



**Simposio di “Biomedicina Spaziale per le Future Missioni di
Esplorazione Umana dello Spazio: a Call to Action”**

Nanomateriali e nanotecnologie per la biomedicina spaziale

**Prof Livia Visai
Università degli Studi di Pavia
Dipartimento di Medicina Molecolare**

**Effetti delle condizioni ambientali spaziali sulla
fisiopatologia umana Individuazione, sviluppo ed
applicazione di contromisure (codice FIS)**

**Agenzia Spaziale Italiana
Via del Politecnico, snc, 00133, Roma
15-17 Marzo 2023**

Laboratory of biomaterials and cells interaction. Nanotechnology

Nanotechnology Application

In microgravity

In tissue engineering and 3D models

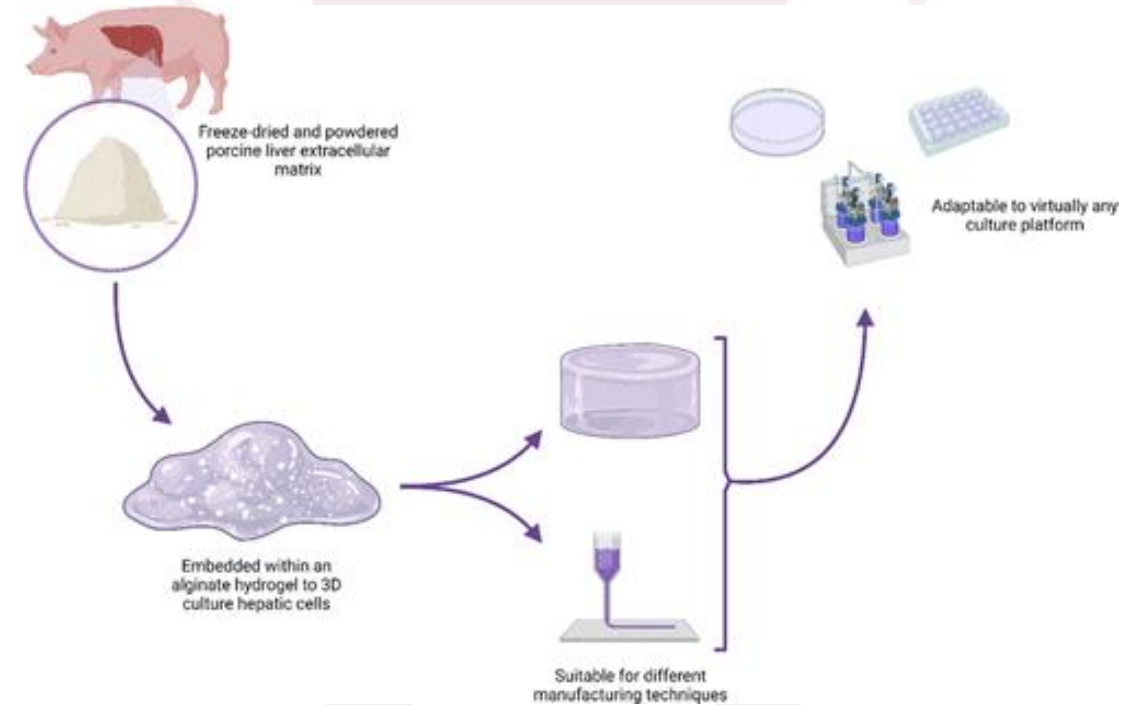
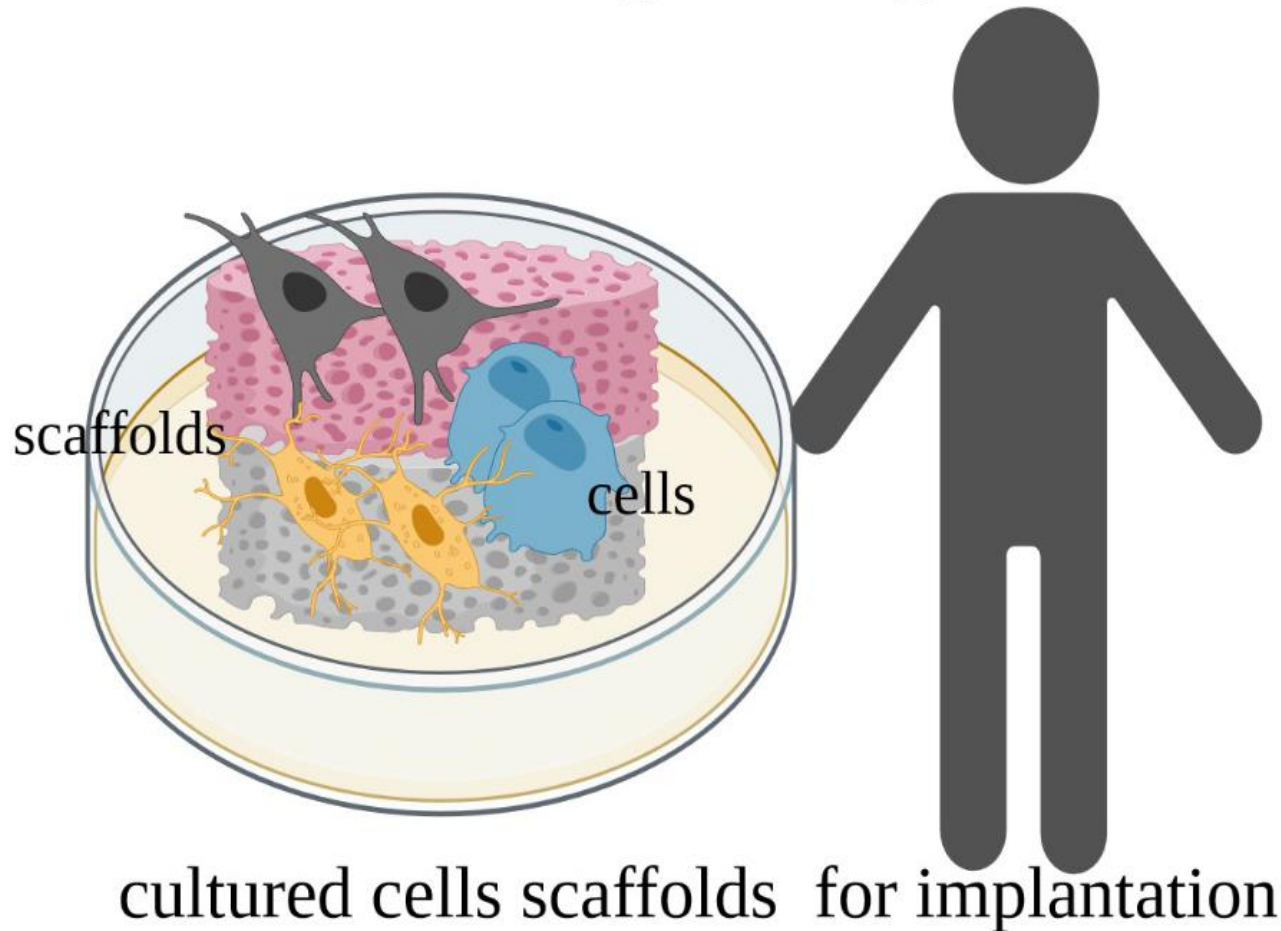
In cancer

