Finanziato dall'Unione europea
NextGenerationEU

Ministero dell'Università e della Ricerca

Italiadomani
PIANO NAZIONALE DI RIPRESA E RESILIENZA

HEAL ITALIA

SPOKE N.5
"Next-Gen Therapeutics"

Project title

Development of an ORGANOid-Based Platform for CAR-T Validation Using Nanoparticles Mediated mRNA Delivery

Project Acronym

ORGANO-CAR

Partners

CA.RE.BIOS – UNICZ – UNIBS - CROB

University of Brescia

UNIBS was established in 1982 and offers a diverse range of educational programs including :

- Bachelor and Master of Science (MSc) degrees;
- Postgraduate technical courses;
- Masters and Specializations;
- Ph.D. programs.

The current student population is approximately 16,000.

UNIBS has been involved in numerous research programs.

It is engaged in 250+ ongoing financed research projects at the national and international levels, including PNRR research programs.

UNIBS Research Unit

DMMT
Biogenic colloids and surfaces lab.
Zebrafish facility
RNA biology lab

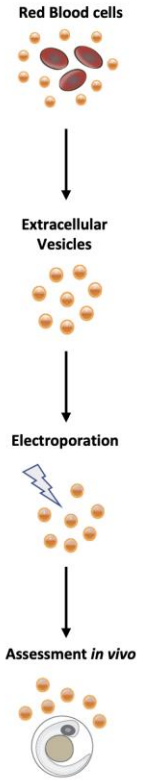
Personnel involved in the project

Paolo Bergese, PO, PI of the project
Marco Schiavone, PA, Co-PI of the project
Alessandro Barbon, PO
Annalisa Radeghieri, PA
Luca La Via, Lab Technician
Alessandro Zendrini, Lab Technician
2 (“Assegno di ricerca”, junior post-doc level)
Selena Tassoni, PhD student in Precision Medicine
Stefania Bonusi, PhD student in Precision Medicine

General aim of the project

The main objective of the Partrtenariato is to develop and validate an innovative and integrated platform, named "ORGANO-CAR," which leverages tumor organoids and advanced nanotechnology strategies for the enhancement and validation of Chimeric Antigen Receptor T-cell (CAR-T) therapy.

In particular, UNIBS will lead Work package 3 – mRNA delivery mediated by Red Blood Cell-derived Extracellular Vesicles (months 3-14)



Task 3.1 – Production and characterization of red blood cell-derived extracellular vesicles (months 3-6)

Task 3.2 – CAR-mRNA loading into red blood cell-derived extracellular vesicles (months 7-11)

Task 3.3 – Quality control of the RBC-EVs in vivo (months 11-14)

Deliverable A: Standard Operating Procedure (SOPs) to produce RBC-EVs loaded with CAR-mRNA.
Deliverable B: Report on in vivo biocompatibility of the RBC-EVs loaded with CAR-mRNA in zebrafish.

Contribute to Heal Italia and Spoke 5 Programs

The proposed "ORGANO-CAR" platform directly aligns with the goal of Heal Italia, and in particular with the goal of Spoke 5, by contributing to addressing key challenges in Precision Medicine: i) improving the efficacy and safety of CAR-T therapy for solid tumors, ii) overcoming possible limitations associated with the application of CAR-T therapy to solid tumors, and iii) focusing on safety, efficacy, and translational potential.

By leveraging tumor organoids and advanced nanotechnology, this platform aims to:

1. **Validate new targets and therapeutic effectors:** By testing CAR-T cells against tumor organoids, the platform can identify new targets and assess the efficacy of different therapeutic approaches.
2. **Determine cellular and molecular targets:** The platform can provide insights into the molecular mechanisms underlying tumor resistance and CAR-T cell function.
3. **Establish efficient pipelines for preclinical validation:** The use of tumor organoids allows for rapid and efficient preclinical testing of CAR-T therapies, accelerating their development and translation into clinical trials.