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Synthesis and characterization of Ru (II)-*bis*-benzimidazole- based complexes, Ru (III)-polydentate pyridine-based complexes and Ru (II)-*bis*-benzimidazole polydentate pyridine-based complexes with broad spectrum antimicrobial activity and novel mode of action

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We report herein the synthesis and characterization of Ru(II)-*bis*-benzimidazole-based complexes, Ru(III)- polydentate pyridine-based complexes and Ru(II)-*bis*- benzimidazole polydentate pyridine-based complexes respectively, being Ruthenium-aquo-1, 2-di(1H- benzo[d]imidazole-2-yl) ethane trichloride [Ru(bbe)(H_2O)Cl_3], Ruthenium-tri-tert-butyl-2,2',6,2"- terpyridine-chloride-N,N,N',N'-Tetrakis(pryidylmethyl)-1,8 octanediamine perchlorate [Ru(terpy*)(1,8)Cl](ClO_4)$_4$ and Ruthenium-aquo-1, 2-di(1H-benzo[d]imidazole-2-yl)ethane chloride- N,N,N',N'- Tetrakis- (pyridylmethyl)-1,8-octanediamine perchlorate [Ru(bbe)(1,8)(H_2O)Cl_2](ClO_4)$_4$ respectively. Characterization of all the complexes was done by FTIR, ^{1}H-NMR, ^{13}C-NMR spectroscopies, and elemental analysis. Cytotoxicity and antimicrobial activity studies against both Gram negative and positive bacteria, as well as multi drug resistant bacterial isolates were tested for all the complexes. The CC50, EC50, MIC and possible mode of action for each metal complex was determined. Results showed that all metal complexes were not toxic to peripheral blood mononuclear cell (PBMCs), with calculated CC_{50} values ranging between 0.48 mg/mL to 1.0 mg/mL. Antimicrobial properties of the complexes were determined by Kirby Bauer (KB) method and it was observed that both Gram negative and positive bacteria, including multi drug resistant test microorganisms were susceptible. The calculated MICs ranged between 0.25-2 mg/L. The effective concentration (EC_{50}) was between 0.18 mg/mL and 0.5 mg/mL. Whereas the selective index ($SI=CC_{50}/EC_{50}$) was 1.0 and 2.6 indicating low to high potential as microbial agent. The metal complexes were tested for possible mode of action and did not conform to known bactericidal activities suggesting a novel mechanism yet to be elucidated.

Biography

Daphne T Mapolelo has completed her PhD at the age of 35 years from University of Georgia, Athens GA, USA, working with Prof. Michael K. Johnson. In her dissertation she focused on the characterization of the roles of A-type proteins and monothiol CGFS glutaredoxins in Iron-Sulfur cluster biogenesis. After completing her PhD, Mapolelo joined the University of Botswana, Gaborone, Botswana as a lecturer in chemistry, where now she holds a position of senior lectureship. Her current research interest lies in the synthesis and characterization of ruthenium polydentate pyridine and benzimidazole-based complexes and their application as chemotherapeutic agents and drugs. She published more than 15 papers in reputed journals and holds membership to professional bodies such as International BioIron Society (SBIC) and Society of Biological Inorganic Chemistry (SBIC). In addition, she served on and chaired many committees within the University of Botswana and within the nation.

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