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Structure-Reactivity Relationship of Some Rh^{III} and Os^{III} Complexes with N-Inert Ligands in Ionic Liquids

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Abstract : Kinetically-inert transition metal complexes, such as Rh(III) and Os(III) complexes, attract increasing attention as leading scaffolds for the development of potential pharmacological agents due to their inertness and stability. Therefore, we have designed and fully characterized a few novel rhodium(III) and osmium(III) complexes with a tridentate nitrogen−donor chelate system. For some complexes, the crystal X-ray structure analysis was performed. Reactivity of the newly synthesized complexes towards small biomolecules, such as L-methionine (L-Met), guanosine-5'-monophosphate (5'-GMP), and glutathione (GSH) has been examined. Also, the reactivity of these complexes towards the DNA/RNA (Ribonucleic acid) duplexes was investigated. Obtained results show that the newly synthesized complexes exhibit good affinity towards the studied ligands. Results also show that the complexes react faster with the RNA duplex than with the DNA and that in the DNA duplex reaction is faster with 15mer GG than with the 22mer GG. The UV-Vis (Ultraviolet-visible spectroscopy) is absorption spectroscopy, and the EB (Ethidium bromide) displacement studies were used to examine the interaction of these complexes with CT-DNA and BSA (Bovine serum albumin). All studied complex showed good interaction ability with both the DNA and BSA. Furthermore, the DFT (Density-functional theory) calculation and docking studies were performed. The impact of the metal complex on the cytotoxicity was tested by MTT assay (a colorimetric assay for assessing cell metabolic activity) on HCT-116 lines (human colon cancer cell line). In addition, all these tests were repeated in the presence of several water-soluble biologically active ionic liquids. Attained results indicate that the ionic liquids increase the activity of the investigated complexes. All obtained results in this study imply that the introduction of different spectator ligand can be used to improve the reactivity of rhodium(III) and osmium(III) complexes. Finally, these results indicate that the examined complexes show reactivity characteristics needed for potential anti-tumor agents, with possible targets being both the DNA and proteins. Every new contribution in this field is highly warranted due to the current lack of clinically used Metallo-based alternatives to cisplatin.

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