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The study of gold nanoparticles coated with human serum albumin as drug carriers

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In recent years, nanoparticles (NPs) conjugated with proteins have received much attention due to their exclusive properties that are size tunable. Special interest is given to the dynamic layer formed between the NP and the proteins based on competitive grounds. This layer is usually formed by the proteins covalently binding or adsorbed on the NP surface. Among the several divisions of proteins, human serum albumin (HSA) is one of the major drug carrier proteins in the blood plasma. We have recently studied the spectroscopy of HSA in physiological conditions using fluorescein (FL) as a probe ligand. The quenching effect of FL on the fluorescence intensity of W214 (the sole tryptophan in HSA) indicates that FL occupies the warfarin drug-binding site in the protein which is known to bind most hydrophobic drugs. This was confirmed by site-competitive displacement experiments using ibuprofen and warfarin as site markers. Upon its association with the NP surface, the intrinsic spectroscopic signatures of HSA tend to change. Therefore, modification of the system was performed by coating selected gold nanoparticles (AuNPs) with the HSA-FL complex. The preliminary results indicate a complex formation in which HSA is adsorbed on the AuNPs surface. This was further confirmed using dynamic light scattering and transmission electron microscopy measurements. Significant quenching of the W214 fluorescence was observed in the HSA-AuNP complex which is attributed to the surface plasmon effect on the protein, thereby, implying an efficient energy transfer from HSA to the AuNPs. The absorbance change of the AuNPs was also quantified as a function of the HSA and FL concentration in order to understand the mechanism of interaction with the NPs. Optimization of the complex formation between the AuNPs and the HSA-FL complex will be discussed in the light of the different spectroscopic signatures in both frequency and time domains.

Biography

Saba A J Sulaiman has been a Lecturer at the Higher College of Technology in Muscat since 2005. She is now a PhD student at Sultan Qaboos University from 2013 where she studies the spectroscopy and dynamics of protein-ligand interaction.

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