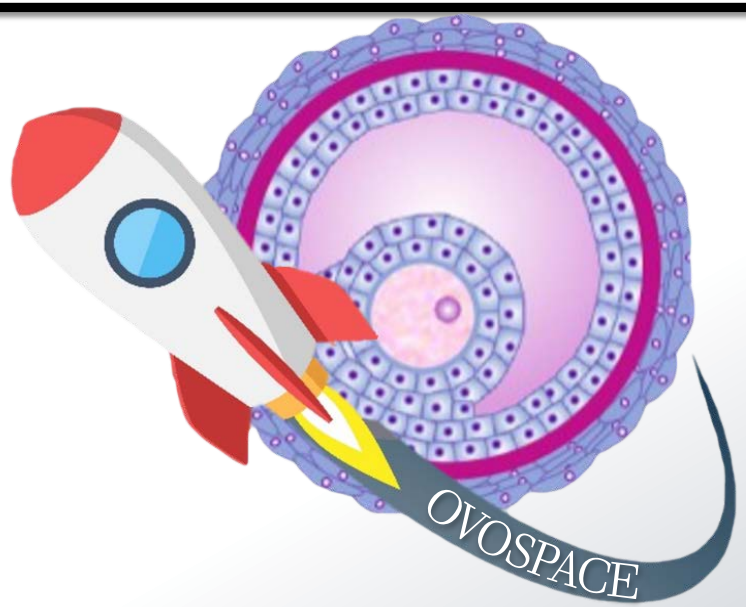
OVOSPACE



Modulation of Granulosa and Theca cell activity in real microgravity. Effects on human health and reproduction. Experiments on mammalian ovary cells.

Dr. Valeria Fedeli

Dept. of Experimental Medicine
Sapienza University, Rome

Agenzia Spaziale Italiana

Aerospace Laboratory for Innovative components S.c.a r.l.

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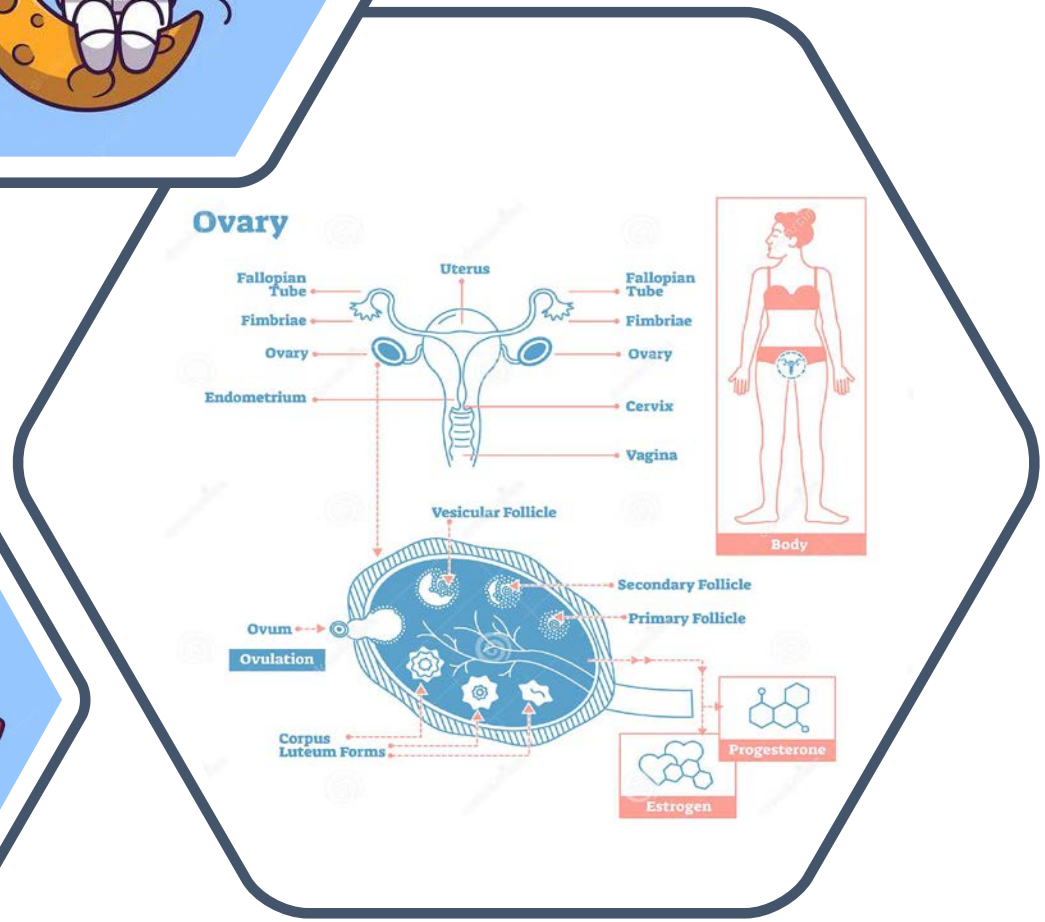
INTRODUCTION AND OPENING REMARKS

Human settlements in other satellites (Moon) or planets (Mars) could impair the fertility of Astronauts (both men and females) living for prolonged times in a condition of weightlessness. This threatens the objective of establishing permanent/extended settlements outside the Earth.

