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Short communication

Synthesis, characterization antibacterial and antiproliferative activity of novel Cu(II) and Pd(II) complexes with 2-hydroxy-8-R-tricyclo[7.3.1.0.^{2,7}] tridecane-13-one thiosemicarbazone

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ABSTRACT

Synthesis and biological activity investigation of complex compounds of Cu(II) are challenging issues because of the metal is not a xenobiotic one and the activity of ligands could be modulated by complexation. Complex combinations of Cu(II) and Pd(II) with thiosemicarbazone derivatives of 2-hydroxy-8-R-tricyclo[7.3.1.0.^{2,7}]-tridecane-13-one (where R = C_3H_7, C_4H_3O) were synthesized. The characterization of the ligands and the newly formed compounds was done by ^{1}H NMR, ^{13}C NMR, UV–vis, IR, ESR spectroscopy, elemental analysis, molar electric conductibility and thermal studies. Experiments performed to identify the structures proved that the ligands coordinate to metal ions in different ways – neutral bidentate or mononegative bidentate. Also, if copper(II) acetate, copper(II) nitrate, copper(II) chloride and copper(II) thiocyanate were used, the ligands coordinated in a mononegative bidentate fashion. If copper(II) sulfate was used, the ligands coordinated in a neutral bidentate fashion. The biological activity for the copper(II) synthesized compounds was assessed in terms of antibacterial or antiproliferative activity. The antibacterial activity of the complexes against *Staphylococcus aureus* var. Oxford 6538, *Escherichia coli* ATCC 10536, *Klebsielle pneumoniae* ATCC 100131 and *Candida albicans* ATCC 10231 strains was studied and compared with that of free ligands. The effect of complex compounds on the proliferation of HeLa cells was tested. For all tested complexes an antiproliferative activity was noted at concentrations higher than 1 μM, but lower than 10 μM.

Therefore, complex compounds of copper(II) were synthesized, structurally characterized and tested for biological activity, proving both antibacterial and antiproliferative activity.

1. Introduction

Thiosemicarbazones have received considerable attention since the discovery of their cytotoxic activity against cancer cell and bacteriostatic effects [1]. Thiosemicarbazones have received considerable attention since the discovery of their cytotoxic activity against cancer cell and bacteriostatic effects [2]. The pharmacological properties of thiosemicarbazones have been recently reviewed [3].

The mechanism of action of thiosemicarbazones (e.g. Triapine) is due to their ability to inhibit the biosynthesis of DNA in leukemia L1210 cells, probably by blocking ribonucleotide reductase activity [4]. The chemistry of transition metal complexes of thiosemicarbazones became largely attractive because of their broad profile of pharmacological activity affording a diverse variety of compounds with different activities [5]. The biological properties of thiosemicarbazones are often related and modulated by metal ion coordination. For example, lipophilicity, which controls the rate of entry into the cell, is modified by coordination and some side effects may decrease upon complexation. In addition, the complex can exhibit bioactivities which are not shown by the free ligand [6–11]. The thiosemicarbazone derivatives of Cu(II) – especially with pyridyl substituents at the C^2 – have proved to be more effective as anticancer or anti-microbial agents than the ligand by itself is, probably

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