Ciprofloxacin Copper(II) Complexes; the Study of Interaction of [Cu(cip)2(OH)2] with DNA

Tahereh Ahmadi Bagheri

t. ahmadibagheri@ch.iut.ac.ir

Date of Submission: 2011/12/10

Department of Chemistry

Isfahan University of Technology, Isfahan 84156-83111, Iran

Degree: M.S Language: Farsi

H. Hadadzadeh, Assoc. Prof. (hadad@cc.iut.ac.ir)

**Abstract**

In this thesis, three mononuclear complexes of Cu(II), [Cu(cip)2(OH)2]∙2CH3OH∙6H2O, [Cu(cip)(bpy)(H2O)2]PF6 and [Cu(cip)(phen)(H2O)2]PF6∙H2O, (where cip is 1-cyclopropyl-6-fluoro-4-oxo-7-(1-piperazinyl)-1,4-dihydroquinoline-3-carboxylic acid)have been prepared and characterized by elemental analysis, FT-IR and UV- vis spectroscopies. Solid state structure of [Cu(cip)2(OH)2]∙2CH3OH∙6H2O complex was determined by single crystal X-ray crystallography. Blue crystals of [Cu(cip)2(OH)2] were grown by aceton diffusion into an aqueous solution of the complex. This complex crystallized in triclinic crystal system with space group of *P-1,* with the following unit-cell parameters: *a* (Å)= 9.376(4), *b* (Å)= 9.576(5), *c* (Å) = 11.200(5), *α* (˚)= 87.46, *β* (˚)= 80.67, *γ* (˚)= 86.22, *Z* = 1 and *V*(Å3) = 989.9(8). Single crystal structure showed that the coordination geometry around the Cu(II) was a distorted octahedron, with bite angles of 86.73(6)˚ for the cip ligands. The two main quinolone rings of the cip ligands are nearly coplanar. The cip ligand is coordinated to Cu(II) ions through one carboxylate and the exocyclic carbonyl oxygen atoms.The cip ligand exists in its zwitterionic form, due to the presence piperazine basic nitrogen and the deprotonated carboxylic group.

The FT-IR spectra of these complexes showed that carbonyl and carboxylate bands are shifted and their intensity are reduced in comparison to free cip ligand. Electronic spectra of these complexes were taken in water. The intense absorption bands seen in the UV region are assigned to ligand-centered transitions and a weak absorption band seen in the visible region is assigned to d-d transition.

The interaction of the [Cu(cip)2(OH)2] complex with DNA was investigated by UV-vis and fluorescence Spectroscopies, cyclic voltammetry and gel electrophoresis. Absorption spectral titration of complex with fish DNA indicate hypochromism and red-shift in their intraligand transfer band suggesting that the complex binds to DNA. The magnitude of the binding constant (Kb) was obtained from absorption spectral titration. All the results showed the majority of interaction mode between the complex and DNA was intercalation. DNA cleavage experiments showed that the complex induce cleavage of pEGFP-N1 plasmid DNA.

An *in vitro* cytotoxicity study of the [Cu(cip)2(OH)2] complex on human breast adenocarcinoma (MCF7) cell line by an MTT assay indicated that the complex may have anticancer potency with a cytotoxicity value of 9.3±1.4.

Key word

Ciprofloxacin complexes; DNA- binding; DNA- cleavage; cytotoxicity activity