The **OVOSPACE** project will investigate how Granulosa cells (GCs) and Theca cells (TCs) from mammalian ovaries could be affected in their **endocrine function** when exposed to microgravity

How microgravity influences ovary cells **development**.

TCs provide **structural integrity, endocrine function**, and **follicle growth.**



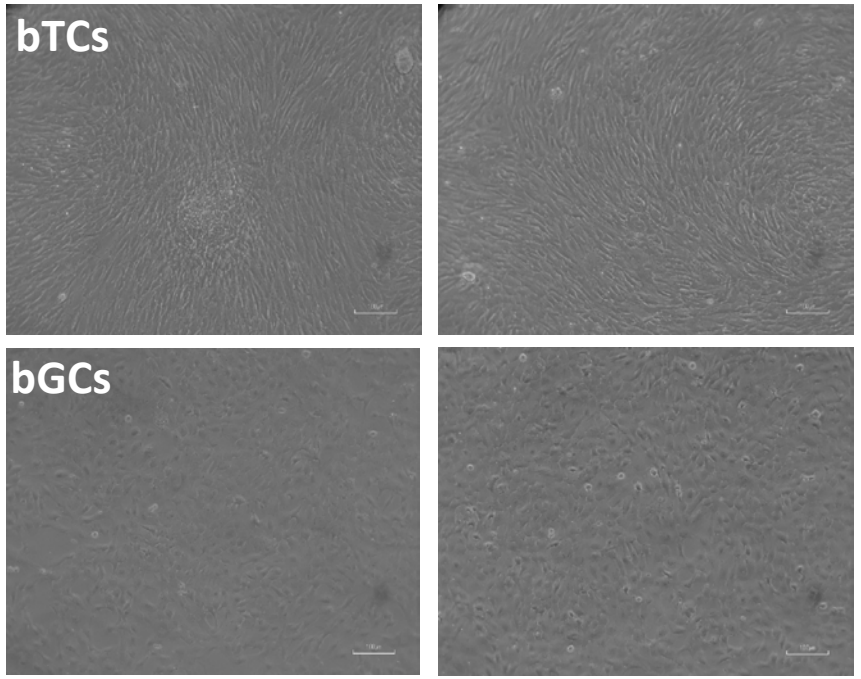
EXPERIMENTAL MODEL

Bos taurus

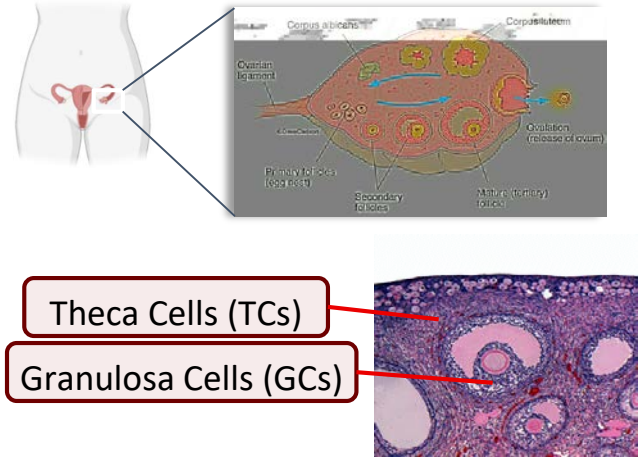
REPRODUCTION AS IN HUMANS

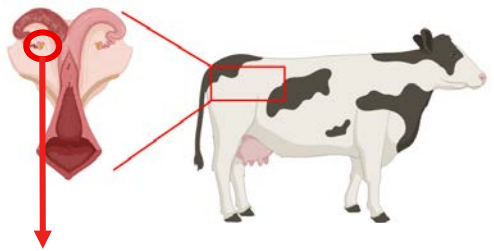
- Same hormonal feedback
- Same days of estrous cycle
- Same months of pregnancy

