The Italian scientific research activity in the Minerva mission

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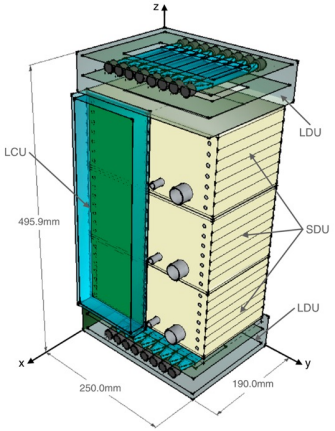
LIDAL

PI: Prof. Livio Narici, University of Rome “Tor Vergata”
PD: Kayser Italia s.r.l.

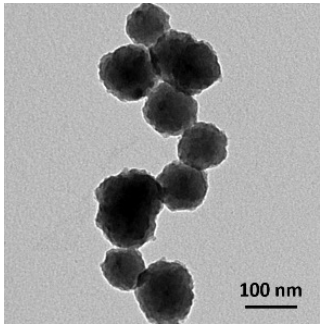


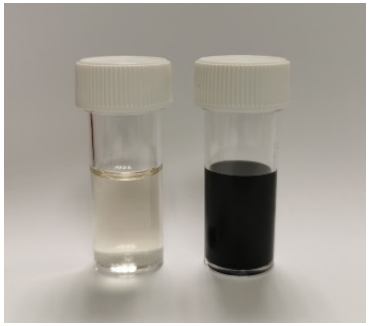
LIDAL (Light Ion Detector for ALTEA) is a particle detector based on the ASI payload ALTEA. It has improved features such as detectors based on scintillators and fast electronics. Its objective is to study and characterize cosmic radiation on board the ISS. LIDAL will allow:

- the measurement of Helium nuclei
- the direct measurement of the speed of each ion by means of a time-of-flight system which allows a more efficient nuclear identification;
- the analysis of the radiation features necessary for the detection, and probability assessment, of dangerous Solar Particle Events.

PROMETEO

PI: Dr. Gianni Ciofani, Italian Institute of Technology
Co-I: Dr. Giada Genchi, Italian Institute of Technology
PD: Kayser Italia s.r.l.





Microgravity and radiation lead to high level of cellular oxidative stress in human cells. A countermeasure through antioxidant protection is of key importance for keeping astronauts healthy during long missions. This experiment hypothesizes that polydopamine-based nanoparticles can provide antioxidant protection.

Objectives:

- Develop an innovative nanotechnology countermeasure based on polydopamine against degeneration of neurons induced by oxidative stress, both associated to microgravity and cosmic radiation exposure during spaceflight and to neurodegenerative disease onset/progression on Earth.
- Develop multifunctional nanotechnology tools able to compensate loss of dopamine neurotransmitter

EVOOS

PI: Enzo Perri CREA
Co-I: Marta Del Bianco, ASI
Partners: Unaprol, Coldiretti, Telespazio, Eat Freedom GmbH & Co

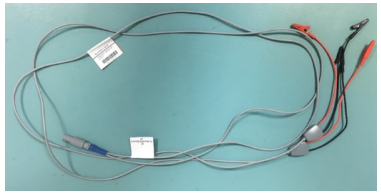
In an environment characterized by microgravity and radiation and high levels of carbon dioxide, having a controlled diet rich in antioxidants and antiinflammatory components could represent a valid countermeasure.

EVOOS will assess whether olive oil can retain its properties (e.g. physico-chemical, nutritional) and its composition of secondary metabolites when stored into spacecraft and exposed to the space environment for long period of time.

EVOO samples, despite being considered a scientific experiment, are uploaded following the nominal logistics of astronaut food

NUTRISS

PI: Prof. Gianni Biolo, University of Trieste
Co-I: Dr. Filippo Giorgio Di Girolamo, University of Trieste
PD: Kayser Italia s.r.l.



This experiment aims at controlling and monitoring an ideal body fat/lean composition in order to overcome changes due to microgravity-induced inactivity and optimize astronaut performance, on board quality of life and post-flight recovery.

Body composition is measured over time with a Body Mass Measurement Device and an instrument for the bioelectrical impedance analysis while monitoring the nutritional intake (via the EveryWear app)

ACOUSTIC DIAGNOSTICS

PI: Prof. Arturo Moleti University of Rome “Tor Vergata”
Co-I: Prof. Giorgio Pennazza, Università Campus Bio-Medico di Roma
Co-I: Michele Trichilo, ALTEC S.p.A
PD: University of Rome “Tor Vergata”, ALTEC S.p.A.

