Synthesis, spectroscopic and thermal studies for ternary glutamate and other amino acids of divalent metal complexes and their effect on the metal weight loss inhibition.

Thesis submitted
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Abstract

Thesis Title:

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(Ternary complexes of Ni(II), Co (II), Cu(II), and Zn(II) with glutamic acid as a primary ligand and Nitrilotriacetic acid [$HNTA^{2-}$] or alanine as a secondary ligand were synthesized in slightly acidic medium. Characterization of the new complexes were performed by elemental analysis, Fourier transform infrared, UV–Visible spectrophotometr, thermal analysis, magnetic measurements and mass spectroscopy. The complexes have been suggested to show geometry of an octahedral symmetry .The results indicated that the ternary complexes were isolated in 1:1:1 (M: glutamic: HNTA) ratios, and the molecular structures were suggested to Be [M(glutamic)(HNTA)(H_2O)].(2-1.5)H_2O and [M(glutamic)(alanine)(H_2O)$_2$].(1-0.5)H_2O.The prepared

complexes were used in weight loss studies of aluminim and copper plates , antimicrobial activities of the prepared complexes against *Escherichia coli*, *Staphylococcus aureus* ,*Candida albicans* and *Aspergillus flavus* were investigated and evaluated for their *in vitro* anticancer activity against hepatocellular carcinoma .

Keywords

Ternary complexes, glutamic acid, NTA, alanine, Synthesis, Characterization, Biological study, hepatocellular carcinoma and the weight loss studies .

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1. 1. Introduction

The study of coordination compounds has received much attention in recent years. This interest was generated by the discovery of the anti-bacterial, -fungal and cancer activities of several coordination compounds. As a result, studies have been carried out on the structure and chemical behavior of several metal complexes **(Chohan et al., 2006)**.Various *in-vivo* studies have shown that biologically active compounds become more bacteriostatic and carcinostatic upon chelation **[Chohan et al., (2006) and Husseiny et al.,(2008)].** Amino acids, which are also components of proteins, offer excellent ligands for binding to metal ions**[(Zhang and Lippard., (2003) and Kostova., (2006)]**.The properties of coordination compounds are influenced to a considerable extent by the nature and the oxidation state of the central metal atom. A method of studying this influence is by comparing the compounds method of studying this influence is by comparing the compounds Fromed by a series of metal atoms in a given oxidation state with a particular ligand **[Komiyama etal., (2008))].** **A**lthough coordination compounds of amino acids, such as histidine**[(Nomiya et al., 2000)]** arginine, glutamic acid **[Legler et al., (2001)]** have been synthesized and their antimicrobial properties studied, little attention has been focused on hydrophobic amino acids, such as phenylalanine. Chelation of bulky ligands to metal cations reduces the

polarity of the ion. Due to the glycolipophilic nature of the cell wall, an increase in the lipophilicity of a coordination compound enhances its ability to penetrate bacterial cell membrane.

A mixed ligand complex is regarded as a simplified chemical model for the enzyme-metal substrate complex fromed in the course of the enzymatic reaction with metal ion at the active center, As has been shown for the carboxypeptidase A-peptide complex, the electrostatic bonding between the coordinated ligands is certainly one of the important driving forces leading to the formation of mixed ligand complexes**[Lips Comb., (1970) and Yamauchi et al., (1975)]** suggesting that such electrostatic or hydrogen bondings exist between the oppositely charged groups in the side chains of the two ligands in several Cu(II) containing ternary systems and that they affect the formation of mixed ligand complexes.

An intensive number of studies on the formation of mixed ligand complexes reveal a realization of their growing importance, particularly in their role in biological process **[Rao., (1994)].**The formation of mixed ligand chelates is a general feature of systems where a metal is present with two or more ligands. The study of these complexes shows that their formations are a favored process over that of simple complexes **[Ramanujam and Krishnan.,(1980)].**The study of ternary complexes involving an aromatic amine as the