MAIN ISSUE

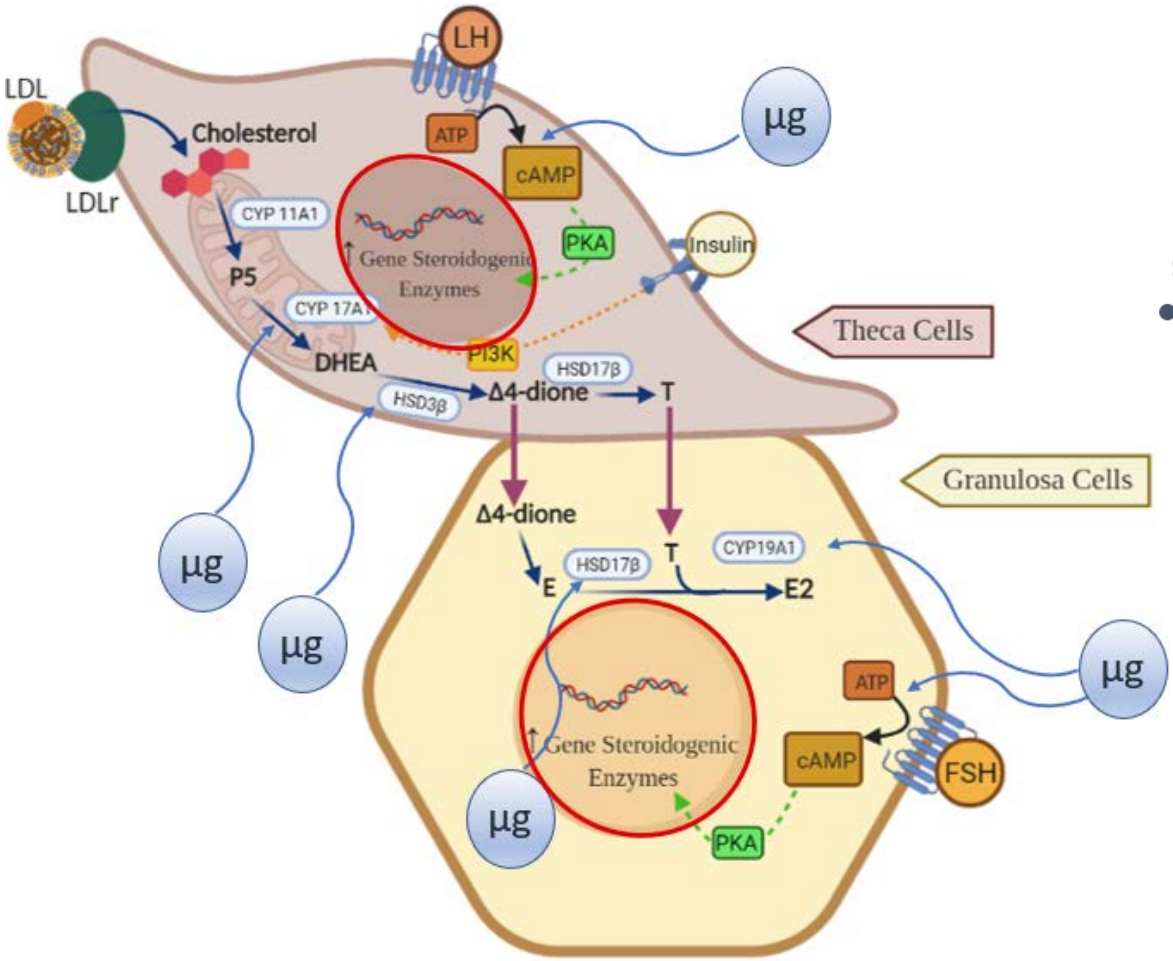


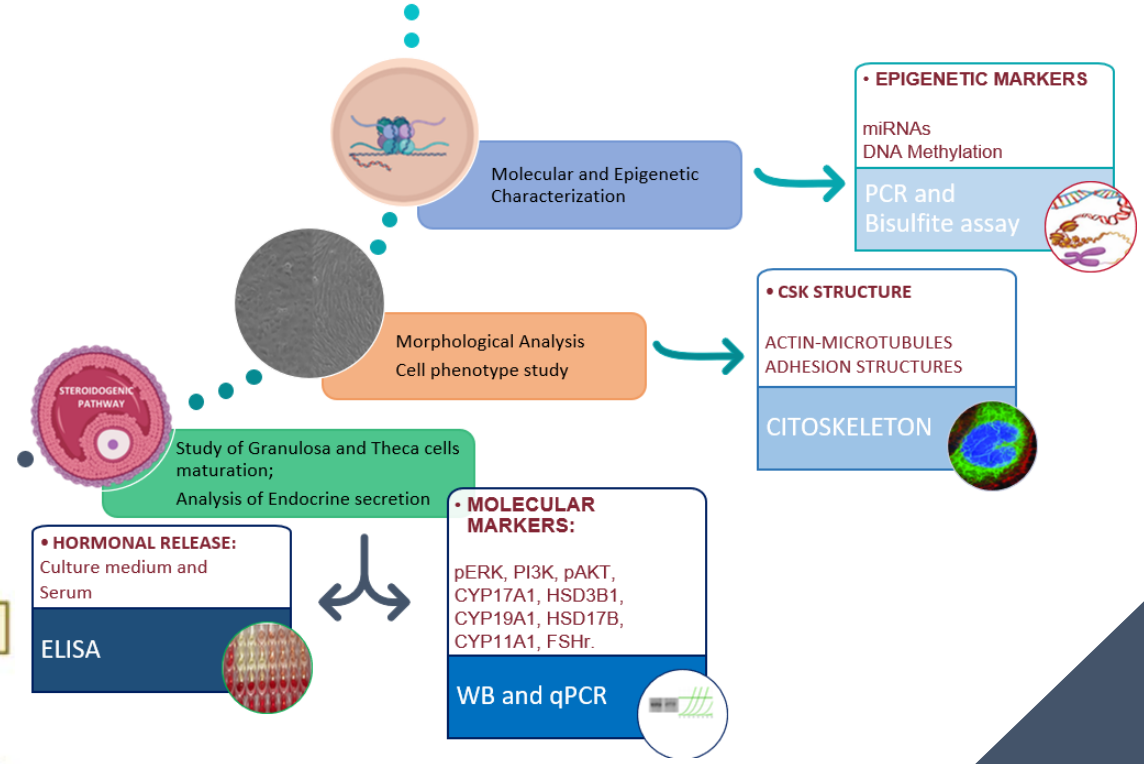
9 Months





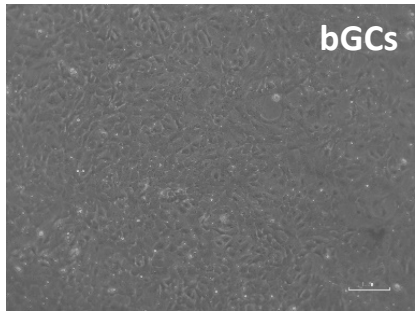
INVESTIGATION OBJECTIVES

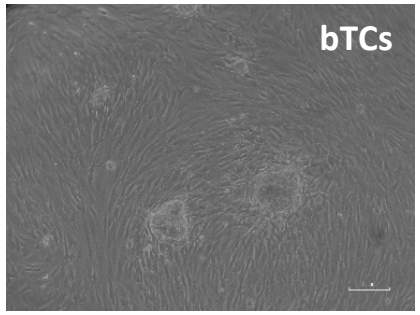




- Modulation of steroidogenic Pathway
- Synthesis and secretion of sex hormones
- Changes in morphology and adhesion
- Epigenetics changes

OVOSPACE MINI-LAB





