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# Zinc complexes bearing novel sulfonamide ligands towards biological applications: Crystal structures and molecular docking studies

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Use of metal complexes in medicinal chemistry possibly stems from the ability of the metal center to bind with negatively charged biomolecules such as proteins and nucleic acids. With the intention of identifying novel drug leads, two novel zinc complexes; [Zn(N($SO_2$pyridine)dpa)$Cl_2$] (C1) and [Zn(N($SO_2$methylimidazole)dpa)$Cl_2$] (C2) derived from novel sulfonamide ligands; N($SO_2$pyridine)dpa (L1) and N($SO_2$methylimidazole)dpa (L2) were synthesized and characterized. Structural data from X-ray diffraction studies of L1 and L2 confirm that the S-N bond lengths (1.6331 (12) Å and 1.6196 (6) Å) are within the accepted range of sulfonamide bond lengths. The S=O, C-N and C-S bond lengths of the ligands lie within the normal range. A trigonal planar geometry can be suggested around sulfonamide nitrogen atom of both ligands since the bond angles around the nitrogen atom are approximately 120°. L1 crystalizes in the triclinic form whereas L2 crystalizes in the orthorhombic form. As expected, the S-N bond length of C1 has not changed upon forming the metal complex as the sulfonamide nitrogen is not bound to Zn. The Zn metal center exhibits a tetrahedral geometry; it binds with two chlorine atoms and coordinates with the ligand through the two pyridyl nitrogens forming an eight membered chelate ring. The bond angels around the sulfonamide nitrogen are around 120° in C1, confirming that the $sp^2$ hybridization remains unchanged upon binding with Zn. High energy absorption bands which appeared in the region of 200-300 nm of UV-Vis spectra indicate the intra-ligand л- л* and n-л* transitions. Ligands display high fluorescence intensities and they were lowered in complexes; C1 and C2 possibly due to the quenching of fluorescence upon binding to the metal. *In silico* analysis of drug-likeness indicates that both ligands comply with the Lipinski rule of five. Both ligands were predicted to bind with GABA-A receptor with a calculated binding affinity of -6.0 kcal/mol. Furthermore, L1 was predicted to bind with cyclooxygenase-2 with a calculated binding affinity of -7.0 kcal/mol. The synthesized ligands and zinc complexes have the potential to be investigated towards biological applications as novel drug leads.

**Keywords:** Zinc, sulfonamide ligands, pyridine, methylimidazole

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