Organotin(IV) complexes of 2-hydroxyacetophenone-N(4)-cyclohexylthiosemicarbazone (H₂dact): Synthesis, spectral characterization, crystal structure and biological studies

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1. Introduction

Thiosemicarbazones form an interesting class of compounds with a wide range of pharmacological applications [1,2]. Thiosemicarbazone usually act as chelating ligand with certain metal ions, bonding through the sulfur and hydrazine nitrogen atoms [3]. The heterocyclic thiosemicarbazones are of high interest because of their great versatility as ligands. This is due to the presence of several potential donor atoms, their flexibility and ability to coordinate either neutral or deprotonated forms. Seena and Kurup have synthesized and characterized dioxomolybdenum(IV) complexes with 2-hydroxyacetophenone-N(4)-cyclohexyl and N(4)-phenyl thiosemicarbazone which suggested that the Mo(IV) complex is penta-coordinated [4]. Rebolledo et al. have reported that Pd(II) complexes of 2-benzoylpyridine-N(4)-methyl/phenyl thiosemicarbazone ligands are active against the MCF-7, TK-10 and UACC-62 human tumor cell line [5]. For the past few years, studies of the coordination chemistry of thiosemicarbazone involved complexes with transition metal ions [6–9]. The synthesis and characterization of organotin(IV) complexes of Schiff base ligands have always attracted the attention of inorganic chemists and is well established in the literature [10–14]. Organotin(IV) complexes have been extensively studied due to their beneficial biological activities as well as their wide industrial and agricultural applications [15–21]. de Sousa et al. have reported organotin(IV) derivatives of 2-hydroxyacetophenone-N(4)-phenylthiosemicarbazone and found that the Sn(IV) atom adopts a strongly distorted trigonal bipyramidal configuration [22]. Although the organotin(IV) complexes exhibit important cytotoxic effects, but based on the literature review there is still very limited information available regarding the X-ray and biological studies of novel organotin(IV) complexes with substituted thiosemicarbazone ligands [23]. Previous works described the synthesis and structural studies of tin(IV)/organotin(IV) complexes with N(4)-substituted thiosemicarbazone ligand [24,25]. The particular interest of this work is a better understanding of the structural diversity of organotin(IV) complexes to delineate their biological properties. This paper reports the synthesis, spectral characterization and in vitro biological activity of organotin(IV) complexes (2–5). X-ray crystal structure of diphenyltin(IV) complex (5) is also described.

Keywords: 2-Hydroxyacetophenone-N(4)-cyclohexylthiosemicarbazone Organotin(IV) complexes Spectral analyses Crystal structure Cytotoxicity Antibacterial activity