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Hybrid nanoparticles conjugated to human albumin for photoacoustic imaging in cancer disease

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Early detection of cancer is the key to successful treats this disease. Traditional diagnostic and imaging techniques cannot detect tumors in early development stages. New diagnostic imaging methods based on the use of nanoparticles (NPs) have greater sensitivity and selectivity. The aim of this work is to develop hybrid nanoparticles with photoacoustic properties for early diagnosis in cancer disease. These nanoparticles consist of a metallic silver core, surrounded by a silicon and a melanin like compound (5,6-dihydroxyindol-2-carboxylic acid, DHICA) shell (MelaSil_Ag-NPs). DHICA and silicon have high biocompatibility, low cost and physical properties, while silver is able to amplify the PA signal produced by DHICA. The NPs biological evaluation was performed with breast cancer cells (HS578T) and immortalized non-tumoral breast cells (MCF10a), using MelaSil_Ag NPs bioconjugated with human albumin (HSA) (MelaSil_Ag-HSA NPs), by EDC/NHS chemistry strategy. The results showed a good level of internalization and cytocompatibility. Furthermore, to evaluate the hemotoxicity of MelaSil_Ag-HSA NPs, the percentage of lysed red blood cells after incubation with NPs was estimated. The data showed absence of hemotoxicity previously observed in bare NPs. The analysis of corona proteins interacting with NPs indicated that the presence of albumin reduces the interaction of these proteins with nanoparticles surface. Finally, the binding of HSA to MelaSil_Ag-HSA NPs show a high biocompatibility, hemocompatibility, stability and a good photoacoustic signal.

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