

Space Life Sciences Division

Unraveling the Plasticity of Life Through Space Research

Building Fundamental Science to Support the Survival of Humanity and Earth's Ecosystems

The **Space Life Sciences Initiative** integrates and expands the life science research jointly developed by the **University of Tsukuba** and **JAXA** through studies aboard the International Space Station (ISS). Centered on the Transformative Research Area "**Life in Space**" and the JAXA flagship project "**Astronaut Digital Twins**," the initiative brings together interdisciplinary research in space biology, artificial hibernation, and space psychiatry, creating an international hub for space life science research.

Using extreme environments - including microgravity, space radiation, and isolated and confined habitats - as experimental platforms, we investigate both the plasticity and the limits of life. The knowledge gained will contribute not only to space exploration but also to terrestrial medicine and solutions to societal challenges. Ultimately, we seek to understand biological adaptation and the sustainability of future civilizations on the Moon and Mars while establishing a globally recognized center for expanding humanity's capacity to thrive beyond Earth.

Overview & Mission

Space Environmental Responses

Building upon discoveries from mouse spaceflight experiments conducted aboard the ISS, we investigate how living organisms respond to environmental factors such as microgravity and space radiation.

Mouse Spaceflight Research



Space Psychiatry

We investigate psychological adaptation and mental health in isolated and confined environments associated with space missions.

Mental Health in Long-Duration Space Missions



Sleep & Hibernation

We study metabolic regulation and artificial hibernation technologies for future space exploration. Our goal is to develop countermeasures against sleep disorders while translating hibernation biology into terrestrial medicine.

Artificial Hibernation for Space Exploration



Digital Twins + AI-Integrated Physical Modeling

Predictive Space Medicine

Using multi-omics analyses together with cellular models, we develop personalized approaches for predicting individual health risks during spaceflight.

Precision Medicine in Space



Mission

- Develop next-generation experimental platforms beyond the ISS
- Lead international collaborations with commercial space stations and lunar/Martian exploration programs
- Establish the scientific foundation of Predictive Space Medicine
- Build standardized data platforms for space life sciences
- Advance life-risk assessment for deep-space exploration

Faculty Members

Space Health Prediction

Masafumi Muratani

Space Environmental Response

Satoru Takahashi

Takashi Kudo

Ryo Fujita

Sleep & Hibernation

Takeshi Sakurai

Yuki Saito

Shingo Seiya

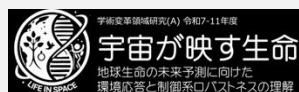
Space Psychiatry

Shinichiro Sasahara

Shotaro Doki

Daisuke Hori

Recent Research Programs



Life in Space

Transformative Research Areas (A)

Understanding the robustness of environmental response and regulatory systems to predict the future of life on Earth.



学術変革領域研究(A) (令和5～9年度)
冬眠生物学2.0
能動的低代謝の制御・適応機構の理解



Hibernation Biology 2.0

Transformative Research Areas (A)

Mechanisms of torpor and hibernation.

JAXA Mouse Spaceflight Missions

MHU-1,4,5,8

JAXA Cell-Free Epigenome Mission