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Synthesis and characterization of novel Zn(II) and Cu(II) complexes with 7-hydroxycoumarin derivatives as prospective anticancer agents

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Cancer is one of the main causes of mortality in the world. There are many types of treatment, among which chemotherapy is particularly useful for metastasis. In this context, one of the most successful chemotherapeutic agents is cisplatin; however, the treatment with this agent is restricted because of severe dose-limiting side effects and drug resistance. This problem has stimulated new investigations in the search of non-platinum metal complexes based on essential metals like zinc and copper. Furthermore, coumarin compounds have shown attractive pharmacological properties which include their anticancer activity. In this sense, the strategy of this project was to synthesize two ligands, 8-formyl-7-hydroxycoumarin (LIG1) and its glycine Schiff base (LIG2) to obtain a new series of copper(II) and zinc(II) complexes as potential cytotoxic agents. However, the use of these ligands leads to several possible structures and coordination modes with Cu(II) and Zn(II). Hence, the purpose of this research is to find their most likely structure using spectroscopic and analytical techniques due to the lack of monocrystals for X-ray determination. This information is of interest for establishing structure-activity relationships in further biological essays. The synthesis of the first ligand (LIG1) was based on a reported procedure. The second, not yet reported compound (LIG2), was synthesized by condensation between LIG1 and glycine. The new copper(II) and zinc(II) complexes were obtained by adding an aqueous solution of a Cu(II) or Zn(II) salt to a hot methanol solution of LIG1 or hot DMF/H₂O (1:1) solution of LIG2. They were characterized by IR, RMN, UV-Vis, TGA and AAS. A successful synthesis of the four new complexes was developed and the analysis of spectroscopic and analytical data indicated an octahedral geometry in case of both complexes of LIG1, whereas those with LIG2 agree with tetrahedral structure.

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