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Short communication

Synthesis and characterization of some new complexes of Cu(II), Ni(II) and V(IV) with Schiff base derived from indole-3-carboxaldehyde. Biological activity on prokaryotes and eukaryotes

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Cu(II) complexes

ABSTRACT

Six new Cu(II), Ni(II), and VO(II) complexes (**1**–**6**) with Schiff base 1-phenyl-2,3-dimethyl-4-(1*H*-indole-3-carboxaldehyde)-3-pyrazolin-5-one (**HL**) were synthesized. The Schiff base was prepared through the condensation of 1-phenyl-2,3-dimethyl-4-amino-3-pyrazolin-5-one (antipyrine) with 1*H*-indole-3-carboxaldehyde. The new obtained compounds were characterized by ^{1}H NMR, ^{13}C NMR, UV–VIS, IR, EPR spectroscopy, elemental analysis, molar electric conductibility, magnetic susceptibility and thermal gravimetric analysis. In addition, the structure of the ligand **HL** has been determined by X-ray diffraction methods. The biological activity of complex compounds was investigated in terms of antibacterial effect on prokaryotic cells, by using paper disc diffusion technique, and for antiproliferative effect on eukaryotic cells, by monitoring mitotic activity in timelapse videomicroscopy experiments. The compounds were screened for their antibacterial activity against gram-positive bacteria (*Staphylococcus aureus* var. Oxford 6538, *Klebsielle pneumoniae* ATCC 100131 and *Legionella monocytogenes* ATCC 35182), gram-negative bacteria (*Escherichia coli* ATCC 10536, *Pseudomonas aeruginosa* ATCC 9027 and *Salmonella typhimurium* ATCC 14028) and anti-fungal activity (*Candida albicans* and *Aspergillus flavus*) using paper disc diffusion technique. The minimum inhibitory concentrations (MICs) of the compounds were also determined by agar streak dilution method. Compounds **3** and **4** proved to be the most effective as antibacterial agents. The antiproliferative activity was investigated by counting the number of mitoses for HeLa, and MCF7 cells. No significant antiproliferative effect was noted for **HL** and complex **2**, for both used cell types. For complexes **1** and **3** complete inhibition of cell proliferation was observed in the case of HeLa cells, while the effects on MCF7 cell proliferation were lower.

In conclusion, six new complex compounds were synthesized, and their biological activity investigated on both prokaryotic and eukaryotic cells, proving that some of them could be putative therapeutic substances.

1. Introduction

The indole nucleus is a common substructure of many biologically active compounds and occupies an important position in medicinally relevant heterocyclic systems [1,2]. Therefore, although indole derivatives have been the target of synthetic investigations over many years, there is still a demand for general strategies that can efficiently provide variously substituted and functionalized indoles [3]. Schiff bases obtained through the condensation of amines and amino acids with 1*H*-indole-3-carboxaldehyde have received considerable attention since the discovery of their cytotoxic activity against cancer cell and bacteriostatic effects [4–7].

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