D8: Synthesis and Characterization of Organotin(IV) Dithiocarbamate Compounds and Their Cytotoxic Activity on Chronic Myelogenous Leukemia Cells (K562)

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ABSTRACT

Introduction: The success of metal-based compounds like cisplatin and other platinum compounds in treatment of cancers has biased the approaches used to discover new metal-based anticancer drugs. **Methods: I**n this study, three new organotin compounds has been synthesized and accessed for their cytotoxicity toward chronic myelogenous leukemia cells (K562). The compounds are dibutyltin(IV) [N-(2-methoxyethyl)-N-methyldithiocarbamate] (C1), diphenyltin(IV) [N-(2-methoxyethyl)-N-methyldithiocarbamate] (C2) and triphenyltin(IV) [N,N-bis(2-methoxyethyl)dithiocarbamate] (C3). All the compouds were characterized by elemental analysis, FT-IR, ^{1}H, ^{13}C and ^{119}Sn NMR spectroscopies. The dithiocarbamate ligands chelated bidentately using both sulfur atoms,giving Sn atom five and six coordination number as indicated in ^{119}Sn NMR with the peaks appeared in the range of -90 to -190 and -210 to -400 ppm. The crystal structure of the compounds has been determined by single X-ray crystallography. **Results:** The spectroscopic and single crystal X-ray crystallographic data illustrate that the dithiocarbamato ligands in all compounds are bidentate [Sn-S1 and Sn-S2= 2.5425(5), 2.9318(5) Å, respectively] for C1, [Sn-S1 and Sn-S2= 2.6071(6), 2.6653(6) Å, respectively] for C2, and [Sn-S1 and Sn-S2= 2.4612(4), 3.,0992(4) Å, respectively] for C3. The geometry is best described as skewed trapezoidal bipyramidal with the angles S1-Sn-S2= 65.482(12)^{0} and C10-Sn-C6= 136.27(11)^{0} for C1, S1-Sn-S2= 67.742(17)^{0} and C-Sn- C= 100.07(10)^{0} for C2, and distorted trigonal bipyramidal geometry for C3 with the angles S1-Sn-S2= 63.534(11)^{0} and S2-Sn-C14=154.45(4)^{0}. The cytotoxic effects of compounds on K562 cell line were assessed using 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay for 24 h using different concentrations. The results showed a decrease of cell proliferation in dose-dependent manner with IC50 value for C1, C2, and C3 is 5.2, 4.0, and 2.8 µM respectively. The results were compared using doxorubicin as positive control and the value of IC50 for doxorubicin was 25 µM. All compounds gave better toxicity toward K562 cell line compared to doxorubicin and based on their IC_{50} values, C2 and C3 were classified as highly toxic. **Conclusion:** In conclusion, the newly synthesized compounds demonstrate strong cytotoxicity on K562 cell line, making them good candidates to be developed as antileukemic agents. However, further studies should be conducted to identify their ultimate potential so that they can be developed as potent antileukemic agents.

KEY WORDS:

Organotin, dithiocarbamate, single crystal X-ray crystallographic, K562, IC_{50}