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Synthesis, characterization and biological evaluation of zinc (II) complexes with phenanthroline derivatives and s-methyl dithiocarbazate Schiff bases

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The discovery of novel active compounds with new mechanisms of action, higher efficacy and improved selectivity is a matter of urgency to multi drug resistance and toxicity problems associated with many therapeutic drugs. In the current work, S-methyl dithiocarbazate Schiff base: SalSmdt, $Mp(Smdt)_2$, VanSmdt, PySmdt and their Zn(II) complexes: Zn[(SalSmdt) (H2O)]□$0.5H_2O$, $Zn_2[(Mp(Smdt)_2)\ (CH_3COO)]$, Zn[(VanSmdt) ($H_2O$)] and Zn[(PySmdt) (CH3COO)]□$1.5H_2O$ were synthesized. Additionally, $Zn[(phen)_2(NO_3)_2]$□$2H_2O$, $Zn[(aminophen)2(NO_3)_2]$□$1.5H_2O$ and $Zn[(Mephen)2(NO_3)_2]$□$3.5H_2O$ complexes were developed by reaction of Zn(II) with 1,10phenanthroline (phen), 4,7-dimethyl-1,10-phenanthroline (Mephen) and 5-amino-1,10phenanthroline (aminophen). All compounds were characterized by elemental analysis, FTIR, UVVis, NMR, MS and fluorescence spectroscopies. The characterization suggests that the Schiff base ligands coordinate the metal ion through the phenolate–O, the imine-N and the sulfur atom in the thiol form. The stability of the compounds in buffered aqueous media (5 % DMSO and 95 % PBS, pH 7.4) was evaluated and all compounds are stable at least for three hours. Cytotoxicity studies with several tumor cell lines (PC-3, MCF-7 and CACO-2) are ongoing. The results obtained for the Schiff bases are promising since the IC_{50} values ranged from 4.41 to 28.99μM. The phenanthroline ligands and their corresponding Zn complexes showed very high cytotoxicity towards A2780 ovarian cancer cells, with the Zn complexes showing slightly higher activity than the ligands.

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