

Drug -Metal Complexes in Research - A Review

SHUCHITA AGRAWAL*

*Professor, Department of Basic Science,
B.T.Institute of Research & Technology Sironja, Sagar M.P. (India)
Mrs.shuchitaagrawal@yahoo.com

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Abstract

Metal compound provides opportunities for building structures with defined properties. Various diseases and their treatment depend on the metabolism of inorganic constituents. Co-ordination chemistry provides better opportunities to use metal complexes as therapeutic agents. These Co-ordination compounds show a great diversity in action. Metal coordination can be used to enhance the activity of biologically active molecules. This paper reviews about the various applications of metal complexes in biological system.

Key words: Inorganic- Metal complexes, Biological activity, Inorganic constituents.

Introduction

Organo-metallic compounds have been used as medicine for treatment of various diseases from centuries. Metal complexes plays essential role in pharmaceutical and in agriculture. The metallo-elements play vital roles in trace quantities at the molecular level in living system. Transition metal ions are responsible for proper functioning of enzymes.

The biometals forms complexes with different bio-ligands to attained mode of biological action. The biological action of complexes depends upon the thermodynamic and kinetic properties. The lipophilicity of the

drug increases by the chelate formation and drug action increases significantly due to effective permeability of the drug into the site of action. Interaction of various metal ions with antibiotics may enhance their activity as compared to that of free ligands.

Metal Compounds :

Metal complexes are coordination compounds, which include all metal compounds. Metal complex is contains a central atom (or) ion of metal bonded with anions called ligands. The compounds which contain a coordination complex are called coordination compounds. Metals are positively

charge Lewis acid, when dissolved in water they forms hydrated compounds.

Metal Complexes in Biological system :

Metal ion forms bond with ligands in some process, to oxidize and reduce in biological systems. The important metal present in the body of living organisms is iron which plays an important role in all living cells. Generally iron complexes are used to the transport the oxygen in the blood and tissues. In normal condition an adult consumes 250ml of pure oxygen per minute. This oxygen carried through the metal complex transport system known as Heme. The Heme group is metal complex, having iron as central metal atom, which binds & releases the molecular oxygen.

Metal Complexes in Treatment of Cancer:

In medicinal chemistry, the therapeutic use of metal complexes in cancer and leukemia are reported from the sixteenth century. An inorganic. Complex CISPLATIN was discovered in 1960; today it is still one of the world's best selling anticancer drugs. Complexes formed with other metals like Cu, Au, Ga, Ge, Sn, Ru, Rh, Ir was shown significant antitumor activity in animals¹.

Some recent progress provide new targets for anticancer agent which act by the formation of DNA adducts with cancer cell and results the inhibition of DNA replication². But it also affects normal cells like hair follicles, mucus lining of gastrointestinal tract etc. Different techniques have been used to modify such effects by reducing its side effects, avoiding drug resistance and to improve efficacy³. The drugs have been conjugated with porphyrin ring

to enhance the tumor tissue specificity of complexes. Titanium complexes, gold complexes also show significant antitumor activity. In the treatment of ovarian cancer ruthenium compounds containing aryl azopyridine ligands show cytotoxic activity. Now a day's metal complex in the form of nano shells are used in the treatment of various types of cancer⁴.

Metal Complexes in Treatment of Neurological Disorder :

In the treatment of various neurological disorders metal complexes are also play a vital role. Lithium complex with drug molecules may cure many nerve disorders like Huntington's chorea, Parkinsonism, organic brain disorder, epilepsy and in paralysis etc. Other transition metals such as copper and zinc are involved as a transmitter in the neuronal signaling pathways⁵.

Metal Complexes in Treatment of Diabetes:

Diabetes mellitus is a chronic disorder and characterized by hyperglycemia, that is high concentration of blood glucose. Hyperglycemia is caused due to insulin deficiency. In diabetes intake of chromium metal complex shown considerable reduction in the glucose level⁶. New insulin mimetic zinc (II) complexes with different coordination structures and with a blood glucose lowering effect to treat type 2 diabetes in animals were found⁷.

Schiff Bases Metal Complexes :

Schiff base with metals such as thallium, molybdenum, manganese, zinc, cadmium, copper and silicon form complexes show impaired

antimicrobial property when compared with Schiff base. Schiff base of pyridone, pyrrolidone, with o-phenylenediamine and their metal complexes have better antibacterial activity⁸.

Schiff base with metals such as Arsenic, Antimony and Bismuth shows antifungal property against *A.niger* and *A.alternata*. Schiff bases and their metal complexes formed between furan or furylglycoxal with amines show antifungal activity against various organisms⁹.

Schiff base and silver complex shows considerable antiviral activity. Silver complexes in oxidation state showed inhibition against cucumber mosaic virus¹⁰.

Schiff bases with metal complexes possess anti-inflammatory, anti-allergic, antioxidant and analgesic action. Furan semicarbazone metal complexes exhibit significant antihelmintic and analgesic activities¹¹. Schiff base metal complexes possess antifertility and enzymatic activity¹². Also chromium azomethine complexes, cobalt complex of Schiff bases are used in dyes for coloring of leather, food package and wool¹³.

Conclusion

Metal complexes offer a platform for the design of therapeutic compounds. The basic ideas for the synthesis and develop the various process in metal complex is under progress. Even though it having more side effects, they are still widely used in the treatment of cancer as a therapeutic drug. Regardless of the achievements of current metal complex drugs,

there are some drawbacks. Therefore there is a need for new approaches that are required to circumvent these drawbacks.

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