

changes might occur in the structure and function of biomolecules upon interaction with nanoparticles. Therefore, conducting a series of fundamental investigations before designing any nano based system would be of high significance. Herein, structure of lysozyme has been studied upon interaction with a specific type of gold nanorods (gold nanorice). Gold nanorices were synthesized by modification of conventional seed-mediated growth protocol, by reduction of surfactant concentration up to 5 mM. The nanorices were characterized by UV- Vis Spectroscopy, Transmission Electron Microscopy (TEM) and Atomic Absorption Spectroscopy (AAS). Lysozyme solution (300  $\mu\text{g}\cdot\text{mL}^{-1}$ ) was then interacted with nanoparticles of 25 nM concentration. Conformation of lysozyme treated gold nanorice was studied by circular dichroism spectroscopy under different pH conditions, and quenching of the intrinsic fluorescence was traced in varying concentrations of gold nanorices (0-200 nM). Circular dichroism revealed mild conformational change in the secondary structure of lysozyme, with a slight increase of compactness upon binding to gold nanorices. Intrinsic fluorescence spectra showed a steady reduction in the fluorescence intensity of protein, indicating the proximity of gold nanorices' interacting surface to the location of tryptophan residues in lysozyme, and possibility of complex formation. Maintaining high fraction of native structure and internal quenching, the enzyme could perform its catalytic activity in the presence of gold nanorices. Findings of this investigation might encourage utilization of gold nanorices as a new generation of nanocarrier within the domain of drug delivery applications.

**Keywords:** Nanocarrier, Plasmonic Nanoparticles, Circular Dichroism, Internal Quenching.

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#### Abstract No.26

##### **$\beta$ -Casein Nanoparticles As An Efficient Drug Carrier System For Curcumin And Its Derivatives**

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In milk  $\beta$ -casein micelles exists a natural nanostructure, which can be used as a Nancarrier of hydrophobic drugs. Curcumin, diacetylcurcumin and bis-demethoxy curcumin, are the active curcuminoids of turmeric (*Curcuma longa* L.) with many physiological, biochemical, and pharmacological properties. Here, we investigated the

complex formation of curcuminoids and some of its derivatives with  $\beta$ -casein micelles and its use as a vehicle for drug delivery to cancer cells. Steady-state fluorescence spectroscopy of the  $\beta$ -Casein micelle-curcuminoids complex formation revealed that at pH 7, curcuminoids molecule binds to  $\beta$ -Casein micelle and formed complexes through hydrophobic interactions. The binding parameters including number of substantive binding sites and the binding constants have been evaluated by fluorescence quenching method. Results showed that curcuminoids molecules quench the intrinsic fluorescence of  $\beta$ -Casein upon binding. The distance ( $r$ ) between donor ( $\beta$ -Casein) and acceptor (CUR, DAC and BDMC) was obtained according to Förster theory of non-radiative energy transfer. The utility of  $\beta$ -Casein micelle as carriers of curcuminoids was evaluated in vitro, using cultured MCF7 cells. Cytotoxicity studies revealed that, the  $\beta$ -Casein micelle-curcuminoids complex exhibited similar cytotoxic effects on MCF7 cells compared to an equal dose of free curcuminoids. Because  $\beta$ -Casein is an edible protein, the  $\beta$ -Casein micelle-curcuminoids complex has a potential to be administered orally

**Keywords:** Curcumin, Diacetylcurcumin ,Bis-demethoxy curcumin,  $\beta$ -Casein micelle, Fluorescence, Förster's theory.

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#### Abstract No.27

##### **DNA Binding of Cyclopentadienyliron Substituted Polyoxotungstate CoW11O39(CpFe)]7-**

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The ctDNA (calf thymus DNA) binding properties of water soluble keggin type polyoxometalate(POM): [CoW11O39CpFe]7-, (CoWCpFe) were carried out with electronic absorption, fluorescence spectrophotometry and cyclic voltammetry. Absorption spectrum trace revealed 12.08%, hypochromism, indicative of moderate interaction to ctDNA. The binding constant has been estimated  $3.10 \times 10^3 \text{ M}^{-1}$ , by analysis of UV- Vis titration experiments. In addition, number of substantive binding sites and the binding constants parameters were obtained from fluorescence spectroscopy. The estimated parameters from two spectroscopic methods are consistent. Also, voltammetric method was used to probe the interaction binding mode through shift in potential and change in limiting current of POM due to addition of ctDNA. The results of voltammetric study represent the binding of POM to ctDNA is via of phosphate groups of nucleic acid. It is noticeable,

that this result is in good agreement with obtained results of spectrometric techniques.