In Infection and Immunity



In tissue engineering and 3D models

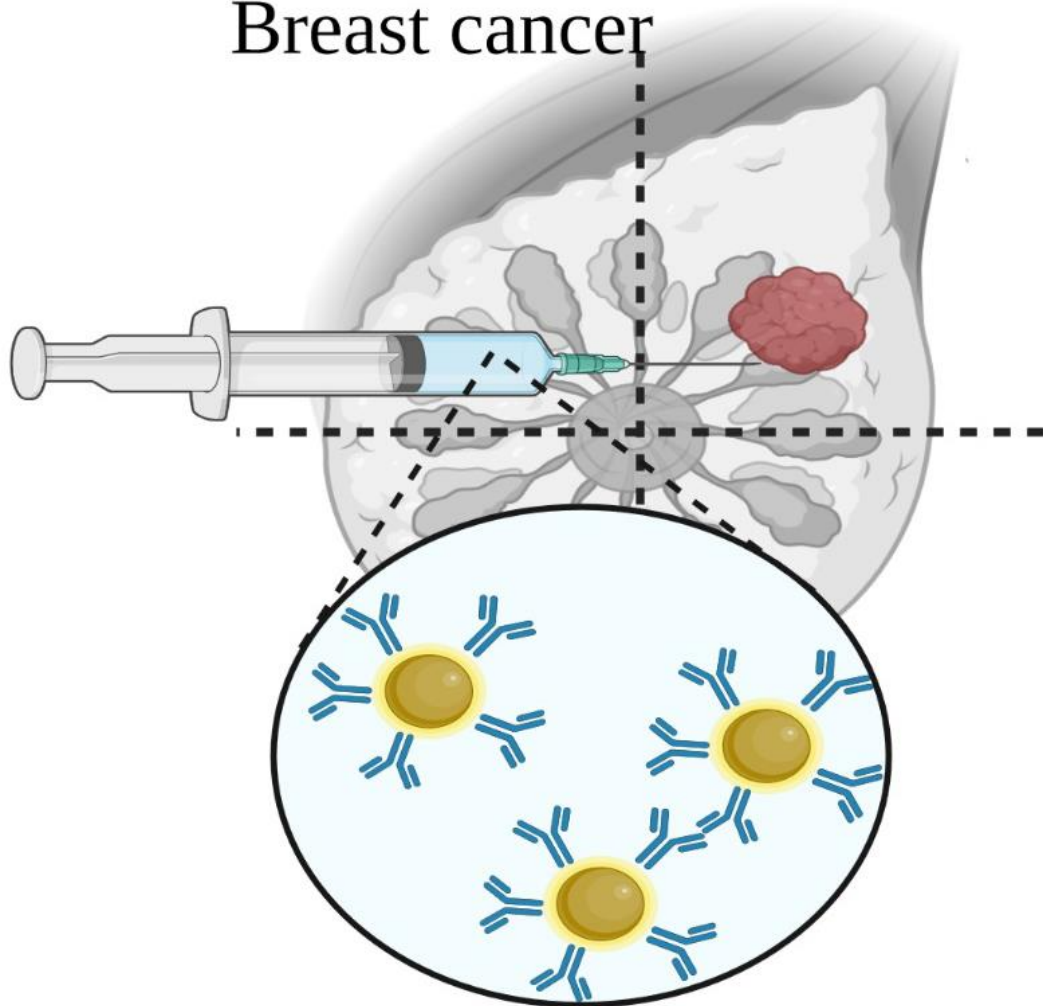
Tissue engineering



<https://doi.org/10.1021/acsbiomaterials.2c01226>

In cancer

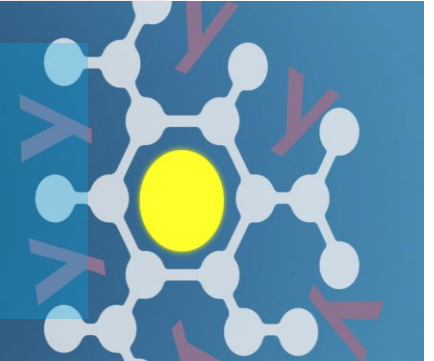
Breast cancer



gold nanoparticles with drugs

doi: 10.3389/fbioe.2020.00132

Breast cancer: smart nanogold
spheres to defeat it.
New challenges


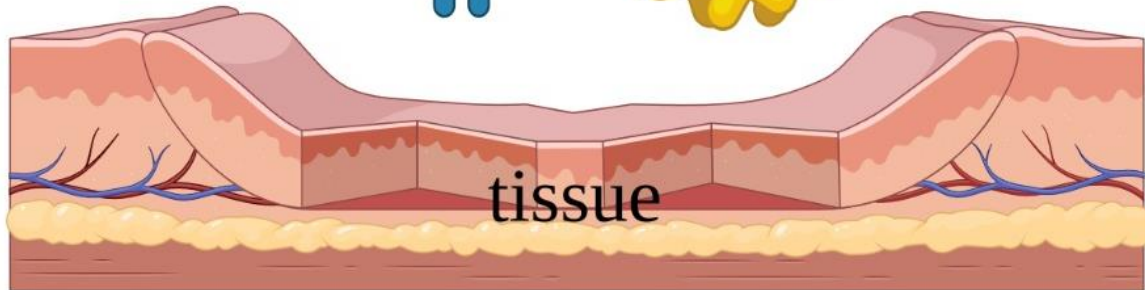
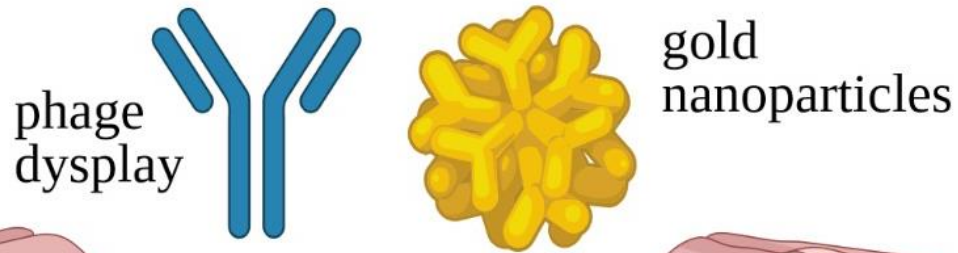


<https://universitiamo.eu/campaigns/tumore-al-seno-sconfiggerlo-con-nanosfere-doro-intelligenti-nuove-sfide/>






In Infection and Immunity

Bacterial infection




Universal 3D substrate for bacterial culture

Harnessing the power of bacteria




EIT Health is supported by the EIT, a body of the European Union

