AuAg hollow nanoshells as therapeutic tools for cancer treatment

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It has become widely accepted that none of the existing single-modality treatments (immunotherapy, chemotherapy, radiotherapy, gene therapy or thermotherapy) can cure fatal diseases such as cancer by itself. Consequently, different combinations of these treatments have been tested for their synergistic effects that may dramatically improve outcomes by reducing the side effects of each single modality treatment. This is because therapeutic effects add up while side effects are distributed[1]. Au nanoparticles (AuNPs) provide a broad range of biomedical applications thanks to their possible use in a number of techniques for cancer imaging, diagnosis and treatment[2]. All these applications rely on on the so-called localized surface plasmon resonance phenomenon (LSPR), taking place when an AuNP is irradiated with an electromagnetic wave. Then, its conduction electrons will be driven by the electric field to collectively oscillate relative to the lattice of positive ions, creating intense peaks (both scattering and absorption) at resonant wavelenthgs.

However, prior the development of these multimodal NPs there are important question that need to be address being the integration of the NPs and their properties in the standard models of ADME (Administration, Distribution, Metabolization/Transformation/Degradation and Excretion). For that purpose, we describe the synthesis of monodisperse AuAg hollow nanoshells which is obtained by means of a highly reproducible and robust methodology based on the galvanic replacement reaction[3,4]. This is possible thanks to the systematic identification of the role played by the different synthetic parameters involved in the process (such as surfactants, co-oxidizers, complexing agents, time, and temperature), providing an unique control over the morphological and optical properties of the material[4]. At the same time, we have developed an in vivo biodistribution study in order to determine: where the NPs go, how they evolve and how they end-up while delivering drugs and serving as antennas for real time monitorization, and validate the extend of their capabilities on therasnotic future applications.

References

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