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In vivo targeting efficiency of multifunctional nanoconstructs bearing antibody-derived ligands

Marta Truffi[1], **Luisa Fiandra**[2], **Serena Mazzucchelli**[2], **Miriam Colombo**[3], **Raffaele Allevi**[1], **Davide Prosperi**[3] and **Fabio Corsi**[1,2]
[1]"Luigi Sacco", University of Milan, Italy[2], L. Sacco Hospital, Italy[3], University of Milano-Bicocca, Italy

The identification of new strategies aimed to optimize the detection and treatment of primary breast cancer and metastases represents a great technical and medical challenge. Target-specific nanodevices may allow to combine specific tumor recognition with the capability to act as a drug reservoir for the selective delivery of chemotherapics to tumor sites. At present, the importance of surface functionalization of nanoparticles to improve their *in vivo* localization at the tumor is still controversial. Here, we have designed and developed a set of multifunctional nanoprobes, modified with three different variants of the model antibody trastuzumab (TZ), a widely used therapeutic agent for the management of HER2-positive breast cancer. We have performed a comparative study of internalization, trafficking, and metabolism in breast tumor cells of multifunctional nanoparticles (MNP) functionalized with either the entire TZ or alternative lower molecular weight variants of the monoclonal antibody, such as the half-chain (HC) and a single chain variable fragment (scFv). Then, we have estimated to what extent the structure of the surface bioligand could affect the targeting efficiency of the nanoconjugate in both *in vitro* and *in vivo* settings, and found that the highly stable MNP-HC is the best candidate for application in breast cancer detection. Our results provide evidence that a specific functionalization of nanoconstructs may afford long-term action in cancer cells *in vivo*. Furthermore, the longer period of accumulation of MNP-HC in the tumor makes this nanoparticle a promising candidate for future application in breast cancer diagnosis and treatment.

Biography

Marta Truffi is a Post-doc fellow at Centro di Microscopia Elettronica per lo sviluppo delle Nanotecnologie applicate alla medicina in University of Milano, Italy. During her studies and research activities she got interested in cell biology and differentiation, in particular how cells sense external stimuli and respond to the surrounding microenvironment. At present, her research projects aim to exploit bioengineered nanoparticles to target specific cellular populations in order to monitor different stages of inflammatory bowel diseases, and further provide therapeutic benefits.

Competences: cell culture and transfection, RNAi technology, lentivirus production, protein and RNA analysis, recombinant protein purification, GST pull-down, DNA cloning and sequencing, classic and Real-Time PCR, confocal microscopy.

marta.truffi@gmail.com