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Synthesis, characterization and biological studies of dipicolylamine sulfonamide derivatized platinum complexes as potential anticancer agents

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One novel ligand, N(SO₂(2-nap))dpa (94%) and one previously reported ligand, N(SO₂pip)dpa (60%), both containing the dipicolylamine core and a central sulfonamide group and their corresponding novel Pt complexes, [PtCl₂(N(SO₂(2-nap))dpa)] (68%), [PtCl₂(N(SO₂pip)dpa)] (90%) have been synthesized in good yield and high purity. X-ray crystallography, ¹H NMR, FT-IR and UV-Vis spectroscopies were used to characterize the synthesized compounds. ¹H NMR studies revealed that all the peaks of the ligand spectrum have shifted more downfield upon binding to the metal precursor. Structural results for [PtCl₂(N(SO₂(2-nap))dpa)] and [PtCl₂(N(SO₂pip)dpa)] revealed indisputably that platinum has coordinated to the pyridyl nitrogen of the ligand and that Pt–N_{pyridyl} bond lengths fall within the normal range. The methylene protons observed as singlets at 4.60 ppm and 4.54 ppm in ¹H NMR spectra of N(SO₂(2-nap))dpa and N(SO₂pip)dpa ligands, respectively appear as two doublets (6.18 ppm and 5.14 ppm, 6.06 ppm and 5.33 ppm) in the corresponding metal complexes in DMSO-*d*₆ and confirm the presence of magnetically nonequivalent protons upon coordination of ligand to Pt. FTIR data indicate that the stretching vibration frequency of S-N bond (923 cm⁻¹) for both ligands remain unchanged upon complexation as expected for the bidentate coordination mode. The presence of high energy intraligand π → π* transitions of compounds is indicated by the absorption peaks approximately in the range of 200–250 nm in UV-visible spectra. Sulforhodamine B assay was used for obtaining the IC₅₀ values of ligands and corresponding metal complexes. All four compounds have shown anticancer activity against human breast cancer cells, MCF-7. N(SO₂(2-nap))dpa ligand and [PtCl₂(N(SO₂(2-nap))dpa)] complex have shown acute anticancer activity at IC₅₀ of 34.88 mg/L and 0.1810 mg/L respectively, indicating these are promising novel compounds that can be further investigated on their usage as potential anticancer agents.

Keywords: Dipicolylamine, potential anticancer agents, sulfonamide complexes

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