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Exploring DNA interaction and anticancer activity of ruthenium (II) mononuclear complexes and their luminescent properties

S Satyanarayana
Osmania University, India

A series of mononuclear Ru(II) polypyridyl complexes with N, N-donar ligands (phen = 1, 10 phenanthroline, bpy = 2, 2' bipyridine, dmb = 4, 4'-dimethyl 2, 2' bipyridine) and different intercalating ligands (ptip=2-(5-Phenylthiophen-2-yl)-1H-imidazo [4,5-f][1,10] phenanthroline; Bripc = (6-bromo-3-(1H-imidazo[4,5-f] [1,10]-phenanthroline; mipc = 2-(6-methyl-3-(1H-imidazo[4,5-f][1,10]-phenanthroline-2-yl)-4H-chromene-4-one) have been synthesized and characterized by various spectral methods. The binding abilities of ruthenium complexes were investigated using UV-visible and Fluorescence studies. The mode of binding was confirmed by viscosity experiment. Experimental results suggested that they can bind through intercalative mode with DNA having different binding constant. Theoretically, molecular docking studies supported the DNA binding ability of these complexes. These complexes were effectively cleaving the pBR-322 DNA by generating singlet oxygen and encouraging antibacterial activity against Gram-positive and Gram-negative bacterial strains. It was found that cell viability of these complexes shown significant dose dependent cytotoxicity on human cancer cell lines *HeLa*. The apoptosis assay was carried out with Acridine Orange (AO) staining methods and the results indicate that complexes can induce the apoptosis of *HeLa cells*. The cell cycle arrest investigated by flow cytometry and these results indicate that all complexes induce the cell cycle arrest at G0/G1phase.

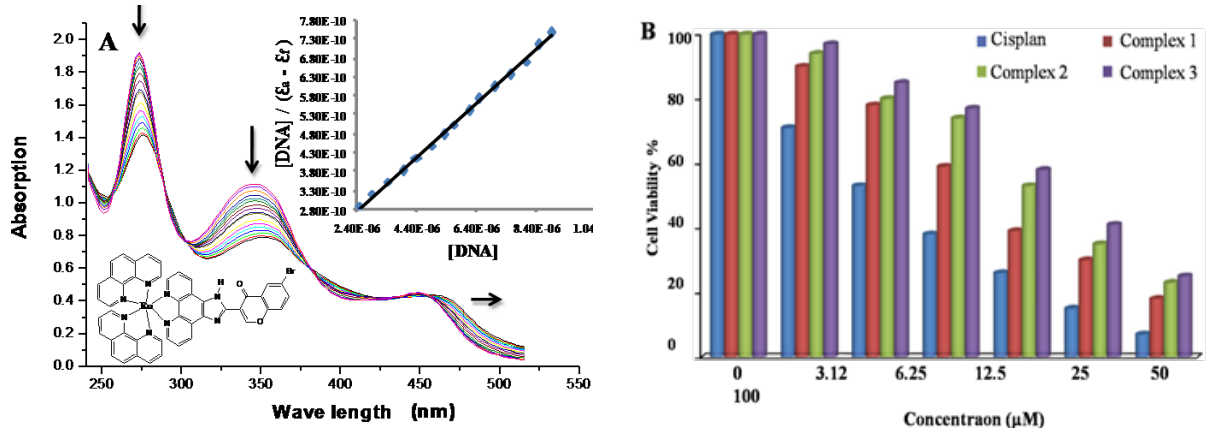

Figure 1 (A) Absorption spectra of complexes [Ru(phen)2BrIPC]2+ in Tris HCl buffer upon addition of CT-DNA. Arrow shows the hypsochromic and bathochromic shift upon increase the DNA concentration.Plots of [DNA]/ (εa-εf) vs [DNA] for the titration of DNA with Ru(II) complexes. (B). Cell viability of HeLa cell lines in vitro treatment with complexes 1, 2 and 3.Each data point is the mean ± standard error obtained from at least three independent experiments. Complex 1 = [Ru(phen)2BrIPC]2+ , Complex 2 = [Ru(bpy)2BrIPC]2+ , Complex 3 = [Ru(dmb)2BrIPC]2+.

Biography

S Satyanarayana received his PhD in 1982 at Osmania University Hyderabad, India. In 1983, he was appointed as Assistant Professor at Osmania University Hyderabad, India. He worked with Prof. K.L. Brown, Mississippi State University Mississippi State, MS (USA) as Postdoctoral Associate (1989-1991). He also worked with Prof. J. B. Chaires at University of Mississippi Medical Center Jackson MS (USA) 1991-1993. He has 34 years of experience in teaching and research. He awarded 22 PhD, 2 MPhil and published 132 national and international publications in the area of Bioinorganic and Inorganic Chemistry. Currently, he is Incharge Vice Chancellor of RGUKT Hyderabad, Telangana, India.

ssnsirasani@gmail.com