A REVIEW OF METAL COMPLEXES IN DRUG INVESTIGATION

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ABSTRACT

Metal composites provide fresh possibilities for creating structures with specific features. The metabolism of inorganic components is a factor in many illnesses and their treatments. Metal complexes may now be used as medicinal agents better thanks to developments in inorganic chemistry. Metal complexes interact with living things in a different way than non-metals do. These complexes exhibit a wide range of behavior. Biologically active compounds may benefit from metal coordination to increase their activity. The numerous uses of metal complexes in biological systems are reviewed in this essay.

INTRODUCTION

Since ancient times, organometallic compounds have been employed in medicine. Metal complexes are crucial to the pharmaceutical and agricultural industries. At the molecular level, the metallo-elements, which are present in minuscule amounts, are essential to biological systems. The correct operation of several enzymes depends on the transition metal ions. The creation of complexes with various bioligands results in the activation of biometals, and the mechanism of biological action for these complexes relies on their thermodynamic and kinetic characteristics. Chelates are formed, increasing the drug's lipophilicity, and the drug's effective permeability into the site of action greatly increasing the drug's capacity to act. In comparison to free ligands, the interaction of certain metal ions with antibiotics may increase their antibacterial activity.

Complex Metals

Coordination compounds, which include all metal compounds, are another name for metal complexes. A metal complex is a structure made up of anions (ligands) with a core metal atom or ion. Coordination compounds are substances that include a coordination complex. Because of their positive charge, metals are Lewis acids, and when they dissolve in water, they produce hydrated compounds.

The Body's Metal Complexes

In certain processes, metal ions form bonds with ligands. They also oxidize and decrease in biological systems. The most significant metal in the body is iron, which is essential to all living cells. Iron complexes are often employed to carry oxygen through the blood and tissues. At rest, an adult uses 250ml of pure oxygen per minute. Heme, a metal complex transport mechanism, enables the oxygen to leave the blood as it reaches the tissue. Iron serves as the core metal atom in the heme group, which may bind or release molecular oxygen.

Metal Complexes in the Treatment of Cancer

In medicinal chemistry, metal complexes have a more significant place. Metal complexes have been used therapeutically for leukemia and cancer since the seventeenth century, according to reports. An inorganic compound called cisplatin was discovered in 1960; more than 50

years later, it is still among the most popular anticancer medications on the market. Significant anticancer activity was shown in animals when metal complexes were generated with other metals such copper, gold, gallium, germanium, tin, ruthenium, and iridium.

Recent developments in cell biology provide fresh targets for anticancer agents that work by forming DNA adducts with cancer cells and preventing DNA replication [1]. Normal cells like hair follicles and the mucus lining of the digestive system are also affected. Various methods have been used to alter these effects by lowering their negative effects, preventing medication resistance, and improving effectiveness [2]. To improve the complexes' ability to target particular tumor tissues, for instance, medicines have been conjugated with the porphyrin ring. Other transition metals than platinum are also employed in anticancer medications. Both gold and titanium complexes have substantial anticancer activity. Ruthenium compounds with arylazopyridine ligands have cytotoxic action in the therapy of ovarian cancer. A variety of cancers are treated nowadays using metal complexes in the form of nanoshells [3].

Mental illness and Metal Complexes

Additionally, metal complexes are essential in the management of certain neurological diseases. Many neurological conditions, including Huntington's chorea, Parkinsonism, organic brain illness, epilepsy, and paralysis, among others, may be treated with lithium in combination with medicinal molecules. In the neural signaling pathways, other transition metals including copper and zinc play a transmitter role [4].

Complex Metals in Diabetes

Diabetes mellitus is a complicated condition that need multimodal treatment. Hyperglycemia, a chronic condition defined by a high blood glucose level, is brought on by both insulin resistance and insulin insufficiency. Consumption of chromium metal complex has significantly lowered blood glucose levels in diabetes [5]. In order to treat type 2 diabetes in animals, new insulinomimetic zinc (II) complexes with various coordination configurations have been discovered [6].

Metal Schiff Base Complexes

a metal surrounded by a collection of iron atoms or molecules known as Schiff bases, which are the byproducts of the condensation of primary amines with aldehydes or ketones (RCH=NR', where RPR' is an alkyl or aryl substituent.

When compared to Schiff base, complexes made of metals such thallium, molybdenum, manganese, zinc, cadmium, copper, and silicon have less antibacterial properties. For instance, pyridone with O-phenylenediamine and its metal complexes have improved antibacterial action [7].

Arsenic, antimony, and bismuth are among the metals in Schiff bases that have significant antifungal properties against A. niger and A. alternata. Examples of Schiff bases that are produced when furan (or furylglycoxal) and amines interact have antifungal action against a variety of species [8].

Significant antiviral action is shown by Schiff bases with silver. Cucumber mosaic virus suppression was shown, for instance, by silver complexes in an oxidized form [9].

In addition to having antibacterial, antifungal, and antiviral properties, Schiff bases and their metal complexes have analgesic, anti-inflammatory, allergy inhibitory, and antioxidant properties. For instance, metal complexes of furan

semicarbazones have potent anthelmintic and analgesic properties [10].

Schiff base metal compounds have considerable enzyme and antifertility properties [11]. Additionally, cobalt Schiff base complexes and chromium azomethine complexes are employed in dyes to color wool, leather, and food packaging [12].

CONCLUSION

The creation of new medicinal molecules may be facilitated by metal complexes. The fundamental concepts for synthesizing and developing diverse processes in metal complexes are now being worked on. Despite having significant negative effects, they are still a common therapeutic medicine used to treat cancer. Despite the successes of the modern metal complex medications, there are certain negative aspects. In order to get around these problems, new strategies are thus needed.

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