Isfahan University of Technology

Department of Chemistry

Mononuclear complexes of Ru(II), Zn(II), Pd(II), Cu(II), and Ni(II) with oxicam drugs; synthesis, characterization, crystal structure, experimental and theoretical study of DNA and BSA interaction, photocleavage and their *in vitro* cytotoxicity against K562 leukemia cell lines

Zahra Jannesari Ladani

Zh_janesari@yahoo.com

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Department of Chemistry

Isfahan University of Technology, 84156-83111, Isfahan, Iran

Supervisor: Hassan. Hadadzadeh, hadad@cc.iut.ac.ir

Abstract

Mononuclear complexes of Ru(II), Zn(II), Pd(II), Cu(II), and Ni(II) with oxicam drugs (piroxicam and meloxicam) were synthesized and structurally characterized by X-ray crystallography and spectroscopic methods. Interaction studies of the Pir^- anion and all of the complexes with DNA and BSA were carried out using spectroscopic techniques. The results suggested that the Pir^- anion binds to DNA in a moderately strong fashion *via* intercalation between the base stacks of double–stranded DNA, while the oxicam complexes interact with DNA with more affinity, by two binding modes, *viz.*, electrostatic and groove binding. In addition the free Pir^- and the oxicam complexes can lead to the photocleavage of DNA supercoiled pUC57. Moreover, the results demonstrated that the microenvironment and the secondary structure of BSA were changed in the presence of Pir^- and oxicam complexes. An *in vitro* cytotoxicity investigation of the oxicam complexes on K562 cell lines indicates that the oxicam complexes exhibit a considerable cell growth-inhibitory effect and most of the oxicam complexes show a remarkable increase in their cytotoxic activity in comparison to their free ligands and their metal salt precursors. Finally, the binding of the oxicam complexes to BSA and DNA was modeled by molecular docking and molecular dynamic simulation methods.

Key Words: Oxicam, BSA, DNA, Cytotoxicity, Photocleavage.