Biomimetic keratin gold nanoparticles for photo-thermal cancer therapy

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Abstract

During the last couple of decades, considerable research efforts have been directed towards the synthesis and functionalization of gold nanoparticles (AuNPs) for biomedical applications due to their excellent biocompatibility and stimuli-responsive properties. In this regard, the light-to-heat conversion efficiency of AuNPs has played a key role in the development of a drug-free cancer therapy named plasmonic photo-thermal therapy (PPT). Herein, a new generation of biomimetic AuNPs capped with keratin (Ker-AuNPs) is presented and discussed. Ker-AuNPs, in addition to a long-term colloidal stability, exhibit both high biocompatibility and remarkable photo-thermal properties. The chemical-physical, morphological and photo-thermal properties of Ker-AuNPs are investigated by means of dynamic light scattering, ζ-potential, UV–Vis and Fourier-transform infrared spectroscopy, X-ray photoelectron spectroscopy, transmission electron microscopy (TEM) and high-resolution thermography. *In vitro* experiments, performed on a human glioblastoma cell line (*i.e.* U87-MG), by means of viability assays, TEM, fluorescence microscopy, and cytometric analyses combined with PPT experiments confirm the excellent biocompatibility of Ker-AuNPs as well as their efficient cellular uptake and localized photo-thermal heating capabilities. The reported structural and functional properties pointed out these Ker-AuNPs as a promising new tool in the field of biocompatible photo-thermal agents for PPT treatments against cancer-related diseases.