SOLUTION | FULLY TUNABLE UNIVERSAL BACTERIAL 3D CULTURING SUBSTRATE



Adaptive environment for different bacterial culture conditions





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**KAYSER
ITALIA**



NATO
Nanoparticles and Osteoporosis

In microgravity



Nanoparticles and Osteoporosis (NATO)

ASI-ESA-NASA

Bone metabolism

Adult bone
of 30-40 years

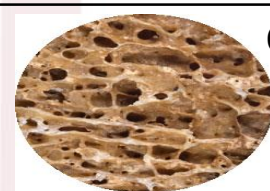


30 years of life on earth

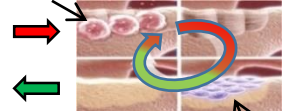
Affected bone
from osteoporosis



Brittle bone



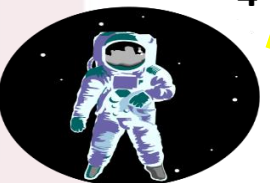
Osteoclasts



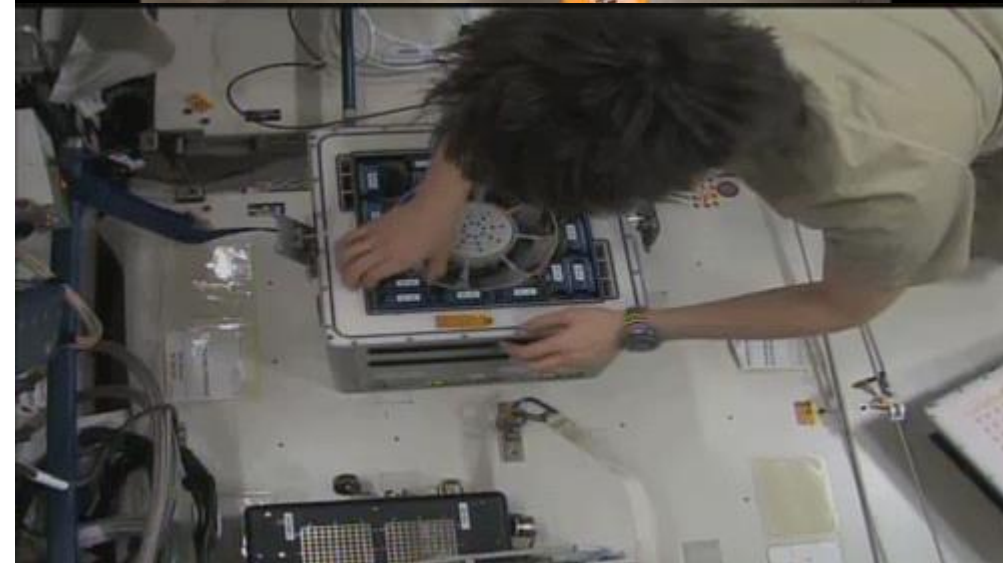
Osteoblasts



4-6 months of stay in space



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NATO

Nanoparticles and Osteoporosis

In microgravity



STARTING (WP 2)

