

**Executive Summary**  
**of**

**Minor Research Project**

**Entitled**

**EQUILIBRIUM STUDIES IN TRANSITION METAL COMPLEXES OF  
SOME DRUGS AND BIOLOGICAL IMPORTANT AMINO ACIDS.**

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### **Objectives of the Study:**

The present work aims at determining the stability constant, the effect of solvent on complex equilibria and energies of metal ligand bonds in the inspiration of importance of drugs and amino acids. In this dissertation, the author had tried to study the stability constant of some bivalent & trivalent metal ions with some new drugs and important amino acids it also aims to understand the effect of substituent ion on PK/ logK values of metal complexes at 27°C, the nature of bonding sites, to confirm exact complexation equilibria and the variations in the mixed ligand stability constants.

### **Actual Plan of the Study:**

**First Year:** As the work is experimental based; the prime focus of the study during the first year of study was collection of equipments, chemicals and glassware's necessary for the study and visits to various libraries, visits to institutions and individuals for the literature survey.

**Second- Year:** Actual collection of the experimental data, analysis of data, planning of chapter scheme, preparation of rough draft, editing of the draft, computerizing of the final draft were undertaken.

### **Chapter Scheme:**

The project is divided into three chapters with following details.

Chapter I- Introduction

Chapter II- Binary complexes

Chapter III Ternary complexes

### **Research Methodology:**

The research methodology employed in the present study is the laboratory based experimental analysis, the solutions are analyzed pH metrically to study the metal ligand equilibrium.

### **Summary:**

The stability constant of binary complexes under the present investigation have been determined by using Irving-Rossotti pH metric titration technique. The experimental procedure involves the titration of the metal, ligand (Zidovudine and Tamsulosin ) and biological important Amino acids like Glycine, Valine, Metionine, Phenylalanine and Glutamic acid solution against standard sodium hydroxide solution. 80 % of the Ethanol (V/V) in Ethanol and water mixture was used as a solvent in the solution equilibria. The ionic strength of all the solution was adjusted to the desired value by the addition of required quantity of 0.1 M NaClO<sub>4</sub> solution. The temperature was kept at 27°C. The titration curves were obtained by plotting the corrected pH meter readings against the volume of the alkali added. The binary and ternary complexes of the metal ions like Cu<sup>2+</sup> and Cr<sup>3+</sup> with the Drug Zidovudine and Tamsulosin along with the amino acids are then determined by using the SCOGS program.

The foremost findings of the project can be listed as below:

- 1) The mixed ligand curves lies below metals drug curve indicates the formation of ternary complexes.
- 2) The negative values of the  $\Delta\log K$  in majority of the cases indicates the destabilized nature of the ternary complex

except in case of the ternary complex formed between Cr (III) metal ion Zidovudine with amino acids were found their  $\Delta \log K$  values positive which is evidence that this ternary complexes are relatively more stable than in the case of Cu(II) metal ion complex with zidovudine and amino acids whose  $\Delta \log K$  values are negative .

- 3) The chelating tendency of the copper has been revealed in many inorganic metal complexes due to its biological importance but in the present study it is found that the chelation tendency of  $\text{Cr}^{3+}$  ion is more compared to that of the  $\text{Cu}^{2+}$  ion when it formed complex with the primary ligand Zidovudine and Tamsulosin.
- 4) Comparing the correlation of copper and chromium ternary complexes it is found that they are not in accordance, this could due to variation in their valences.
- 5) Species distribution diagram helps understanding the nature of the equilibrium.
- 6) The study of the ternary complexes of the Cu(II) ion and Tamsulosin with some amino acids like glycine, alanine, methionine, phenylalanine and glutamic acid forms a curve which runs below the corresponding metal ligand curve, which indicates that the entry of secondary ligand faces the steric hindrance and same is the case with Zidovudine.
- 7) The comparative stability of the ternary complexes of  $\text{Cr}^{3+}$  and drug with respect to the amino acids is
  - i) Zidovudine = Methionine > Phenyl alanine > Glycine > Valine > Glutamic acid.

ii) Tamsulosin = Valine > Glutamic acid.> Glycine  
Methionine > Phenyl alanine

8) The comparative stability of the ternary complexes of  $\text{Cu}^{2+}$  and drug with respect to the amino acids is

i) Zidovudine = Phenylalanine > Methionine >Valine >  
Glutamic acid > Glycine

ii) Tamsulosin = Glycine > Phenylalanine > Methionine>  
Glutamic acid > Valine.

9) It is observed from stability trend of ternary complexes, that the stability is with respect to the amino acids follows the reverse order amongst the chromium and copper metal ion complexes.

10) The overall outcome of this research can be stated that the drug Tamsulosin amongs the two selecteddrugs can be used for detoxification of chromium. Many time it is noticed that certain biological processes taking inside the human body are interrupted due to excess presence of the metals, as in case of mercury contamination leads to hazardous disease. As per the observed values of the stability constants in case of the ternary metal complexes of the chromium and copper with some drugs like Tamsulosin and the zidovudine it is concluded that the chromium can be better complexed with the help of the Tamsulosin and therefor this drug can be used as detoxifying agent to remove the poisoning metal ion.

### ***Further scope of the topic***

Considerable work needs to be done on metal ion affinities and reaction kinetics with particulate and organic systems furthermore comparative determination of metal speciation under various conditions encountered in the sea water, industrial effluents, environmental pollution causing wastages etc.

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