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Cytotoxic and Biocompatible Evaluation of Silica Coated Silver Nanoparticle Against Nih-3t3 Cells

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Abstract : The unique optical properties of plasmon resonance metallic particles have attracted considerable applications in the fields of physics, chemistry and biology. Metal-Enhanced Fluorescence (MEF) effect is one of the useful applications. MEF effect stated that fluorescence intensity can be quenched or be enhanced depending on the distance between fluorophores and the metal nanoparticles. Silver nanoparticles have used widely in antibacterial studies. However, the major limitation for silver nanoparticles (AgNPs) in biomedical application is well-known cytotoxicity on cells. There were numerous literatures have been devoted to overcome the disadvantage. The aim of the study is to evaluate the cytotoxicity and biocompatibility of silica coated AgNPs against NIH-3T3 cells. The results were shown that NIH-3T3 cells started to detach, shrink, become rounded and finally be irregular in shape after 24 h of exposure at 10 µg/ml AgNPs. Besides, compared with untreated cells, the cell viability significantly decreased to 60% and 40% which were exposed to 10 µg/ml and 20 µg/ml AgNPs respectively. The result was consistent with previously reported findings that AgNPs induced cytotoxicity was concentration dependent. However, the morphology and cell viability of cells appeared similar to the control group when exposed to 20 µg/ml of silica coated AgNPs. We further utilized the dark-field hyperspectral imaging system to analysis the optical properties of the intracellular nanoparticles. The image displayed that the red shift of the surface plasmonic resonances band of the enclosed AgNPs further confirms the agglomerate of the AgNPs rather than their distribution in cytoplasm. In conclusion, the study demonstrated the silica coated of AgNPs showed well biocompatibility and significant lower cytotoxicity compared with bare AgNPs.

Keywords : silver nanoparticles, silica, cell viability, morphology
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