**Keywords:** Polyoxometalate, UV-Vis, Fluorescence, Cyclic Voltammetry, Calf Thymus DNA.

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#### Abstract No.28

##### Structural and Activity Study of The Restriction DNAzyme by Spectroscopic Methods

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Beyond the preservation of genetic information in the double helix structure in cells, DNA could also have catalytic role in the single stranded form taking different 3-D structures. This artificial catalytic biomolecule is known as DNAzyme or deoxyribozyme. The Cu<sup>2+</sup> dependent DNA cleavage DNAzyme is the unique example of known DNAzymes. It is introduced as a restriction DNAzyme due to the site specific cleavage of single strand DNA molecule. It is also used as Cu<sup>2+</sup> nanobiosensor in aqueous solutions by modification of DNAzyme molecule with fluorescence dye. Herein, we studied the structure and catalytic function of DNAzyme using Uv-visible and extrinsic fluorescence spectroscopy. Hyperchromic and hypochromic effects of DNA have been traced by UV-visible spectroscopy to investigate structure, hybridization phenomenon and catalytic function. Absorbance intensity at 260 nm decreases upon hybridization of DNAzyme with substrate (hypochromic effect), which increased upon addition of cofactor and starting catalytic activity (hyperchromic effect). This result confirmed the efficiency of this spectroscopic technique for kinetic and function study of the DNAzyme compared with conventional methods. The optimum pH and thermal conditions for hybridization of restriction DNAzyme and its catalytic activity was also determined. The results are well in accordance with previous findings reported by R. R Breaker. The extrinsic fluorescence study of the DNAzyme hybridization and its catalytic function by SYBR GOLD show consistency with Uv-visible experiment results, however this technique offers higher sensitivity compared to that of Uv-visible spectroscopy. Fluorescence intensity of DNAzyme-substrate increased upon hybridization, and decreased when the catalytic activity started. Our findings suggest that spectroscopic techniques, particularly extrinsic fluorescence spectroscopy using SYBR GOLD could be a good alternative to conventional methods for studying kinetic and catalytic activity of DNAzyme, being affordable and time saving.

**Keywords:** DNAzyme, Hybridization, Catalytic activity, Uv-visible, Fluorescence, Spectroscopy.

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#### Abstract No.29

##### The Effect of Detergents on ProteinaseK Stability

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Proteinase K EC(3, 4, 21, 14) is a serin proteinase from *Tritirachum album* Limber. This enzyme has two tryptophan residues and has two disulfide bonds, Cys34 - Cys123 and Cys178 - Cys249, which contribute to the stability of the enzyme structure. Virtually all studies of the protein-folding reaction add either heat, acid, or a chemical denaturant to an aqueous protein solution in order to perturb the protein structure. In this study spectroscopic aspect of ProteinaseK as a function of various concentration of SDS and DTAB by spectrophotometer and spectrofluorimeter has been investigated. The reaction takes place at different pHs and various temperature. Results exhibit, upon increasing the concentration of the Sodium n-dodecyl sulphate(SDS), stability of Proteinase K was increased. But in the presence of DTAB stability of Proteinase K was decreased.

**Keywords:** Proteinase K, Stability, Spectroscopic, Detergent.

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#### Abstract No.30

##### NMR-Monitored Hydrogen Exchange Study on the Conformational Stability of RNase A: The Effect of Cationic Gemini Surfactants

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The conformational stability of ribonuclease A (RNase A) has been measured at the per residue level by NMR-monitored hydrogen exchange in the absence and presence of cationic gemini surfactants. The hydrogen/deuterium exchange mechanism of RNase A has been