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A Glimpse on Biological Properties of Cu (II) and Ni (II) Schiff base Complexes

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ABSTRACT

The present study includes mini review on DNA interaction, antibacterial and cell viability studies of Cu (II) and Ni (II) complexes derived from tridentate Schiff base ligands by our research groups. Potential CT-DNA interactions were performed including electronic absorption titration, viscosity measurements and fluorescence spectroscopy. The antibacterial studies were investigated against various bacterial strains through Agar-well Diffusion Method. The cell viable activities of the complexes were measured in vitro against the Hela cancer cells and it is observed that all the studied Cu (II) and Ni (II) complexes are biocompatible in nature. So the utility of this study is that the complexes under investigation can effectively be used as pharmaceutical components in several antibacterial drugs as they are biocompatible in nature.

Keywords: Schiff Base Ligand; Cu (II); Ni (II) Complex; DNA Interaction; Biological Studies

Background

Schiff base coordination complexes are widely used in the field of materials and biological sciences. These complexes acquire notable anti-tumor, anti-microbial properties. Consequently, the significance of synthesizing metal complexes of Schiff base is enormously increasing in the field of biological studies. Copper, among the transition metals, is significantly essential in +2 oxidation states because in this state it has a vital responsibility in DNA damage linked to cancer and demonstrates general toxicity lower than platinum. So some Cu (II) co-ordination complexes are now projected as prospective tumor inhibiting substances. Not only copper, but nickel complexes are also still emerging because of its exciting structural aspects, low cost, low toxicity and easy availability. Therefore, now a day, Schiff base transition metal complexes are extensively utilized as core constituent elements in a group of developed medicines. In view of this objective, our research groups have synthesized several transition metals complexes. In this mini review, the concluding remarks have been discussed [1-5].

Discussions with Concluding Remarks

As the Cu (II) and Ni (II) Schiff base complexes of present investigation are obtained as single crystals, so their structures were determined from single crystal X-Ray diffraction studies. The electronic absorption and fluorescence spectroscopic methods were employed for DNA interaction studies. In UV absorption titration for all the complexes, a fixed concentration of the complex was experimented over regular addition of CT-DNA. The results obtained from the experiments demonstrate significant interaction efficacy of the complexes with DNA as evident from the values of binding constants obtained from this experiment. In order to further studies on binding behavior, competitive binding study with Ethidium Bromide (EB), a typical intercalator, was performed. A prominent decrease in emission intensities is found for all the complexes on regular addition of complexes to the EB-CT-DNA system due to replacement of EB molecules from the EB–CT-DNA

system. The observed quenching and binding parameters clearly indicate that the titled complexes bind with DNA via intercalation mode. In order to further prove the intercalation binding mode, we have performed viscosity measurement studies which show that the relative viscosity of CT-DNA-EB and CT-DNA- complex solutions increases with the increase in EB or complex concentration indicating lengthening the original size of DNA. But the changes in relative viscosity are not so significant with respect to EB demonstrating partial intercalation mode. The agar well-diffusion method was employed to study antibacterial activities of the complexes against several bacteria. The inhibition zone diameters (IZDs) observed after 24 hrs of incubation reveal anti-bacterial efficacies for all the complexes. From the cytotoxicity studies against Hela cells done through MTT assay, it is observed that cell viability increases with time exemplifying their biocompatible nature. It is worth mentioning here that cell health as well as number density of cells is better and cells were adhered properly on the metal complexes indicating their uses as biomaterial transplants.

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