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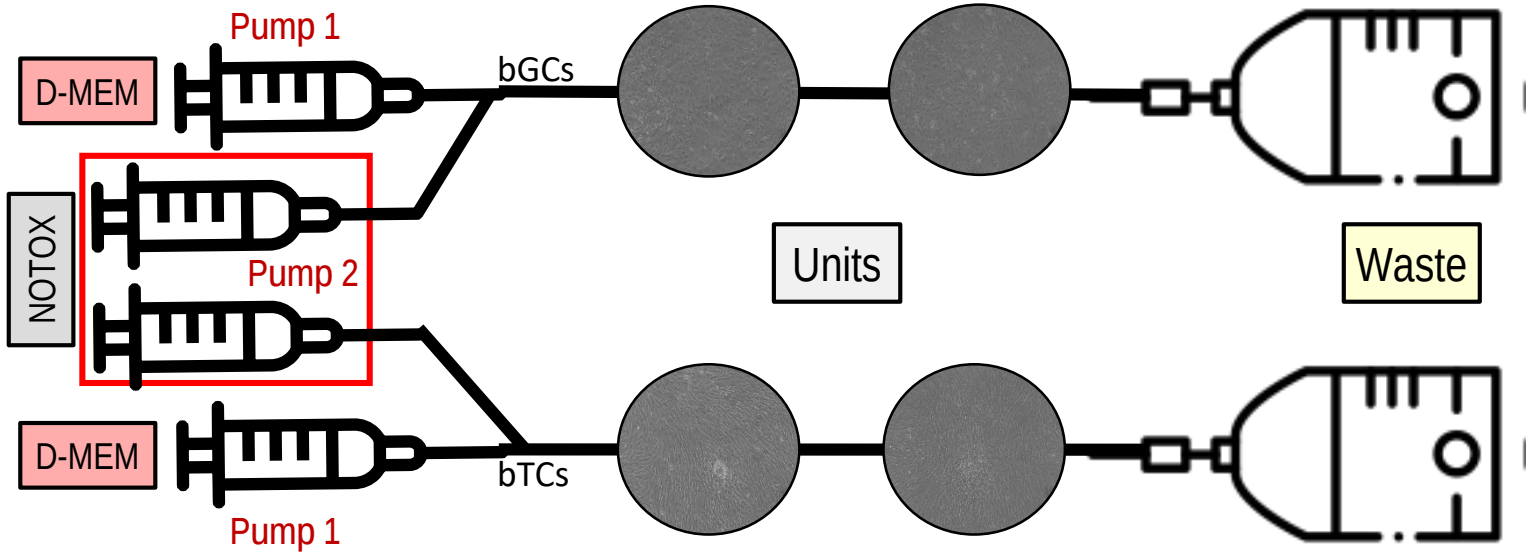
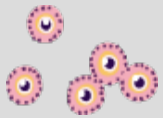
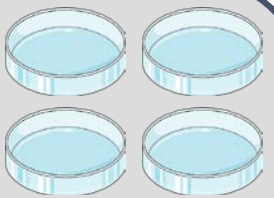


OPERATIONAL OVERVIEW

Pre - flight

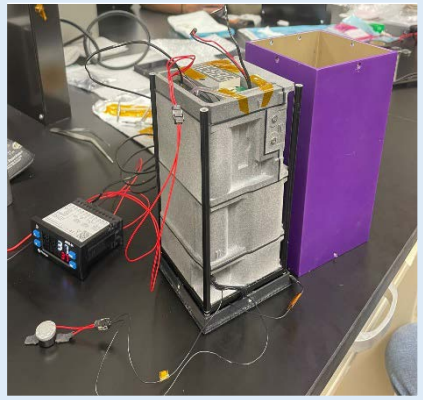


Bovine Granulosa and Theca cells



4 independent cell dishes

Experimental setup and cell adesion/growth optimization in Sapienza Laboratory using a MiniLab unit replica.

