XXI Brazilian Meeting on Inorganic Chemistry
X Brazilian Meeting on Rare Earths
III Workshop on Theoretical Bioinorganic Chemistry
Belo Horizonte, September 12 - 15th 2024

Evaluation of Platinum(II) and Palladium(II) Complexes as Potential Anticancer Agents: Synthesis and Biological Profiling

Lara V. A. Peçanha [1], Aléxia S. Ribeiro[1] and Heveline Silva[1]

[1]Department of Chemistry, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil
E-mail:laravieira@ufmg.br

Thematic Area: Biological Inorganic Chemistry

Keywords: antitumor, ligands (N,N-bidentate)

Cancer is the second leading cause of death in the world[1], highlighting the need for more effective drugs with fewer unwanted effects. The main objective of this work was to synthesize, characterize, and evaluate the biological activity of platinum(II) and palladium(II) metal complexes with biologically active organic ligands containing oxadiazole, thiophene, and diamine functional groups, and to subsequently assess their cytotoxic evaluation in normal and tumor cells. The complexes were synthesized from the appropriate K_2MCl_4 (**1**, M = Pt and **2**, M = Pd) in a 1:1 reaction with two ligands, **a** and **b** in methanolic solutions. Characterization and *in vitro* cytotoxic activity evaluation were performed, as well as the compounds' ability to interact with albumin and DNA. In the IR spectrum, similar bands were observed for the complexes and ligands. The main difference is observed for the band related to the NH bond stretching, showing a broad band in the region of 3300 cm^{-1} for the ligands. For complexes **1a** and **2a**, there is a slight decrease in the wavenumbers. For the complexes **1b** and **2b**, the bands appear at slightly higher wavenumbers, possibly indicating differences in the complexation of the two ligands. The ^{1}H NMR spectra of the ligands and complexes were similar, with the signals of complexes **1a** and **2a** having greater shifts in the region of the H atoms of the diamine. The ^{13}C NMR spectra showed four signals referring to the aromatic carbons for the ligands and the two complexes, as well as similar signals corresponding to the C of the diamine. The ^{195}Pt NMR showed a signal at δ -2356 ppm for complex **1a** and at δ -2963 ppm for complex **1b**, indicating a difference in the metal coordination site. *In silico* studies are underway for a better understanding of the structures. The molecular ion was found by ESI-MS for all complexes and the signals were in accordance with the performed simulation. Raman spectroscopy was performed for the palladium complexes, and for both, a signal was found in the 300 cm^{-1} region, corresponding to the Pd-Cl bond. Elemental analysis showed results with good correlation to the calculated values. Ligands **a** and **b** showed IC_{50} values higher than their respective Platinum complexes (**1a** and **1b**), which were more active than the palladium ones, with complex **1a** being the most active among all the molecules analyzed. In the DNA interaction evaluation, K_b values in the order of 10^4 were found, indicating moderate interaction between the complexes and DNA[2]. For BSA interaction, the K_{SV} values found were in the order of 10^5, indicating a relatively strong interaction[3]. We can affirm that the synthesis was effective and the IC_{50} results showed that complexation with platinum improved the cytotoxic activity and the selectivity of the compounds. Furthermore, the good interaction with BSA may explain the low interaction with DNA.

Acknowledgments: CAPES, FAPEMIG, CNPq, UFMG.

References

[1] World Health Organization (WHO). Disponível em: **2024**
[2] F. Arjmand, et al., *J Photochem Photobiol B.* 103, 166–179. **2011**
[3] T. Topală, et al., *Clujul Medical* 87. **2014**.