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Complementary drug delivery systems to overcome biological barriers that characterize systemic treatment

Alessandro Parodi and **Ennio Tasciotti**
Houston Methodist Research Institute, USA

Biological barriers maintain the homeostasis between different compartments of the body and regulate the transport of every therapeutic administered systemically. Upon intravenous injection, the tumor vascular barrier, the tumor extracellular matrix and the tumor cell membrane barriers represent major obstacles hampering the delivery of the drug to the target. In this work we showed advanced surface modification that enable nanoparticles to overcome all these barriers allowing for a more efficient targeting of tumor microenvironment at a systemic, tissue and cellular level. Proteolipid surfaces coatings directly purified form the cell membrane of leukocytes allowed for the targeting and negotiation of tumor vascular barrier. Proteolytic coatings derived from the stem of the pineapple were efficient in increasing particle penetration and diffusion in tumor extracellular matrix in order to target hypoxic tumor region. Finally polymer science enabled synthetic carriers with pH responsiveness and ability to escape the endolysosomal compartment after internalization and to deliver a payload within the cytoplasm of the cells. A complete characterization of the different systems was performed through chemical technique and imaging analysis. Fluorescent and confocal microscopy was used to characterize the systems in vitro, while intravital microscopy allowed for determining particle targeting and bioactivity. In this work we showed different techniques to negotiate and overcome several biological barriers that stand and betweenthe administration point and the target.

Biography

Alessandro Parodi has completed his PhD at University of Genoa in Pharmacological and Cosmetic Sciences. His post-doctoral study was initially performed at Advanced Biotechnology Center (Genoa) investigating tumor angiogenesis and the impact of carbon nanostructures on endothelium. He has moved to the Houston Methodist Research Institute (HMRI-Houston) where he distinguished himself in the designing and the development of biomimetic carriers to target inflammatory disease. He is currently working as an Instructor of the Department of Regenerative Medicine at the HMRI and is an author of more than 20 papers and 1 patent describing cellular vector technology for the treatment of pulmonary cancer lesions.

aparodi@houstonmethodist.org

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