Biomimetic Nanoparticles for Cancer Target Immunotherapy

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Introduction:
Nanotechnology gives the opportunities to target specifically cancer cells while reducing the side effects of conventional therapies through synthesis of nanoparticles (NPs) with tuneable properties (size, shape, charge, surface modifications, etc).
NPs preferably accumulate in tumor tissues due to the enhanced permeability and retention effect (EPR) allowing efficient delivery and optimal doses of therapeutic compounds to specific tissue or cell types with important applications in immunotherapy[1,2,3].

The aim of this study involves the production of polymeric nanoparticles (pNPs) able to selectively target cancer cells and simultaneously activate the immune response.
A biocompatible FDA approved polymer of particular relevance for biomedical applications is polycaprolactone (PCL) that can be easily modified to improve biomimetic features to enhance targeting properties[3,4].

Methods:
We develop pNPs[2,4] starting by polycaprolactone (PCL) as NPs core and cancer cell membrane as coating[5,6,7].
Morphology and size of pNPs are then characterized by DLS, SEM and TEM. pNPs uptake and homotypic binding are evaluated *in vitro* in human cancer cell lines by fluorescent microscopy and flow cytometry.

Results:
PCL-NPs core made with own synthetised carboxy-termined PCL, show a homogeneous distribution.
Changes in both size and surface charge confirm that nanoparticles were successfully coated with cell membranes. Also, morphological images obtained by TEM, show a distinct layer on the surface of PCL NPs verifying the correct coating with cell membrane.
The higher internalization rates of biomimetic-NPs in their source cells compared to other cell lines was confirmed by fluorescent microscopy and flow cytometry analysis, confirming the self-recognition and the preferentially interaction with cancer source cells.

Conclusion and discussion:

A diversity of cell types selected as membrane source allowed to develop innovative biomimetic nanoparticles that through an intrinsic strategy of self-recognition typical of cancer cell membranes (homotypic targeting) can be used to deliver drugs or genes.

On the other hand, biomimetic-NPs could be used as efficient tool in precise cancer immunotherapy for the possibility to employ patient-derived cell membranes.

Acknowledgement:
This study was supported by “Tecnopolo per la medicina di precisione” (TecnoMed Puglia) - Regione Puglia: DGR n. 2117 del 21/11/2018, CUP: B84I18000540002” and Progetto PON ARS01_00906 “TITAN - Nanotecnologie per l’immunoterapia dei tumori”, finanziato dal FESR nell’ambito del PON “Ricerca e Innovazione” 2014 – 2020 – Azione II – OS 1.b.

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Figures

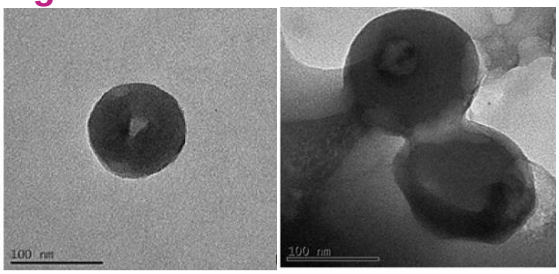

Figure 1. TEM images of Biomimetic NPs

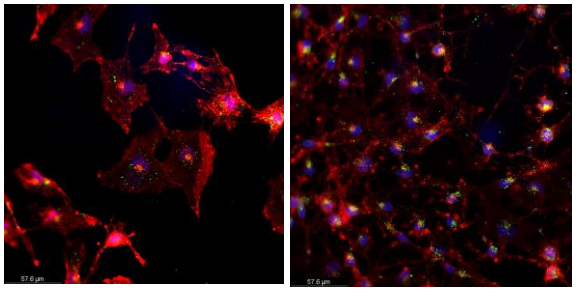

Figure 2. Cellular uptake of Biomimetic NPs after 24 h of treatment to fluorescent microscope. Phalloidin TRITC for beta actin, FITC for NPs and DAPI for nuclei