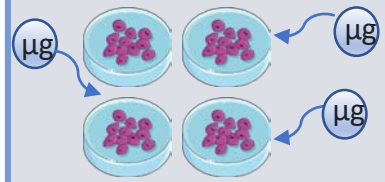


OPERATIONAL OVERVIEW

On - flight

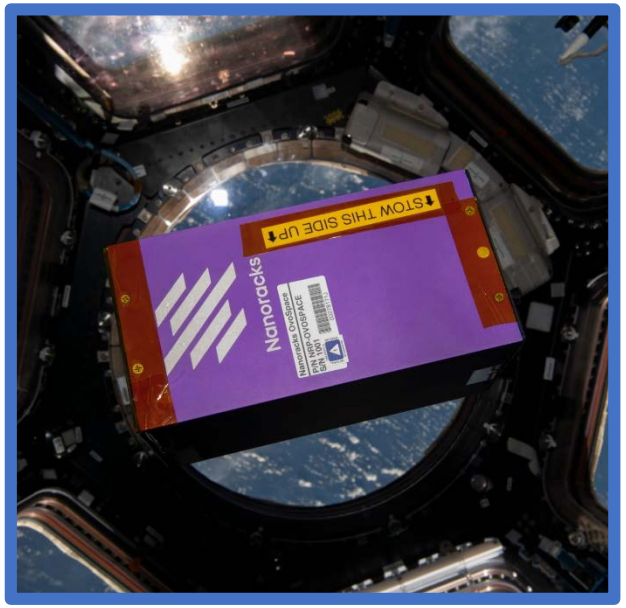
During the launch and docking phases the temperature is kept at 37°C via conditioned stowage.

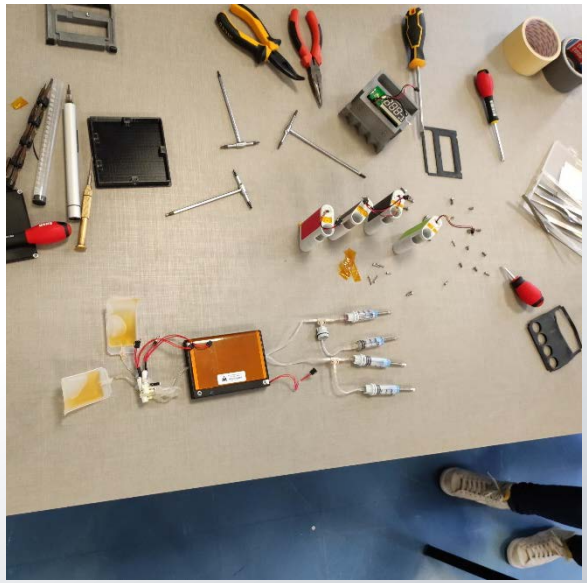
MiniLab is extracted and plugged to the power lines by the astronauts within 24 hours since docking.



- Incubation at 37°C
- Fresh medium
- Duration = 72 hrs after docking

- Cell samples are fixed automatically with Notox after 72 hrs of incubation
- Units are then stored at room temperature until return to ground



