



PROJECT

Supervisor: Riccardo Vago
Title: Exploiting the potential of extracellular vesicles as drug delivery systems
Curriculum: Basic and Applied Immunology and Oncology

Link to the personal page of the University or relevant hospital site website: <https://research.hsr.it/en/institutes/urological-research-institute/extracellular-vesicles-and-toxins.html>

Description of the Project (max 3,000 characters including spaces)

Background/gap of knowledge

Drug bioavailability can be considered as one of the most relevant obstacles both for the development of new therapeutically active drugs and for the success of therapies. Although the promising therapeutic effect of numerous newly developed compounds, most of them do not enter preclinical or clinical trials due to their low water solubility, their fast degradation or instability in the blood flow, their severe toxic side effects, or the lack of specificity for the targeted cells. Extracellular vesicles (EVs) are lipid bilayer-enclosed particles, naturally released by different cell types to transfer cargoes for intercellular communication.

Rationale and hypothesis

The development of an efficient drug delivery system can importantly improve the standard cancer therapy. EV biological features, such as their intrinsic ability of loading, protection and transport of multiple cargoes, as well as target cell selectivity, are now matter of interest for their use as potential biologic vehicles for therapeutic agents. We have demonstrated that EVs can be loaded with various anti-cancer molecules to be efficiently transferred to tumor cells, resulting in cell death.

Objectives and specific aims

1. Prepare a set of cells, genetically modified as to sort bioactive molecules (regulatory RNAs and therapeutic proteins) into EVs.
2. Test EV loading methods previously developed in the laboratory with a broad range of molecules to employ as drugs in order to establish the compatibility with different cargoes.
3. Transfer drugs through EVs to cancer cells and verify their therapeutic effect.

Expected outcomes

We expect to develop versatile EV-mediated drug delivery systems to encapsulate and convey a plethora of therapeutic cargoes within well preserved vesicles, in a more efficient and controlled manner, to be used for therapeutic treatment in the oncological field, likely extendable to other areas.

Skills that the student should acquire (max. 600 characters including spaces):

The student will use the most common molecular, cell biology and biochemistry techniques. He/she will acquire skills in isolating extracellular vesicles; in analyzing vesicular content; in defining the effect of the delivery of specific cargoes to recipient cells.

References (max. 15)



UniSR

Università Vita-Salute
San Raffaele

**APPLICATION TO ACT AS SUPERVISOR
AND RESEARCH PROJECT PROPOSAL**

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Kooijmans et al. Pharmacol Res. 2016
Zuppone et al. Drug delivery 2023
Brancolini et al. Biomedicines 2024