



CEMIOS experiment hardware mounted inside the sounding rocket module. The hardware is designed to capture electrophysiological recordings of living cells under microgravity conditions.

Institute

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In Cooperation with

REXUS/BEXUS Education Program

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Method

Measurement

Development and Construction of Instruments

The entire hardware flown in this experiment was developed and assembled in-house.

9.3 CEMIOS – Cellular Effects of Microgravity Induced Oocyte Samples

Purpose of Research

The mechanisms how cells detect external mechanical forces has not been fully clarified yet. For instance, mechano-sensitive ion channels are thought to be of central importance in transducing physical forces into biological responses. In this study, the gating properties of mechano-sensitive channels under various gravity conditions are investigated with our previously introduced "Ooclamp" device.

The device applies an adapted patch clamp technique that has proven to be functional even during parabolic flights and on centrifugation up to 20 g. In the framework of the REXUS program, we have proposed to conduct electrophysiological measurements onboard a sounding rocket that provides a microgravity environment for up to 2 minutes.

The aim of the CEMIOS experiment is to study possible adaptation processes of the mechano-sensitive channels during the flight, based on modified gating properties in microgravity. In addition, the measurements will also demonstrate the feasibility of conducting electrophysiological experiments onboard sounding rockets.

In order to determine the transmembrane conductivity through the target ion channels, an oocyte from the *Xenopus laevis* is captured in a

silicone chip. A small aperture electrically isolates a patch of the cell membrane. This membrane patch is adjacent to a fluidic chip, allowing the fast exchange of medium in contact with the patch. By using particular drugs, the ion channels of interest can be pharmaceutically isolated. The conductivity across the patch under the different treatment protocols is then measured using a four electrode voltage clamp.

Status

With the REXUS 20 flight in March 2016, we assessed for the first time whether electrophysiological measurements with *Xenopus laevis* oocytes onboard a sounding rocket are possible. The analysis of the data gathered are still ongoing, but it is expected that a paper will soon be published.

Publications

In preparation.

Abbreviations

CEMIOS	Cellular Effects of Microgravity Induced Oocyte Samples
REXUS/BEXUS	Rocket and Balloon Experiments for University Students

Time-Line	From	To
Planning	Dec. 2014	Jun. 2015
Construction	Feb. 2015	Dec. 2016
Measurement Phase	Mar. 2016	Mar. 2016
Data Evaluation	Mar. 2016	Jun. 2016