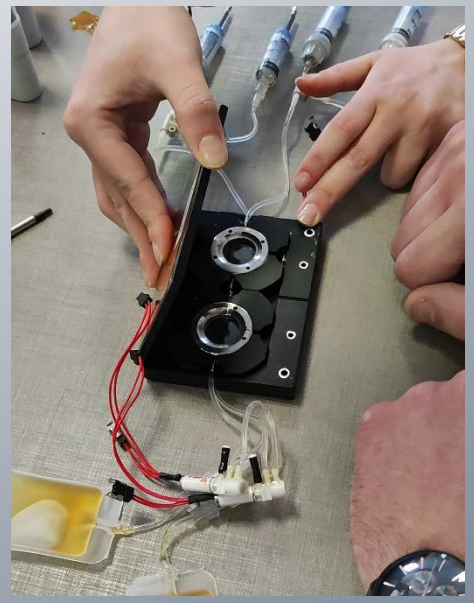


OPERATIONAL OVERVIEW

Return of the minilab

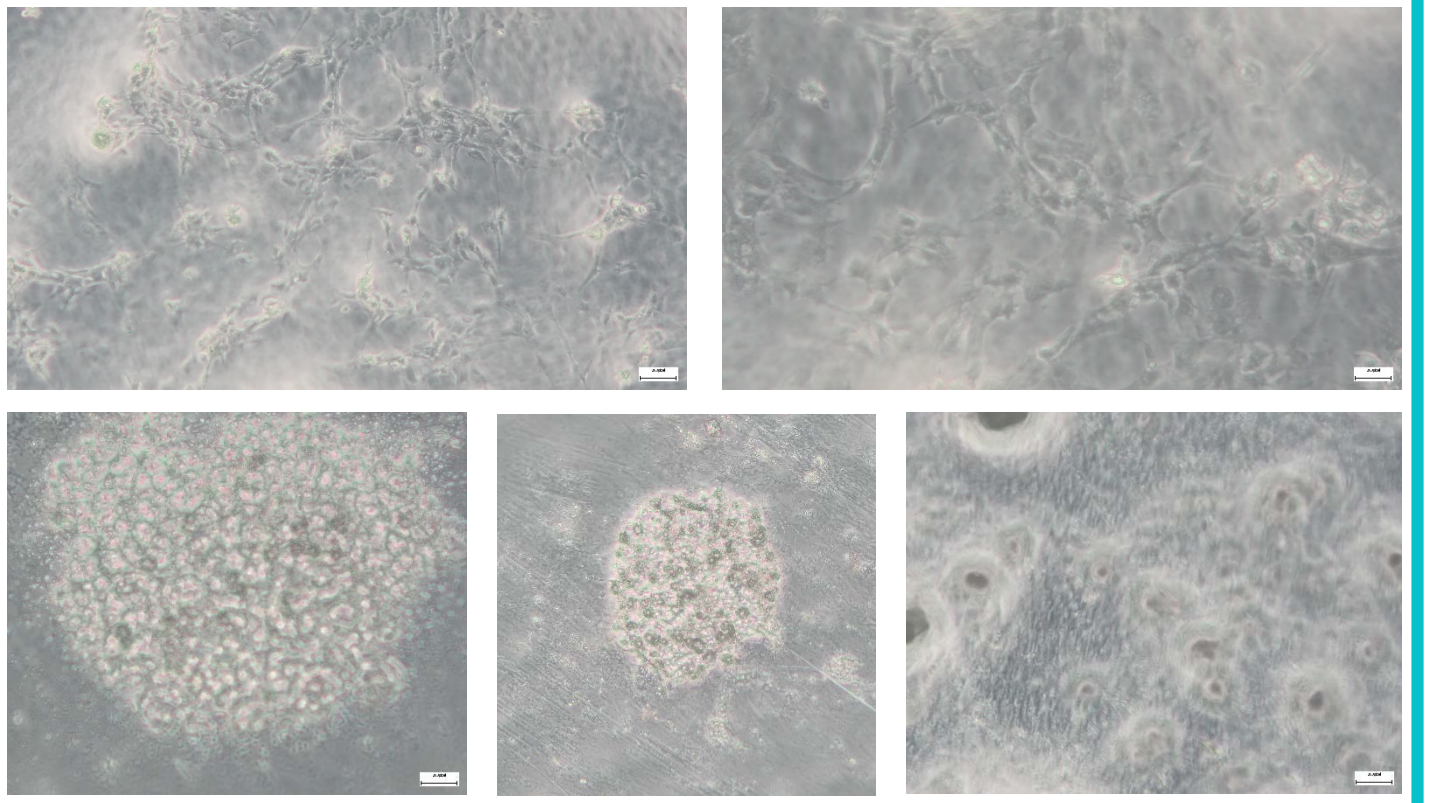
Post-flight

Samples are kept at room temperature immediately after landing.
Samples are then inserted in the return cold stowage container for the shipment to Sapienza laboratory for analysis and investigations.

