# "Synthetic, bioinspired and natural nanovectors as versatile platforms for biomedical applications"

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Recent advances in nanotechnology have enabled fabrication of therapeutic and/or diagnostic nanocarriers with high efficacy for treatment of several pathologies, such as cancer and neurological diseases. For clinical purposes, artificial nanocarriers with tailored properties and functionalities can be produced in laboratory and composed of organic and/or inorganic components. Lipid-based nanocarriers (e.g. micelles, liposomes, solid lipid nanoparticles) as well as polymeric nanoparticles represent the most commonly organic nanostructures explored for biomedical applications, being able to incorporate drugs or imaging agents and target them to the specific disease sites. Nanostructures, based on metals, semiconductor, carbon, silica or oxide-based nanomaterials can be also combined to such nanocarriers providing hybrid nanoplatforms with unprecendented targeting, drug delivery ability, as well as photoactivity and/or magnetic properties, all relevant in the clinical field. Along with the lab-developed nanocarriers, various types of natural vesicles, physiologically emitted from plant and animal cells and actively involved in the intercellular communication, such as exosomes and extracellular nanovesicles, can be used as delivery systems of therapeutic and /or diagnostic agents, offering several advantages respect to the artificial nanocarriers, such as higher stainability, safety, biocompatibility and bioavailability, biorecognition and targeting ability. Here, design, preparation and characterization of such a complete platform of multifunctional synthetic nanovectors along physiologically emitted natural vesicles will be presented for the diagnosis and therapy of specific diseases, as cancer (e.g. gastrointestinal cancers) and neurological disorders [1-5]. In particular, mesoporous silica nanoparticles, lipid or polymer based nanocarriers will be described, highlighting their potential for incorporation of drugs and/or inorganic nanoparticles and for surface functionalization to achieve novel drug delivery targeted nanoformulations with elevated colloidal stability, stealth properties, good degrees of biocompatibility and high encapsulation efficiency. Also, use of luminescent, magnetic and photoactive inorganic colloidal nanoparticles for multifunctional nanovectors fabrication will be illustrated. Finally, examples of natural cell-derived exosomes relevance for diagnostic of gastrointestinal cancer will be provided.

***References***

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