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Title of Ph.D. Thesis: Synthesis, Characterization and Biological activity of some Heterocyclic ligands based Transition metal complexes

Chapter-1 describes the general introduction of metal complexes and their importance in medicine.

Chapter-2 describes the synthesis of Mn(II), Co(II), Ni(II), Cu(II) and Zn(II) complexes with 4′-(2-ferrocenyl)-2,2′:6′2″-terpyridine, characterization and their antiprotozoal activity. A terpyridine ligand **Fctpy** was reacted with divalent metals (Cu, Co, Mn, Ni and Zn), yielding five complexes of general formula $[Metal(Fctpy)_2][PF_6]_2$. The structure of **Fctpy** was determined by single crystal X-Ray diffraction studies. The complexes characterized using various spectroscopic techniques suggested an octahedral geometry around the central metal ion. These complexes were screened for their antiamoebic, trypanocidal and antimalarial activities.

Chapter-3 deals with the synthesis and characterization of novel Quinazolines and their transition metal complexes along with their antiamoebic activity. The chapter comprises of four quinazoline derivatives and their Co(II), Ni(II) and Zn(II) complexes. The structures of the ligands and the complexes were established using various spectroscopic techniques and magnetic moment studies All the complexes attained tetrahedral geometry. All of the sixteen compounds were screened for their *in vitro* antiamoebic activity and it was found that complexes **(Q5-Q7), (Q10-Q13)** and **(Q15-Q16)** displayed better IC_{50} values than the standard drug, metronidazole.

Chapter-4 deals with the synthesis and characterization of bis-hydrazone derivatives and their first row transition metal complexes and their antiamoebic activity. In this chapter, five hydrazone derivatives were synthesized and complexed with various metal ions resulting in a total of fifteen bis hydrazones complexes. The compounds were characterized using various spectroscopic techniques and magnetic moment studies. All the complexes attained octahedral geometry. The antiamoebic activity results showed that the chelation to metal ions results in the

enhancement of the efficacy of the ligands and it was observed that the ligands **B1** and **B3** along with the complexes **(B1-B8)** and **(B10-B14)** presented excellent activity results when compared to the reference drug.

Chapter-5 deals with the synthesis and characterization of some pyrazoline derivatives and their first row transition metal complexes and their antiamoebic activity. A series of twelve compounds were prepared which included synthesis of pyrazolines from chalcones containing pyrazolo aldehydes and aromatic ketones followed by the complexation of these pyrazolines with Co(II), Ni(II), Cu(II) and Zn(II) ions. The complexes attained octahedral geometry. The chalcones, pyrazolines and their metal complexes were tested for their *in vitro* antiamoebic activity and it was observed that out of twelve compounds screened, **10** compounds, **(4-7)** and **(9-14)** were more active than the standard drug.

Chapter-6 describes the synthesis and characterization of sulfonamides bearing bis-thiosemicarbazones as potential antiprotozoal candidates and their transition metal complexes along with their antiamoebic activity. Two bis-thiosemicarbazones incorporated sulfonamides were prepared along with their metal complexes. Various spectroscopic techniques were employed to establish their structures. The complexes attained octahedral geometry. Antiamoebic activity results showed that while the ligands were inactive, the complexes **(10-15)** were more potent than metronidazole, the reference drug.

Conclusion

In order to develop potent antiprotozoal agents, sixty six (66) compounds containing various transition metal ions were synthesized. It was found that while the metal complexes of quinazolines attained tetrahedral geometry, the rest of them (containing bis- hydrazones, pyrazolines and bis thiosemicarbazones derivatives) attained octahedral geometry. These sixty six compounds were screened *in vitro* against HM1:IMSS strain of *E. histolytica* by microdilution method. Forty eight compounds were found better inhibitors of *E. histolytica* than the reference drug metronidazole. Therefore, these studies might motivate further efforts towards the development of novel metal based drugs with better anti-amoebic activity and lesser cytotoxicity for the host.