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Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA

HEAL ITALIA

SPOKE N.5

“Next-Gen Therapeutics”

***Development of an ORGANOID-Based Platform for CAR-T Validation Using Nanoparticles Mediated mRNA Delivery
ORGANO-CAR***

Responsabile: Prof. Giuseppe Fiume, PhD

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University of Catanzaro (UNICZ) "MAGNA GRÆCIA"



The University of Catanzaro (UNICZ) is equipped with laboratories, highly technological core facilities, and spaces to accommodate students and researchers.

The research activity of UNICZ is focused on basic, clinical, and translational topics aimed at studying some of the most common human diseases in the fields of oncology, metabolic disorders, and vascular diseases, with an almost always multidisciplinary approach.

UNICZ is endowed with expertise and facilities to perform experimental procedures in the fields of Biochemistry, Molecular Biology and Immunology as well as many facilities including animal house, proteomics, high-throughput DNA and RNA-sequencing, confocal microscopy, FACS sorting and a nanotechnology platform.

The responsible for the ORGANO-CAR project at UNICZ is Professor Giuseppe Fiume, Associate Professor of Applied Biology. Professor Fiume has extensive expertise in the fields of cancer biology, immunotherapy, and molecular diagnostics. **His research focuses on the tumor microenvironment, phage display techniques, and the development of advanced 3D models, including organoid-based platforms for disease modeling and drug screening.**



General objective of HEAL ITALIA

Spoke 5

This spoke aims at developing innovative and comprehensive drug-screening and validation platforms allowing to overcome the limits of currently available systems and accelerate the identification of next-generation effective drugs in the field of precision medicine for oncology, cardiology, rare diseases, microbiota alterations etc.

Next Gen Therapeutics
“From silico to bedside” design
and validation of innovative tailored and
personalized therapeutic strategies

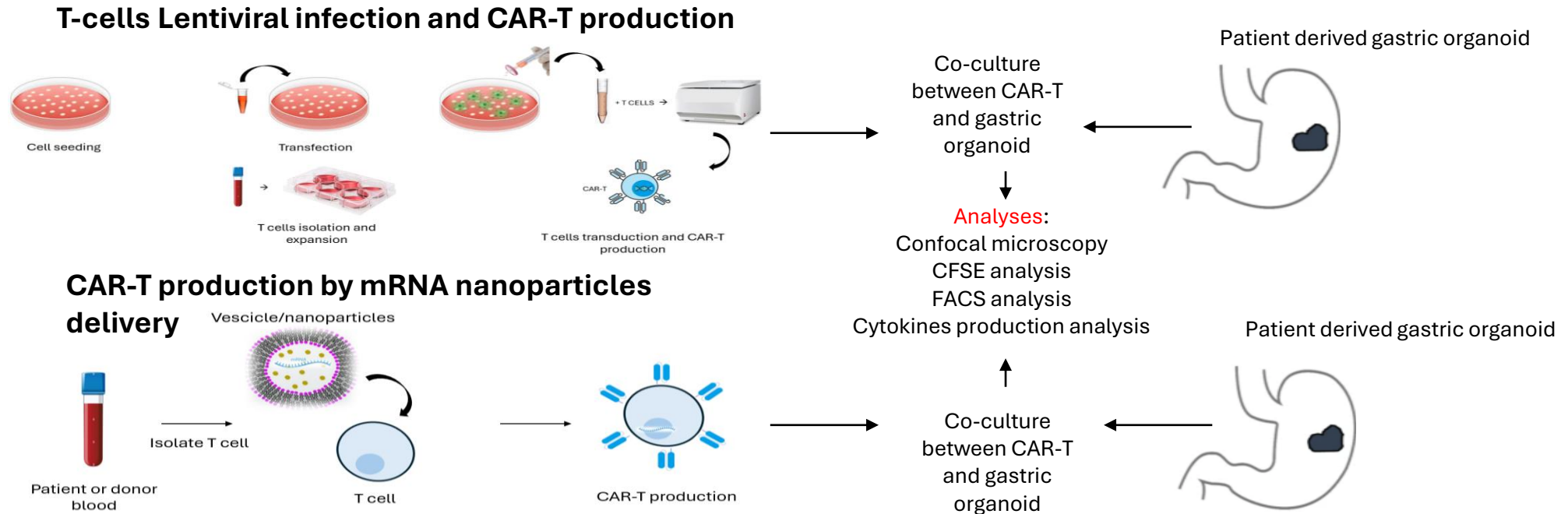


CALL 1: Next Gen Therapeutics
Subject A: Innovative methods for modulating the immune
system for therapeutic purposes

Sub-theme A1. Novel nanotechnology strategies to generate CAR-modified immune effectors. The aim of the call is the development of novel technologies to effectively induce persistent and safe CAR-modified immune effectors. Collaboration with industrial partners is favored to increase the TRL.

Main aims of our project

- 1) Development of an advanced platform:** The project aims to create an integrated platform combining tumor organoids and nanotechnology for improving CAR-T therapy in solid tumors.
- 2) Precision in CAR-T delivery:** Utilization of mRNA nanocarriers to deliver CAR constructs without viral vectors, reducing off-target effects and improving safety.
- 3) Validation in realistic tumor environments:** Use of tumor organoids that mimic the native tumor microenvironment, ensuring CAR-T cells are tested in a setting that closely resembles in vivo conditions.



Contribute of UNICZ to the ORGANO-CAR project

- 1) Enhancement of CAR-T efficacy:** Unit UNICZ will produce CAR-T cells through two different methods: a) by lentiviral infection of isolated T-cells; b) by mRNA-encoding CAR-T nanoparticles delivery (provided by UNIBS).
- 2) Comparative analysis of CAR-T function on established organoid platform:** Unit UNICZ will analyze the anti-tumor activity of CAR-T cells, produced by using the two different methods, on the established organoid (provided by CAREBIOS)

Contribute of our project to the research program of Spoke 5 and HEAL ITALIA

- 1) Enhancement of CAR-T efficacy:** The platform seeks to optimize CAR-T cell performance against solid tumors by addressing the challenges posed by the tumor microenvironment and immune evasion.
- 2) Innovation in immune effector generation:** Leveraging nanotechnology to introduce more efficient and safer methods for CAR-T production and functional validation.
- 3) Contribution to precision medicine:** The project aligns with the goals of advancing personalized therapies, targeting specific tumor characteristics, and improving patient outcomes in solid cancer treatment.
- 4) Focus on safety and efficiency:** The ORGANO-CAR platform aims to offer an efficient, safe, and cost-effective alternative to current CAR-T manufacturing and validation processes.