UNIVERSITÀ
POLITECNICA
DELLE MARCHE

Large-scale production of exosomes for miRNA-based cancer therapy

Supervisor: Dott Marco Tomasetti

02 / 2025 – www.univpm.it

Department of Clinic and Molecular Sciences
(https://www.disclimo.univpm.it)

Supervisor: Dott Marco Tomasetti
Research Group Description: the Supervisor

Dott Marco Tomasetti, PhD, BSc, MSc.

Researcher, DISCLIMO, UNIVPM Occupational Medicine Lab, Polytechnic University of Marche, Ancona, Italy.

Expertise in Biochemistry, Molecular Biology, and cell culture modelling.

Research interests: Cancer biology and prevention. Study of cancer biology using in vitro models as such as 3D-cell culture, spheroids, organoids, patient-derived organoids, and in vivo animal models. Carcinogenesis induced by environmental and occupational exposure. Genetic and epigenetic modifications (methylation and acetylation) involved in asbestos-related diseases communication.

More than 100 peer-reviewed research articles with about 3,930 citations received https://orcid.org/0000-0001-5036-7052, (H-index = 40 according to Scopus). More than 30 years of experience in DNA damage-induced carcinogenesis, asbestos-related malignancies, anticancer compounds, biomarkers for early detection of cancer and miRNA-based therapy.

Fundings:

2023-2025: Proof of Concept PNRR VALUE ““miRNA for the treatment of cancer, EXO-ONCO-MIR” funded by the Italian Ministry of Economic Development.

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Supervisor:

Department of Clinical and Molecular Sciences (DISCLIMO)

16 SCIENTIFIC AREAS

BIOS-13/A MEDS-02/A
MEDS-02/B MEDS-02/C
MEDS-05/A MEDS-08/A
MEDS-09/A MEDS-09/B
MEDS-09/C MEDS-10/A
MEDS-10/C MEDS-18/A
MEDS-19/A MEDS-25/B
MEDS-26/A MEDS-26/D

62 ACADEMICS
14 TECHNICIANS

13
RESEARCH LABORATORIES

MARCHEBIOBANK

- 26 PhD STUDENTS
- 13 POST-DOC
- POST-GRADUATE STUDENTS (15 COURSES)

MUR
Finanziato dall'Unione europea NextGenerationEU
Italiadomani
HEAL ITALIA
VITALITY

11
CLINICAL RESEARCH UNITS

> 3 Mio EUR
RESEARCH INCOME

> 500
Publications (2021-2024)

Supervisor: Dott. Marco Tomasetti

Research Group Description: the Group

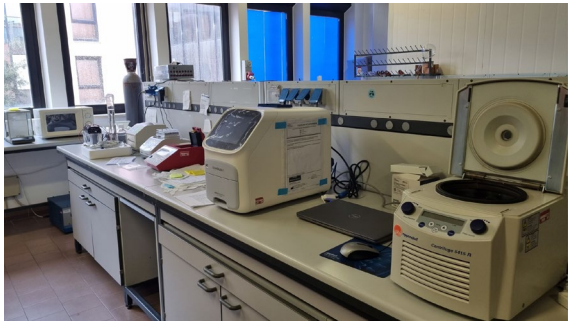
Occupational Medicine Lab

https://www.disclimo.univpm.it/node/78

***STAFF*: The group is currently formed by a full Professor, 2 Researchers, 2 PhD students and two master students.**

RESEARCH ACTIVITY

The main research lines of the Occupational Medicine Lab focus on cancer biology, prevention and therapy. Study of new molecules as anticancer drug for the treatment of pleural mesothelioma and lung cancer. By miRNA profile evaluation we identified tumor-specific miRNAs as promising serum biomarkers for early cancer diagnosis, that have been proposed as therapeutic target. In vitro and ex-vivo 3D models, including spheroids, organoids and patient-derived organoids are used for cancer response to the treatments. Recently, the research interested shifted forward miRNA-based therapy using exosomes as delivery system. A collaboration has been established with the company EVerZom, Paris, France aimed to produce miRNA-enriched exosomes according to Good Manufacturing Practices (GMP) using 3D cell culture in spinner flask. The miRNA-enriched exosomes have been proposed as innovative approach in cancer therapy.



RESEARCH AND PUBBLICATIONS

https://orcid.org/0000-0003-1015-7098
https://orcid.org/0000-0001-5036-7052
https://orcid.org/0000-0002-9798-3589

EQUIPMENT

MARCHEBIOBANK is the collaborative platform created in the field of personalized medicine: drugs, diagnostics and new therapeutic approaches. NGS, Illumina NextSeq 1000, Flow cytometry, Digital PCR, Cell sorting analysis, Florescence and chemiluminescence spectrophotometry (Tecan).

