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DNA fastening and scission actions of Cu(II), Co(II), Ni(II) and Zn(II) complexes: synthesis, spectral characterization and cytotoxic study(Article)

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Abstract

A heterocyclic compound, 2-(aminomethyl)benzimidazole dihydrohydrochloride, was treated with nitrobenzaldehyde to form a Schiff base that was made to react with divalent metals. A co-ligand, either 1,10-phenanthroline or 2,2′-bipyridine, was added to this mixture to obtain metal chelators of type $[ML(co\text{-}L)_2]Cl_2$. They were in 1:1:2 stoichiometry ratio, which was characterized by various spectroscopic techniques that suggested an octahedral geometry around the central metal ions. These complexes were investigated for their binding affinities with calf thymus (CT) DNA, using various techniques, such as UV–Vis, viscosity, cyclic voltammetry (CV), etc. The binding interaction studies revealed intercalation as the possible binding mode of the complexes with the CT DNA. In addition, these complexes were screened for their antimicrobial potential and DNA denaturing tendencies using gel electrophoretic assay. The antimicrobial screening investigation showed that the complexes behaved as better antimicrobial agents than the ligand, especially, complex 5 shows exceptional activity even in the electrophoretic assay along with the antimicrobial efficacy. Moreover, complex 5 was able to denature the plasmid DNA better than the other compounds. All the compounds were screened for cytotoxic efficacy, and the IC_{50} values suggest that the compounds possess cytotoxic activity to some extent that is almost the same as the activity of cisplatin.

Author keywords

1,10-phenanthroline | benzimidazole | biological activity | cytotoxicity | Schiff base

Indexed keywords

Engineering controlled terms: Antimicrobial agents | Binding energy | Bins | Bioactivity | Cyclic voltammetry | Cytotoxicity | DNA | Ligands | Metal ions | Metals | Microorganisms | Platinum compounds | Spectrum analyzers | Synthesis (chemical) | Zinc compounds

Engineering uncontrolled terms: 1 ,10-phenanthroline | Antimicrobial screening | Benzimidazoles | Electrophoretic assay | Heterocyclic compound | Schiff-base | Spectral characterization | Spectroscopic technique

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