RPAR-conjugated nanovesicles for the potential targeting of prostate cancer

Nicola D'AVANZO - *University "G. D'annunzio" of Chieti-Pescara*

Prostate cancer is currently the fifth leading cause of cancer-related death among men worldwide, counting around 375,000 deaths per year. Usually, prostate cancer shows an asymptotic behavior during the early stages, making difficult its early diagnosis and thus ineffective conventional chemo- and radio-therapies. In this scenario, the use of drug delivery able to target specific tumor tissues may provide a huge improvement of payloads activity, facilitating at the same time the overcoming of biological barriers.
The aim of this work was to realize a targeted nanomedicine for a potential use in prostate cancer treatment. The tumor homing peptide with *Cend* RPAR residual was selected as targeting molecules thanks to its ability to recognize Neuropilin 1 (NRP-1) transmembrane receptor that results overexpressed on both prostate cancer cells and tumor-associated vasculature. This peptide was conjugated onto the surface of niosomes through a specific thiol-maleimide reaction and resulting functionalized nanovesicles were physicochemical characterized in terms of size, PdI, surface charge and peptide conjugation efficiency. The ability of peptide-functionalized nanovesicles to interact specifically with NRP-1 positive prostate cancer cells, was confirmed by several investigations, i.e. cell-free binding, confocal and FACS analysis, carried out with or without specific receptor's blocking antibodies. In order to realize a therapeutic nanosystem, Doxorubicin hydrochloride was selected as an anticancer drug model and the cytotoxic effect of resulting nanosystem was *in vitro* tested, showing a superior activity on NRP-1 positive PPC-1 prostate cancer cells compared to free drug or no-functionalized therapeutic nanovesicles.