

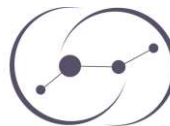


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A Step Forward in Breast Cancer Research: Gold Nanoparticles as Photothermal Therapy Enhancers

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Gold nanoparticles (AuNPs) have been widely used and characterized for multiple biomedical applications, including the enhancement of photothermal therapy (PTT). AuNPs present a particular plasmon resonance band and are able to convert the absorbed optical radiation into heat, which validates their use in PTT. Several production methods have already been proposed for the synthesis of AuNPs, allowing to optimize the particles' morphology, size and optical properties. However, the production methods commonly used are frequently associated with the use of toxic reagents such as Cetyltrimethylammonium bromide, which presents some concerns for clinical applications. Herein, it is proposed a novel AuNPs' core synthesis method using tetrachloroauric acid and a mixture of reducing agents, later on coated with a combination of hyaluronic and oleic acids. The coating here used represents a potential improvement of AuNPs' biocompatibility, biodegradability and lifetime, while simultaneously potentiating the attachment towards specific ligands, such as the CD44 receptor, to develop more localized and highly selective tools. The produced functionalized nanoparticles were characterized by Dynamic Light Scattering, Microscopy Techniques and Spectroscopy, showing diameter sizes under 350 nm, polydispersity index smaller than 0.4 and enhanced absorbance in the Near Infrared (NIR, 650 to 900 nm) range. Moreover, the AuNPs safety and efficacy were preliminarily assessed *in vitro* using breast cancer cell lines. No toxicity was observed by MTT assay, both in breast cancer cell lines, and red blood cells. The irradiation process was proved to be safe; however, when combined with the AuNPs administration, it resulted in a significant reduction of cell viability for some of the breast cell lines tested. Thus, the results highlight the potential of the proposed system for some type of tumors, even though further tests are required to better understand the mechanisms behind the obtained results.

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