International Journal of Biotechnology and Biomedical Sciences
p-ISSN 2454-4582, e-ISSN 2454-7808, Volume 5, Issue 1; January-June, 2019 pp. 99-99

http://www.krishisanskriti.org

Emerging Approaches for Designing Nano-conjugated Protein System

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Abstract—*One of the most promising interfaces of nanotechnology is to conjugate proteins with nanoparticles (protein-NPs) since the conjugated system brings together at the same time the unique properties of nanoparticles and the biological functions of proteins. These conjugates hold exciting potentials in the fields of biotechnology and medicine, such as sensing, imaging, diagnostics, catalysis, drug delivery, and the control of protein activity. In this regard, several methods for nanoparticle-protein interaction were developed and analysed. In the present study, the main aim is to introduce key techniques to study the interaction between Gold nanoparticles (AuNPs) and proteins. In this presentation, we have chosen zebrafish Dihydrofolate Reductase (zDHFR) as our model protein because of its small size, easier way of purification and availability of plenty of literature from various species. DHFR is a crucial enzyme involved in folate metabolism, serves as an anti-cancer drug target and pharmacologic target. Gold nanoparticles, on the other hand, have many unique and attractive properties, such as excellent conductivity, size dependent properties, non toxicity, and their capacity for facile and highly variable functionalization. They can easily form conjugates with proteins through either covalent bonds or physical interactions. Since, proteins have very complicated three dimensional structures with multi-level conformations, so their interaction with NPs can disturb protein structures and also proteins may affect the optical properties of AuNPs, and their stability in solutions with high ionic strength. Here the interactions between zDHFR and AuNPs, and the conformational changes of zDHFR induced by this interaction, were investigated by UV-visible absorption spectroscopy, fluorescence spectroscopy and Circular Dichroism spectroscopy. The AuNPs induced conformational changes in zDHFR are almost negligible.*

Keywords*: Gold nanoparticles (AuNPs), zDHFR, Conjugates, Conformational study, Fluorescence Spectroscopy, Circular Dichroism Spectroscopy*

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