Synthesis and physico-chemical characterization of nHAP and nHAP-Sr

GROUND PHASE I STUDY (WP 3)

In vitro interaction of osteoblasts and osteoclasts with nHAP and nHAP-Sr

GROUND PHASE II STUDY (WP4, 5 and 6)

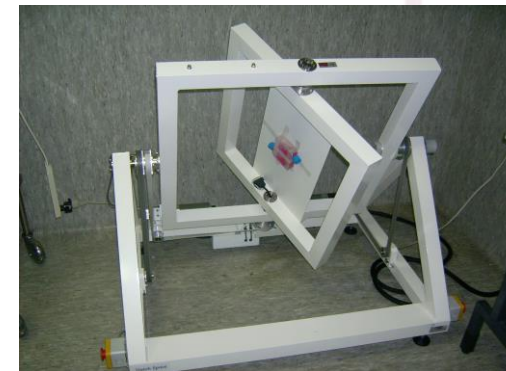
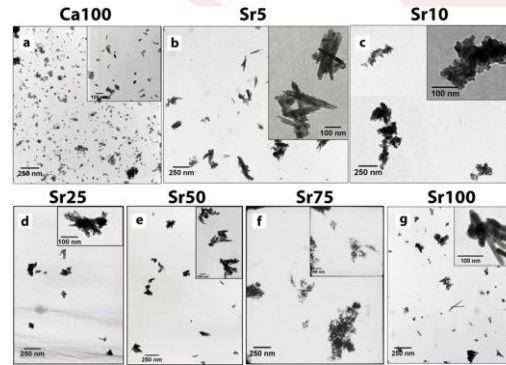
In vitro interaction of nHAP with cells in simulated microgravity (RPM).

STUDY IN FLIGHT PHASE I (WP3,4, 5)

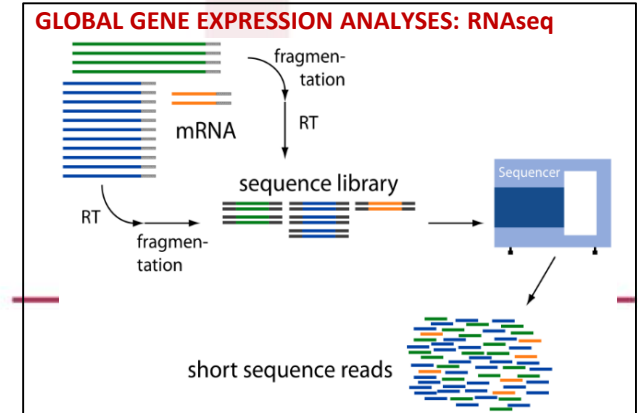
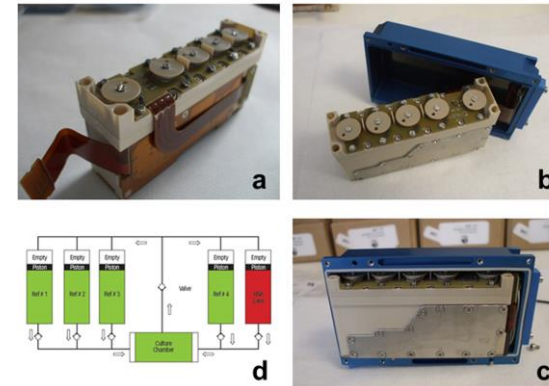
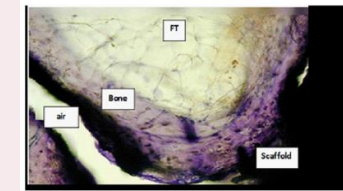
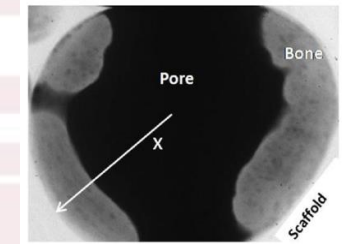
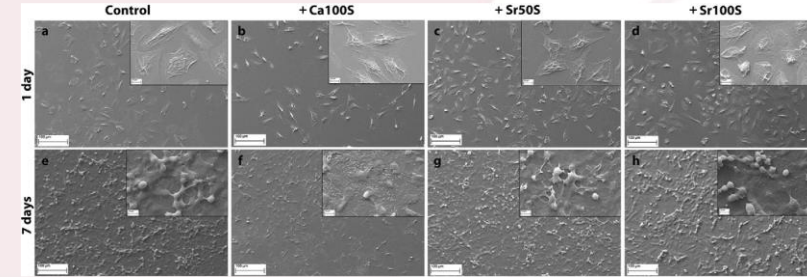
Preparation of the cells for space flight and validation of the same in terms of MG simulated with RPM.

