

Public Abstract

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Title:GOLD NANOPARTICLE"BIOMOLECULE CONJUGATES: SYNTHESIS, PROPERTIES, CELLULAR INTERACTIONS AND CYTOTOXICITY STUDIES

Gold nanoparticles (AuNps) have been widely used in diverse biomedical applications because of their efficient optical and electronic properties. Fundamental to any further clinical developments in AuNps based imaging is the ability to synthesize AuNps conjugated with biomolecules that impart high affinity to target various disease pathologies. This research focuses on conjugation of two major biomolecules i.e., Bombesin and Annexin V, to AuNps and studying their target specificity. The target specificity of AuNps coated with Bombesin, a GRP receptor specific protein was tested using two cancer cell lines (MCF-7, breast cancer ; and PC-3, prostate cancer cell lines) that over-express GRP receptors. Both cell types exhibit significant uptake of Bombesin gold nanoparticles, internalizing them through a highly specific receptor mediated endocytosis pathway.

Binding of AuNps coated with a phospholipid-binding protein Annexin V with high affinity towards apoptotic cells was tested in Jurkat-T- lymphocytes. Annexin V-AuNps showed excellent affinity towards the apoptotic Jurkat-T lymphocytes binding to the cells in a manner similar to the biomolecule annexin V.

We further used environmentally benign so called green chemicals i.e., polyphenols, flavonoids, and various phytochemicals present in tea, soybean, and cinnamon and their synergistic reduction potentials to reduce the gold salts into AuNps. Such nanoparticles also showed excellent affinity toward epidermal growth factor receptors (EGFR) on prostate and breast cancer cells and proved to be non-cytotoxic at as high as 150 μ M. These studies showed that gold nanoparticles can be coated not only to exert specific molecular interactions in specific cell types but also to be devoid of adverse effects.