University of Venda

SYNTHESIS, CHARACTERIZATION AND *IN VITRO* STUDIES OF SOME TRANSITION METAL COMPLEXES OF ARTESUNATE AND CHLOROQUINE DIPHOSPHATE ANTIMALARIAL DRUGS

A DISSERTATION SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN CHEMISTRY

BY

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ABSTRACT

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Background: Research has shown significant progress in the utilization of transition metal complexes as drugs to treat several human diseases like carcinomas, lymphomas, infection control, anti-inflammatory, diabetes, and neurological disorders. The use of metal-complexes as antimalarial drugs has been encouraged by the successful usage of many metal compounds as antiarthritic and antitumor agents. Certain complexes show strong selectivity for biomolecules that are exclusively found in parasites. This study involved synthesizing transition metal complexes of selected antimalarial drugs (chloroquine, artesunate and the combined therapy (CT) drug of chloroquine-artesunate drugs) and then subjecting them to *in vitro* antimalarial and antibacterial tests.

Methods: The complexes of artesunate and chloroquine drugs were formed by reacting with selected metal salts of Cu, Mn, Co and Ag. These compounds were characterized by means of elemental Analysis (EA), infrared (IR) spectroscopy, UV-vis spectroscopy and melting point. The probable structures of these complexes were predicted based on the observed spectroscopic data. Single and mixed metal complexes of both artesunate and chloroquine were obtained for these sets of drugs (ligand). The results of the complexes formed suggested complexation by deprotonation except for silver (Ag) complexes. The biological analysis of the ligands and their corresponding metal complexes were tested for antiplasmodial activity against a chloroquine sensitive strain (NF54), of the *Plasmodium falciparum* of the malaria parasite, likewise the antimicrobial tests were carried out on *Escheria coli*

Results: The spectroscopic studies of the synthesized complexes indicate a probable coordination of the single and mixed complexes by deprotonating the ligand artesunate and coordination through the N-heteroatom of the chloroquine diphosphate drug to form a complex with respective metal salts for most of the single and mixed complexes except for the silver complexes which did not involve deprotonation. The NF54:IC_{50} results show that most of the single and mixed complexes possess better activity toward this strain than the parent ligands (drugs). Silver (Ag) complex of the mixed ligand was the only complex which showed inhibition against *E. Coli*

Conclusion:

Ten complexes were synthesized, 6 single and 4 novel mixed complexes. Generally, 7 of these complexes showed good activity against CQS strain of *Plasmodium falciparum.* The Mn complex of Artesunate showed best activity against malaria parasite, while Mn and Ag mixed complexes showed good activity. The antimicrobial tests showed Ag mixed complex was the only one with an inhibition effect on *E. Coli*. The results have shown how the formation of metal complexes affects the plasmodial activities of the parent organic molecules.

Key words: *Antimalarial, chloroquine diphosphate, metal complex, ligands, deprotonation*