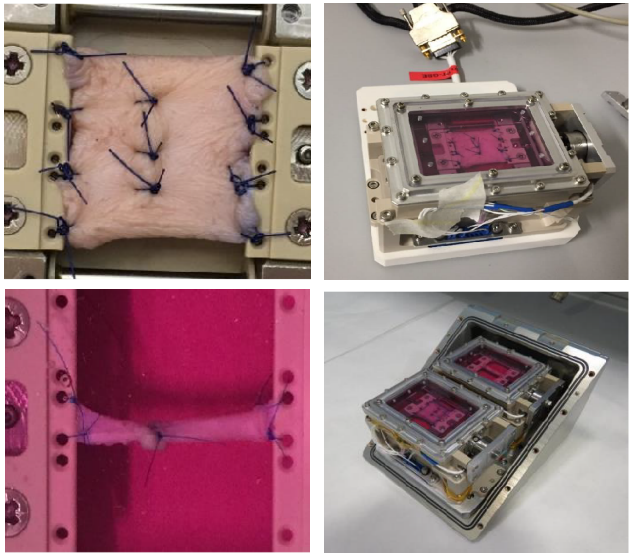
The noise that characterize the environment inside the ISS could represent a potential hazard to the hearing organ of the astronauts.

Objectives:

- Development of a compact, sensitive, non-invasive, objective hearing diagnostic device that can also be useful in the clinic and in occupational heath
- Monitoring of the sensitivity, transmission, and frequency resolution of the astronauts’ hearing by measuring distortion product OAEs (DPOAEs), before, during and after their mission on the ISS.
- Detection of changes of the astronauts’ intra cranial fluid pressure associated with microgravity.

SUTURE IN SPACE

PI: Prof. Monica Monici, University of Firenze
Partners: University of Siena, University of Milano, University of Molise

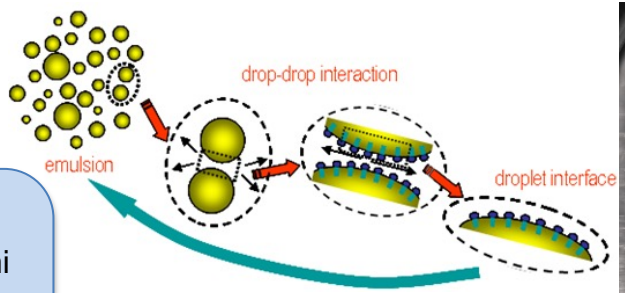


The objective of this scientific investigation is to analyze the behavior of suture and tissue repair processes in an environment characterized by microgravity.

Objectives:

- understand the role of gravity and mechanical elements regulating the behavior of suture and wound healing.
- understand which materials and techniques are suitable in microgravity
- improved suture techniques to be operated on earth

PASTA



PI: Dr. Libero Liggieri, CNR-ICMATE

Co-I: Dr. Francesca Ravera, Dr. Eva Santini
CNR-ICMATE

Co-I: Prof. Luigi Cristofolini, Prof. Davide Orsi, Dr. Valentina Lorusso, Dr. Marco Vaccari
University of Parma

Microgravity provides an optimal environment where fundamental processes underpinning destabilization of emulsions and foams can be studied in absence of segregation processes (that would take place on Earth) due to differences in density.

The objectives of PASTA are:

- to study the role of tensioactive elements and their effect on the dynamic properties of interfaces in the processes of stabilization and destabilization of emulsions and foams.
- to measure key parameters of such processes to be used for the modeling of emulsion aging.

OVOSPACE

PI: Prof. Mariano Bizzarri, Università of Rome “La Sapienza”
Co-I: Dr. Andrea Fuso, University of Rome “La Sapienza”
PD: ALI-S.c.a.r.l., Nanoracks Space Outpost Europe s.r.l.

How microgravity influences ovary cells maturation and embryo development is an open question and a scarcely investigated issue since weightlessness might impair the molecular processes at the core of ovary function:

- Oocyte maturation
- Endocrine secretion of the ovarian tissue
- Morphological and epigenetic development of the embryo
- Sex determination
- Modulation of the regenerative ability of the embryo

The Ovospace experiment will take place autonomously inside the MiniLab unit.

This research plays a critical role in planning future programs of human settlement in the outer space.

Thank you
for your attention

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