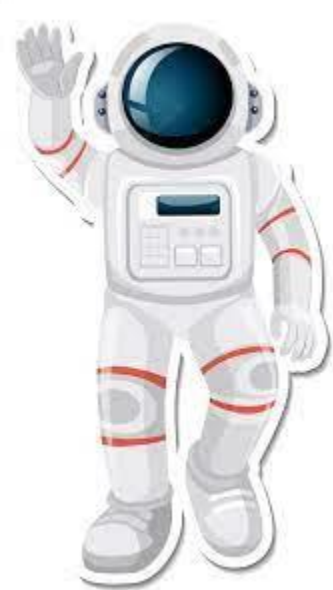
STUDY IN FLIGHT PHASE II (WP3,4,5 and 6)

• Sample preparation for space flight
• Flight activity
• Post-flight analysis



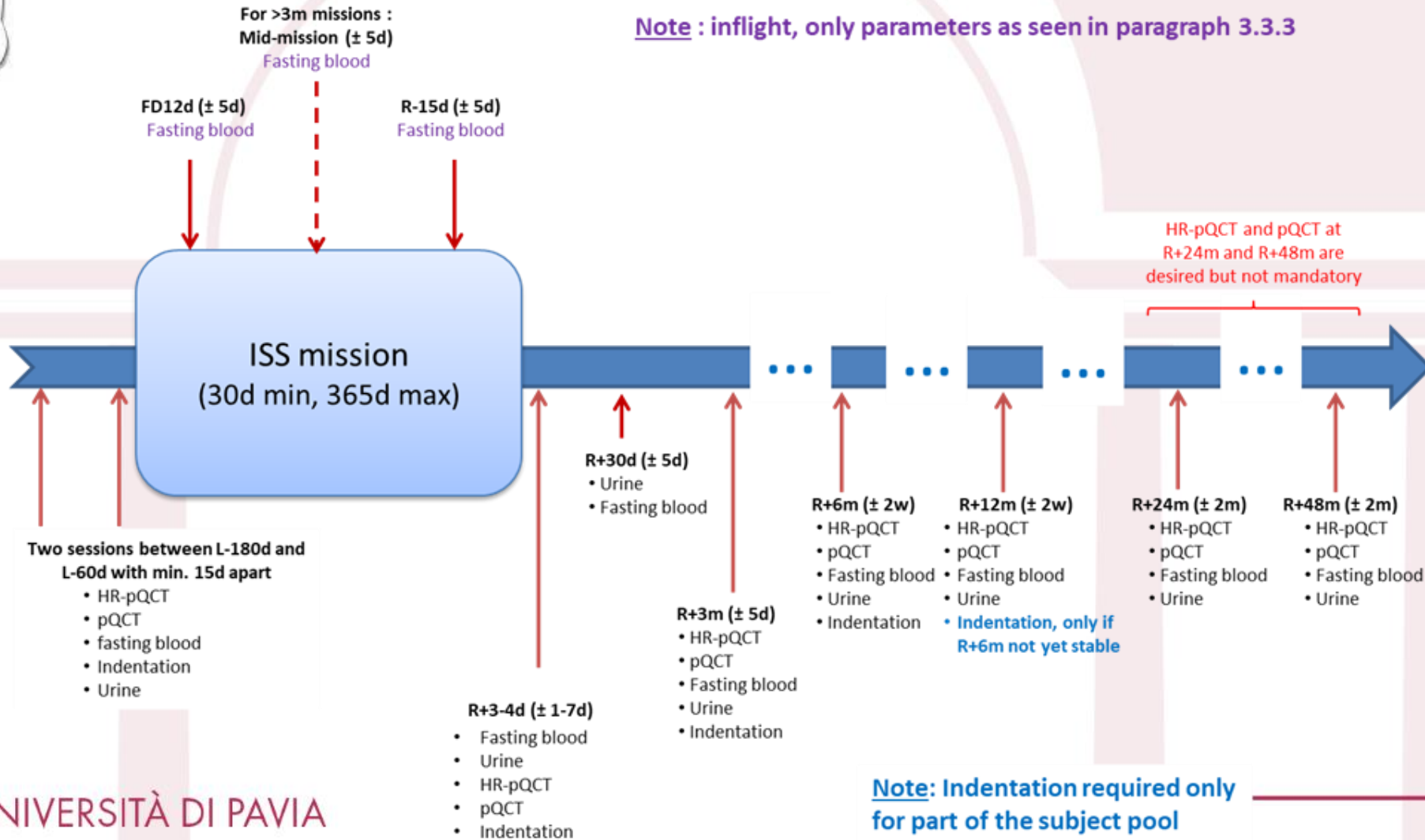
STROMA (Kayser Italia)
Fully automated





COMET_ISS (ASI_ESA)

Note : inflight, only parameters as seen in paragraph 3.3.3



Note: Indentation required only for part of the subject pool



Objectives

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graph TD; A[Objectives] --- B[Development of efficient and effective preventive countermeasures as therapeutic strategies for bone loss and treatment of muscle atrophy during spaceflight]; A --- C[Analysis of the alterations of the extracellular matrix, due to the remodeling of connective tissues during space flight, in order to identify new biomarkers, using omics techniques]; A --- D[Correlation of exercise with body homeostasis and nutrition during spaceflight to evaluate the potential role of exercise in modulating cytokine/chemokine secretion];
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Development of efficient and effective preventive countermeasures as therapeutic strategies for bone loss and treatment of muscle atrophy during spaceflight

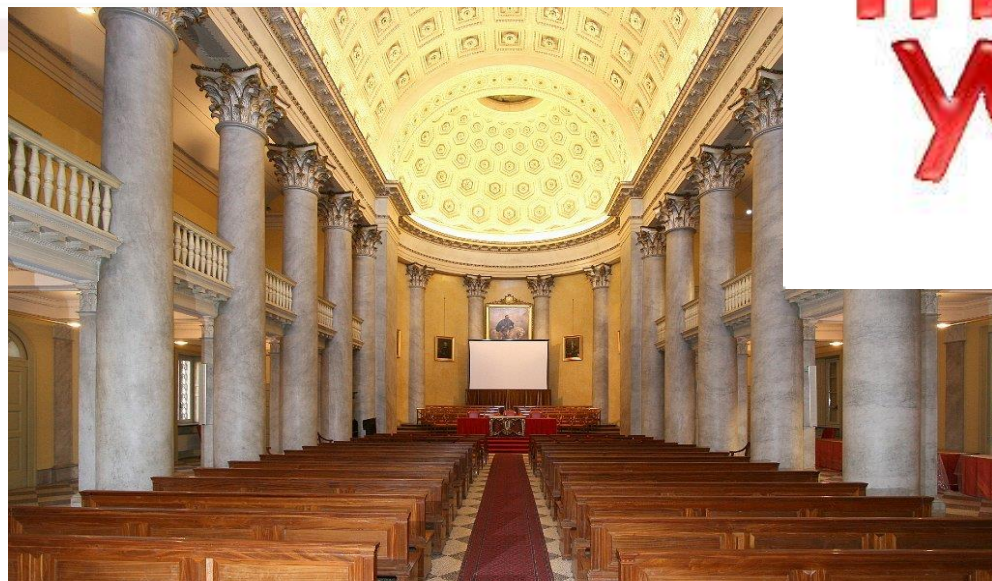
Analysis of the alterations of the extracellular matrix, due to the remodeling of connective tissues during space flight, in order to identify new biomarkers, using omics techniques

Correlation of exercise with body homeostasis and nutrition during spaceflight to evaluate the potential role of exercise in modulating cytokine/chemokine secretion





Thank
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