

**A study on interaction between protein and compounds of biological
importance: fluorescence spectroscopic approach**

EXECUTIVE SUMMARY OF MINOR RESEARCH PROJECT

By

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Objectives

- Selection of protein and ligand in such a way that it forms the protein-ligand complex.
- To identify the suitable composition of both protein and ligand
- Investigation of different photophysical properties of complex formed.
- Correlation of photophysical properties and complex formed to draw the conclusions of biological importance.
- The proposed method may be extended to get its analytical applications.

Summary

Title of the Research Project: “A study on interaction between protein and compounds of biological importance: fluorescence spectroscopic approach”

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In the proposed work we had planned to investigate the interaction between serum albumin and compounds of biological importance. When the complex is formed between protein and compound, which is sensitive to its surrounding environment, the fluorescence characteristics of the complex are markedly different. The photophysical properties like fluorescence excitation, emission, synchronous fluorescence, fluorescence enhancement, quenching, etc are governed by the formation of complex. Hence by characterizing these properties we are able to understand the process of complex formation, conformational changes of protein, number of binding sites, binding constant, thermodynamic parameters, energy transfer and making its application in the desired field depending on the nature of complex formed.

The fluorescence spectroscopic technique has been capably employed to investigate the interaction between bovine serum albumin (BSA) and atazanvir sulphate (AS) under the physiological pH 7.4 condition. The binding constant, number of binding site, thermodynamic parameters such as ΔG , ΔH , ΔS and nature of binding forces between BSA-AS were obtained by measuring the steady state fluorescence quenching of BSA by AS. The static quenching was confirmed from Stern-Volmer quenching constant at different temperature. The effect of AS on the conformation of BSA was analyzed using synchronous and three-dimensional fluorescence spectroscopy.

The binding properties of dolasetron mesylate (DM) to bovine serum albumin (BSA) have been studied by using fluorescence spectroscopy in combination with UV-Visible absorbance spectroscopy. The results showed that the fluorescence of BSA was strongly quenched by the DM through static quenching procedure. The number of binding site was found to be one and the corresponding thermodynamic parameters namely, enthalpy change (ΔH), free energy change (ΔG) and entropy change (ΔS) at three different temperature were calculated according to Van't Hoff relation. From the thermodynamic calculation it was found that the hydrophobic and electrostatic interaction plays an important role in binding of DM to BSA. In

addition, the results obtained from synchronous fluorescence and three dimensional fluorescence spectra showed that the binding of DM with BSA could induce conformational changes in BSA.

The interaction between BSA and zopiclone is investigated by using the fluorescence spectroscopy. From the results it is observed that the conformation of BSA is changed after interaction with zopiclone. The shift of the maximum of emission wavelength from 338 to 347 nm is consistent with the fact that the change in the environment of the tryptophan residue are occurring. FRET study may be extended to investigate the distance between BSA (donor) and zopiclone (acceptor) during the interaction. Thus this study is applicable for the determination of binding mechanism of zopiclone with BSA.

Details of Publications:

a) In Journals:

1) **Umesh S. Mote**, G. B. Kolekar; Investigation of interaction between atazanvir sulphate and bovine serum albumin by using fluorescence spectroscopy. *Indian Journal of Chemistry*, Vol 55A, 2016, pp 820-823. ISSN:0975-0975 (Online); 0376-4710 (Print)

2) **Umesh S. Mote**, G. B. Kolekar; A fluorescence study on interaction between dolasetron mesylate and bovine serum albumin. *International Journal of Applied and Pure Science and Agriculture*, Vol 2 (5), 2016, pp 101-110. E- ISSN: 2394-5532, P-ISSN: 2394-823X.

b) Presented in Conferences:

1) Paper presented in International Conference on Functional Materials @ Nanoscale: Concerns and Challenges, March 9-11, 2015 organized by Dept. of Chemistry, K. B. P. Mahavidyalaya, Pandharpur; Dist. Solapur (M.S.) India

2) Paper presented in International Conference on Opportunities and Challenges before 21st Century India, February 6-7, 2016 organized by Dept. of Chemistry, Rajarshi Chhatrapati Shahu College, Kolhapur.