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Investigation of the interaction of a new ruthenium complex with DNA and human serum albumin

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Abstract

The transition metal-based compounds are extensively used in chemotherapy, and the ruthenium complexes have been introduced as promising options in the treatment of cancer. Regarding the chemical properties such as high ligand transfer rate, different oxidation numbers, and the ability of ruthenium to mimic iron in binding to biological molecules, these compounds have been used for pharmaceutical aims as anticancer drugs to replace platinum compounds in cisplatin-resistant cancers. In this research, the interaction of a new ruthenium complex, complex [(p-cymene) RuCl (ppy)] (1) with calf thymus DNA and human serum albumin (HSA) were investigated using fluorescence spectroscopy and ultraviolet-visible absorption spectroscopy. The competitive diffusion experiments were performed to investigate the mode of interaction of the complex 1 with DNA using several markers including ethidium bromide, thiazole orange, DAPI, methylene blue and Hoechst 33258. The results of the competitive experiments indicated that this complex bind to DNA through the intercalation mode. The values of the thermodynamic functions, Stern-Volmer constant, binding constant and the number of binding sites for the interaction of the complex 1 with DNA and HSA were calculated from the results of fluorescence quenching experiments at different temperatures using the van't Hoff method. According to the obtained results, the quenching mechanism for the interaction of complex 1 with DNA and HSA is of the static type and the effective forces in the interaction of this complex with both DNA and HSA are van der Waals type or hydrogen bond formation.

Key words: Ruthenium complexes, DNA binding, Human Serum Albumin (HSA), and ligand-binding.

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