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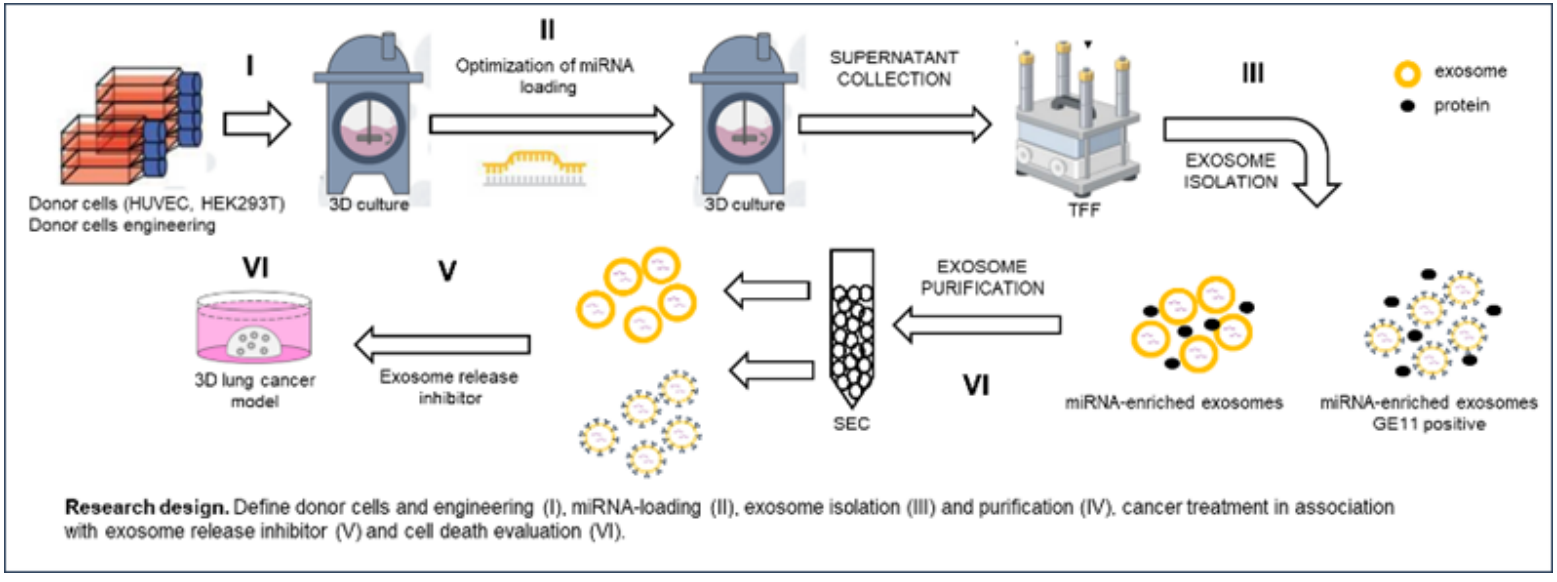
Project Idea:Large-scale production of exosomes for miRNA-based lung cancer therapy

Backgroud: Tumor-suppressive miRNAs are crucial in regulating the expression of genes associated with tumor growth and progression. Restoration of tumor-suppressive miRNAs holds great therapeutic potential in cancer treatment. Although miRNA-therapy is a rapidly developing field, clinical application remains a significant challenge due to issues with efficacy, specificity, and delivery in humans. This proposal will focus on the use of exosomes as delivery of tumor suppressor miRNA in cancer. The miRNA loading, isolation and purification of exosomes, as well their engineering will be standardized for large production. The exosome-enriched miRNA will be test for their anticancer effects in 3D cell models.

Project OBJECTIVES:

- **Define donor cells that can growth in large-scale, can be easily transfected, and can produce exosome in high amounts.**
- **Optimize miRNA loading by establishing the transfection reagent/mimic miR ratio that efficiently introduced miRNA into exosomes.**
- **Setting isolation and purification methods. The size and purity will be evaluated by Nanoparticle Tracking Analysis (NTA) and protein content.**
- **Exosome engineering. Obtaining miRNA-enriched exosomes expressing GE11 ligand.**
- **Compare cell up-take of exosomes with and without expressing GE11**
- **Compare the anticancer effect of exosomes with and without expressing GE11 in association with an inhibitor of exosome release to increase cell death .**



Research design. Define donor cells and engineering (I), miRNA-loading (II), exosome isolation (III) and purification (IV), cancer treatment in association with exosome release inhibitor (V) and cell death evaluation (VI).