JBIC Journal of Biological Inorganic Chemistry
https://doi.org/10.1007/s00775-021-01879-3

ORIGINAL PAPER

Bis(triazinyl)pyridine complexes of Pt(II) and Pd(II): studies of the nucleophilic substitution reactions, DNA/HSA interactions, molecular docking and biological activity

Snežana Jovanović-Stević[1] · Snežana Radisavljević[2] · Andreas Scheurer[3] · Dušan Ćoćić[2] · Biljana Šmit[1] · Marijana Petković[4] · Marko N. Živanović[1] · Katarina Virijević[1] · Biljana Petrović[2]

Received: 14 April 2021 / Accepted: 7 June 2021

Abstract

Four new complexes of Pt(II) and Pd(II), [Pd(L1)Cl]Cl **1**, [Pd(L2)Cl]Cl **2**, [Pt(L1)Cl]Cl **3** and [Pt(L2)Cl]Cl **4** (where L1 = 2,6-bis(5,6-diphenyl-1,2,4-triazin-3-yl)pyridine and L2 = 2,6-bis(5,6-dipropyl-1,2,4-triazin-3-yl)pyridine), were synthesized. Characterization of the complexes was performed using elemental analysis, IR, ^{1}H NMR spectroscopy and MALDI-TOF mass spectrometry. The substitution reactions of **1–4** complexes with L-methionine (L-met), L-cysteine (L-cys) and guanosine-5′-monophosphate (5′-GMP), were studied spectrophotometrically at physiological conditions. Complexes with ligand L1 (**1** or **3**) were more reactive than those with ligand L2 (**2** or **4**) by a factor ranging up to 1.57 and 3.71, respectively. The order of reactivity of the nucleophiles was: L-met > L-cys > 5′-GMP. The interactions of complexes with calf thymus-DNA (CT-DNA) and human serum albumin (HSA) were studied by Uv–Vis absorption and fluorescence emission spectroscopy. Competitive binding studies with intercalative agent ethidium bromide (EB) and minor groove binder Hoechst 33258 were performed as well. All studied complexes can interact with DNA through the intercalation and minor groove binding, where the latter was preferred. The binding constants (10^3 and 10^4 M^{-1}) for the interaction of complexes with HSA indicate the moderate binding affinity of complexes **1–4** to protein. The trends in the experimental results of binding studies between complexes **3** and **4** with DNA and HSA were compared to those obtained from the molecular docking study. Biological evaluation of cytotoxicity of **1** and **2** on HCT-116 and MDA-MB-231 cell lines showed significant cytotoxic and prooxidative character, while **2** also exerted extraordinary selectivity towards colon cancer in comparison to breast cancer cells.

✉ Snežana Jovanović-Stević
snezanaj@kg.ac.rs

[1] Department of Natural Science, University of Kragujevac, Institute for Information Technologies Kragujevac, Jovana Cvijića Bb, 34000 Kragujevac, Serbia

[2] Faculty of Science, University of Kragujevac, R. Domanovića 12, P. O. Box 60, 34000 Kragujevac, Serbia

[3] Inorganic Chemistry, Department of Chemistry and Pharmacy, University of Erlangen-Nürnberg, Erlangen, Germany

[4] "Vinča" Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Mike Petrovića Alasa 12-14, 11001 Belgrade, Serbia

Published online: 15 July 2021