Image provided

More information

The Private University in the Principality of Liechtenstein (UFL) is accredited nationally and internationally and has a model character in the postgraduate education sector. It currently runs the Faculty of Medical Sciences and the Faculty of Law with the two part-time doctoral programs “Dr. scient. med.” and “Dr. iur.”. www.ufl.li, www.spacehub.uzh.ch

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