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Synthesis, characterization and anticancer activity of new organometallic ruthenium(II/III) complexes

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Novel organo ruthenium (II/III) complexes ([(η^6-p-cymene)Ru(η^1-S-TSC)Cl_2], (1); and trans-[$RuCl_2(PPh_3)2(\eta^2$-N,S-TSC)], (2) have been synthesized from the reflux reaction of [{(η^6-p-cymene)RuCl}$_2$(μ-Cl)$_2$] and [$RuCl_3(PPh_3)_3$] with a new TSC (2-acetyl-5-chloro-thiophene thiosemicarbazone) in methanol and benzene, respectively. TSC and both of the complexes have been characterized by elemental analysis, UV–Vis, FT-IR and 1H NMR spectroscopy. The single crystal structure of TSC has been determined by X-ray crystallography revealing that TSC crystallized in the monoclinic space group P21/c. The spectroscopic studies showed that TSC is coordinated to the central metal as a neutral monodentate ligand coordinating via its thiocarbonyl sulfur atom (C=S) in (1), whereas TSC acts as a bidentate anionic chelating ligand with azomethine nitrogen (C=N) and thiol sulfur atom in (2). Both ruthenium complexes displayed higher antiproliferative activities against selected tumor cell lines than TSC ligand, and significantly lower cytotoxic dose towards cancer cell lines and normal colon cell compared to cisplatin. (1) was more active against the colon cancer while (2) was highly cytotoxic towards ovarian carcinoma cells. However, DNA and BSA binding studies for the characterization of antitumor mechanism of ruthenium complexes indicated that these complexes interacted weakly with DNA and BSA, as quantified by Kb in contrast with the importing into cell and accumulation in cytoplasm and then nucleus. These results showed that the mechanism of action may be different from DNA intercalation mechanism. Also, spectral evidences showed these complexes may prefer different transport system instead of binding with albumin. It has been observed that the complexes exhibited different cell cycle arrest on cell lines. Furthermore, our results demonstrated that these newly synthesized ruthenium complexes appear to be as a good antitumor drug candidate. This project has been supported by TUBITAK 215Z663.

Biography

Hulya Ayar Kayali has completed her MSc and PhD from University of Dokuz Eylul in 1997 and 2005, respectively in 2003 and postdoctoral studies from McGill University, Canada, 2011. She works at Dokuz Eylul University from 1998 and she is a professor from 2014. She has published more than 35 papers in reputed journals.

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