INORGANIC NANOPARTICLES AS EMERGING TOOLS FOR TUMOUR THERAPY AND IMAGING

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Inorganic nanoparticles due to their size-dependent properties have unique features that make them appealing as new therapeutic and imaging tools in the medical field. For instance, magnetic nanoparticles are employed as heat transducers to convert magneto-energy into heat when exposed to alternating magnetic fields (AMF). The heat generated by the magnetic nanoparticles is used to kill cells in the tumor mass in the so-called Magnetic hyperthermia treatment (MHT). At AMF of clinical use (100 kHz and up to 24kA/m) the magnetic actuation of the nanoparticles can occur with no tissue-depth attenuation thus enabling the activation of magnetic nanoparticles located at deep tumor sites. This provides more selective heat treatment with less side effects which, furthermore, can be combined with other therapeutic approaches to couple toxic effects against cancer cells in a multimodal therapeutic strategy.[1]
On the other hand, semiconductor nanoparticles, also known as quantum dots, given their robust photoluminescent properties, single source excitation and multicolor emission properties have been employed for multiplexing and long-term imaging studies. More recently, some studies have highlighted their use as photothermal agents able to convert light into heat for the photothermal treatment of skin cancer.[2]
This talk aims at providing an overview of our last few years research efforts to produce, functionalize and use inorganic nanoparticles in magneto-thermia and photo-thermia and/or as drug delivery carriers for chemotherapeutic agents, or for intrinsic nanoparticle toxic ions.[3,4,5] Moreover, we propose the alternative use of some semiconductor inorganic nanoparticles as internal radiotherapeutics agents to deliver Cu64 radioisotopes at very high specific activity.[6,7] Throughout this lecture, for the best performing materials, our preclinical results performed to evaluate their therapeutic efficacy and bio-distribution will be thoroughly presented.

Key words: *hyperthermia, drug delivery, inorganic nanoparticles, tumor imaging, internal radiotherapy*

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