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# Synthesis and characterization of platinum complexes with ethylenediamine and diethylenetriamine sulphonamide ligands towards biological applications

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Diethylenetriamine and ethylenediamine are renowned tridentate and bidentate chelating ligands, and have been utilized to synthesize sulfonamide derivatized platinum complexes. The sulphonamide ligands were synthesized with the use of sulfonyl chlorides and the relevant amine in dioxane, while the platinum complexes were formulated by treating cis-[Pt(DMSO)2 Cl2 ] with the synthesized ligand. Synthesis of novel platinum-ethylenediamine sulphonamide complexes (C1=[PtCl2 (N(SO2 biphenyl) ethylenediamine)], C2=[PtCl2 (N(SO2 azobenzene) ethylenediamine)]) was accomplished using synthesized ethylenediamine sulphonamide ligands, (L1=N(SO2 biphenyl)ethylenediamine, L2=N(SO2 azobenzene)ethylenediamine) while that of novel platinum-diethylenetriamine sulphonamide complexes (C3=[PtCl 2 (N(SO2 a z o b e n z e n e ) diethylenetriamine)], C4=[PtCl2 (N(SO2 quinoline) diethylenetriamine)]) was carried out with the use of synthesized diethylenetriamine sulphonamide ligands (L3=N(SO2 azobenzene) diethylenetriamine), L4= N(SO2 quinoline)diethylenetriamine]. In this study, amphiphilic ligand systems were considered as an ideal approach to enhance uptake of coordination complexes by target cells. This was executed by employing the hydrophilicity of ethylenediamine and diethylenetriamine and the lipophilicity of the aromatic bulky sulphonamide fragment bound to its terminal amine group. The ligands and complexes were synthesizin good yield (66%-96%) and characterization of these synthesized compounds was conducted using UVVisible spectroscopy, FTIR spectroscopy and NMR spectroscopy. UV-Visible spectra of the ligands indicate clear changes from starting material along with the presence of intra-ligand $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$ transitions, giving rise to absorption peaks around 200-600 nm. Shifts of these peaks can be observed in the UV-Visible spectra of the complexes. The strong S-N band signifying the formation of the sulphonamide bond, was detected in the FTIR spectra of the ligand and was found to shift to higher wavenumbers in the ethylenediamine complexes as well as in the diethylenetriamine complexes. The shift could possibly be due to the donation of the nitrogen lone pair to form the platinum coordination complex. The peaks relevant to stretching vibration frequency of -NH2 were found in the 3300-3500 cm−1 region of the FTIR spectra of the ethylenediamine ligands and could be seen shifting to lower wavenumbers in the complex due to coordination with platinum. 1 H NMR spectra were acquired for

the ligands and complexes, where the noteworthy regions include the aromatic protons found in the range of 6.76-9.00 ppm and the methylene protons of the amine group in the ethylenediamine and diethylenetriamine backbone of the ligands, appearing at 2.80-3.00 ppm. Complexes display slightly higher fluorescence intensities in comparison to that of the ligands. Structural data was obtained from single crystal X-ray diffraction of L2 and C1 which validated the formation of the ligand and complex and provided distinct evidence of the deprotonation of the amine group in ethylenediamine upon coordination to metal in complex C1. Results of the in silico analysis of physicochemical and pharmokinetic parameters as well as druglikeliness of the ethylenediamine sulphonamide ligands show that they obey Lipinski's rule of five along with having lead-likeliness. Swiss TargetPrediction was usedto identify several probable biological targets, suggesting that the novel compounds may act as lead compounds for novel anti-cancer drugs.

Keywords: p l a t i n u m , e t hy l e n e d i a m i n e , diethylenetriamine