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Alle Forschungsprojekte zum zweiten Parabelflug auf einen Blick

The impact of reduced oxygenation on human cells during microgravity

Reduced oxygen supply (hypoxia) is a condition that faces astronauts regularly due to technical reasons immanent for space suits during extra-vehicular activities (EVAs). Mammalian cells immediately respond to hypoxia by stabilizing transcription factors called “hypoxia-inducible factors” that coordinate the cell’s emergency response to oxygen shortage. Because these factors need to be transported from the cytoplasm to the nucleus to take effect, we will test for the first time the impact of hyper- and microgravity on this intra cellular transport and thus the hypoxic response of human cells during this parabolic flight campaign.

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Zero-g experiments to understand how phytoplankton respond to turbulence in oceans and lakes

Phytoplankton, photosynthetic microorganisms that live in oceans and lakes, migrate vertically and adapt their swimming strategies for optimal acquistion of nutrients and exposure to light. Turbulence in the water can disrupt these migrations, yet how this happens has remained a mystery. We plan to test the hypothesis that these disruptions are caused by gravity modulations in a setting outside the laboratory – a zero-g flight. The novel experiments aboard the plane will provide information on behavioral and molecular responses of these keystone microorganisms, contributing to our knowledge of larger scale ocean processes and conditions.

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Die Überprüfung der Rückensteifigkeit in Schwerelosigkeit

Experten gehen davon aus, dass die Schwerkraft bei der Entstehung von Rückenschmerzen eine wichtige Rolle spielt. Vor allem im Sitzen, Stehen und eine zusätzliche Last tragen wirken verschieden grosse Kräfte auf den unteren Rücken und verändern die Rückenstabilität. Der Parabelflug bietet nun die einzigartige Möglichkeit, die den Rücken ohne und mit doppelter Erdanziehungskraft zu untersuchen. Mit eigens dafür entwickelten Instrumenten messen wir die Stabilität der Wirbelsäule während der Schwerelosigkeit und mit doppelter Erdanziehungskraft und vergleichen die Ergebnisse mit Messungen am Boden. So hoffen wir, neue Behandlungsmethoden der Chiropraktik zu entwickeln.

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Mars Sedimentation Experiment

The search for past life on Mars, such as planned for ESA's ExoMars mission, depends on finding traces of microorganisms living in or near liquid water 3.5 billion years ago. Movement and deposition of particles in water, leading to the formation of rocks that could preserve such traces of life, is strongly affected by the lower gravity on Mars. The Mars Sedimentation Experiment simulates sediment movement on Mars to support the search for past life, using the partial gravity offered on board Novespace's A 310 during the 2nd Swiss Microgravity Campaign.

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Involvement of calcium in mechano-sensitive processes of muscle cells

Calcium plays a major role in various functions of muscle cells. Mechanical stimulation, including removal of gravity, is one of them. Thus, our experiments apply an innovative combination of Digital Holographic and Fluorescent microscope techniques to study the calcium movement in muscle cells under microgravity conditions. With this experiment, we address fundamental questions in cell biology which are relevant in particular to sports and rehabilitation medicine.

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Are calcium dependent Ion channels also sensitive to gravity?

Calcium is known to have important functions in many biological cells. With a specialized electrophysiological setup, we examine frog eggs to show whether the open-close status of calcium dependent ion channels alters under zero gravity. If so, particular countermeasures can be designed to fight space muscle atrophy of astronauts as well as muscle loss diseases of humans in the future.

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Miniaturisiertes Labor für Mikrogravitationsplattformen

Spacepharma ist ein Anbieter von Lösungen für die Durchführung von Forschung im echten schwerelosen Raum. Während des Parabelflugs wird Spacepharma sein miniaturisiertes Labor testen, das in Zukunft in verschiedene andere Mikrogravitationsplattformen, wie das Kleinsatellitenprogramm CubeSats und bemannte Raumstationen ISS, integriert werden kann. Das Labor beherbergt eine enzymatische kinetische Studie mit zwei verschiedenen Enzymen, ein Experiment mit kurzkettiger Peptidselbstorganisation und einen bakteriellen Genexpressionsversuch, in dem eine neuartige miniaturisierte Pumpe eingesetzt wird, die von Spacepharma entwickelt worden ist.

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