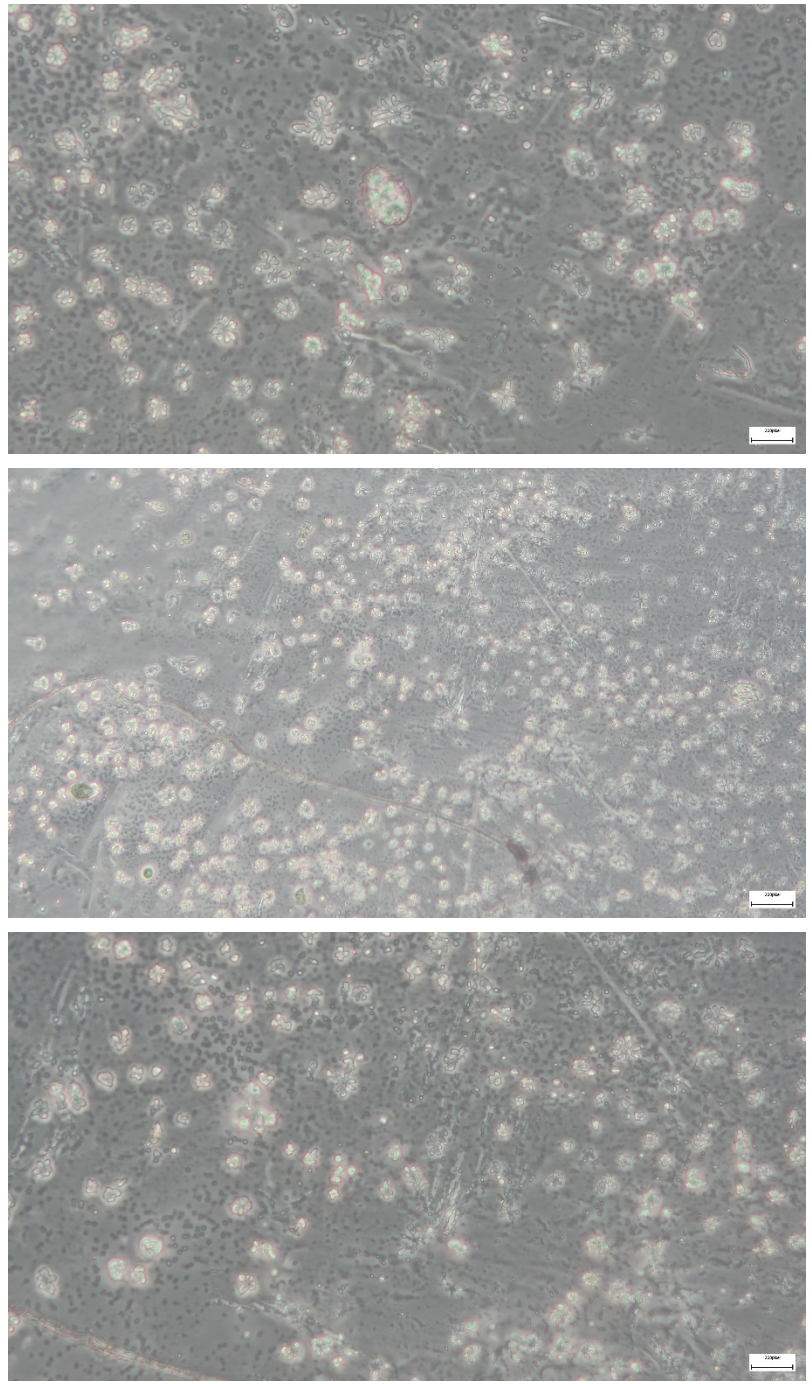


FIRST ANALYSIS - LIGHT MICROSCOPY

bGCs



bTCs



International Journal of *Molecular Sciences*

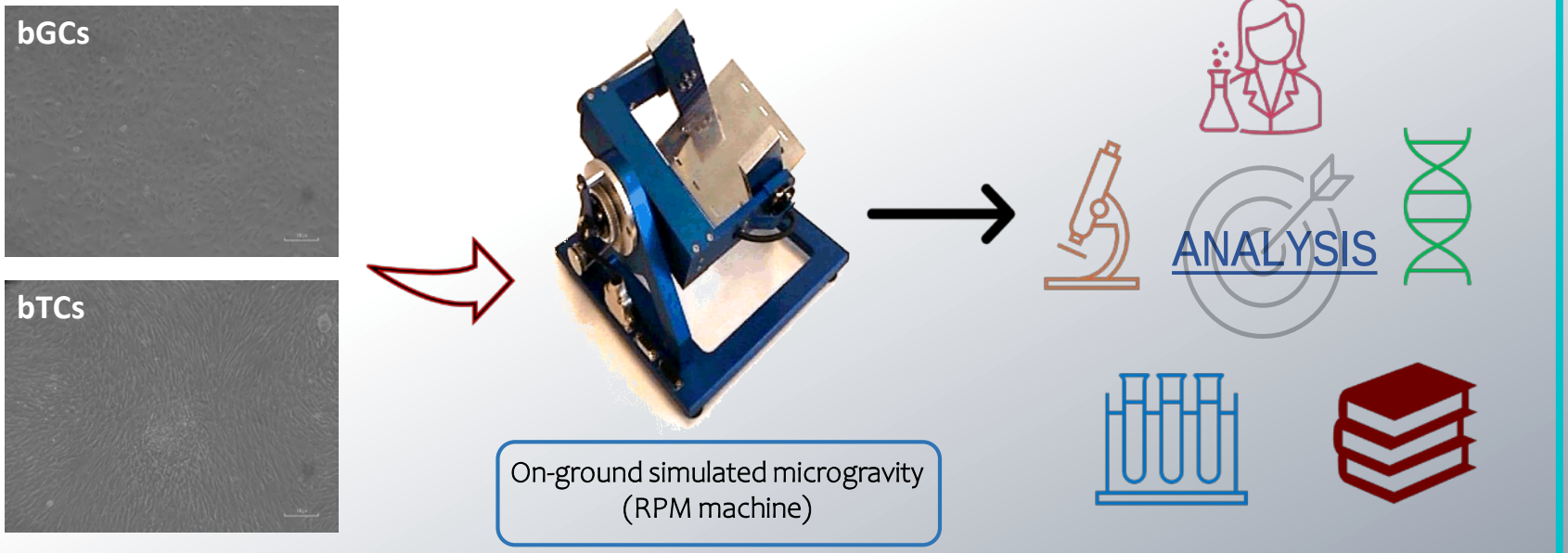
MDPI

Article

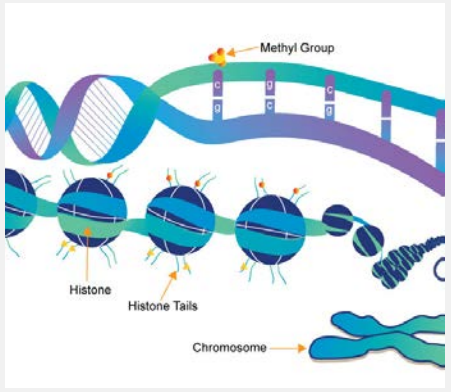
Survival Pathways Are Differently Affected by Microgravity in Normal and Cancerous Breast Cells

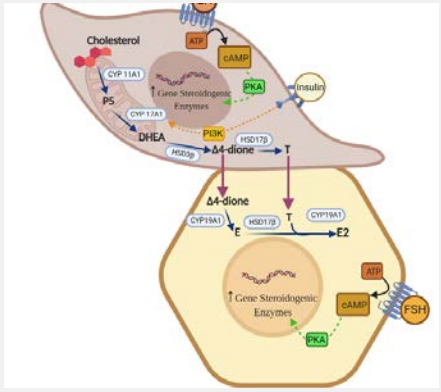
Noemi Monti [1,2], Maria Grazia Masiello [3], Sara Proietti [3], Angela Catizone [4], Giulia Ricci [5], Abdel Halim Harrath [6], Saleh H. Alwasel [6], Alessandra Cucina [3,7] and Mariano Bizzarri [1,2,*]

ON GROUND STUDIES



BENEFITS AND POTENTIAL SPIN-OFF APPLICATIONS





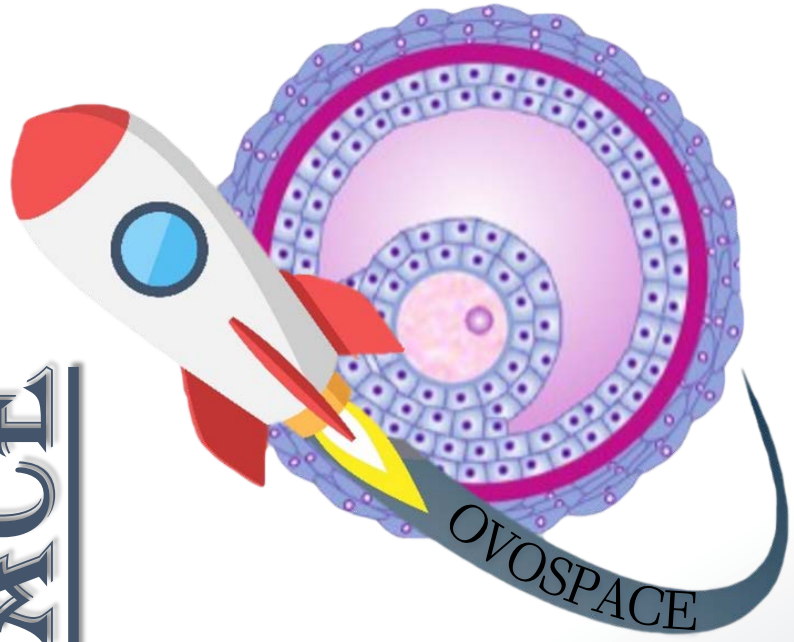
Results could provide insight into biophysical factors that can hamper function of cells in the ovary. Studying steroidogenesis in microgravity conditions will help to disclose basic mechanism of hormone production modulation and its role in fertility.

The role of the epigenetic regulation of these processes represent an original approach and will open the possibility of intervention with epigenetic modifiers to modulate/improve fetal implantation and fertility.

This could support development of treatments to improve or restore fertility in people on Earth

The use of molecules modifying steroidogenesis, in the on-ground experiments, will potentially open a totally new branch of investigation related to human fertility.

OVOSPACE



Agenzia Spaziale Italiana

- Ing. Gabriele Mascetti
- Dr. Luca Parca

Dept. of Experimental Medicine
Sapienza University of Rome

- Prof. Mariano Bizzarri
- Dr. Valeria Fedeli
- Dr. Noemi Monti

Systems Biology Group Lab

- Prof. Andrea Fuso
- Dr. Tiziana Raia

Neuroepigenetics Lab

SISTEMA SANITARIO REGIONALE
ASL FROSINONE

MATTATOIO DI TORRICE
EUROMAC srl

ALI Aerospace Laboratory for Innovative components S.c.a r.l.

- Ing. Pasquale Pellegrino
- Ing. Sara Rita Merola
- Ing. Maurizio Ruggiero
- Ing. Francesco Punzo
- Ing. Michele Cioffi

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- Jacob Scoccimerra
- Veronica La Regina
- Michael Gamble