REVIEW OF RESEARCH
IMPACT FACTOR : 5.7631(UIF) UGC APPROVED JOURNAL NO. 48514 ISSN: 2249-894X
VOLUME - 8 | ISSUE - 1 | OCTOBER - 2018

A STUDY ON BIOLOGICAL AND LANTHANIDE COMPLEXES COORDINATION COMPOUNDS

Virendra Kumar
Research Scholar , L.N.M.U. Darbhanga.

ABSTRACT

*The coordinating chemistry of lanthanides is important for understanding, especially in biological, biochemical and health systems, the basis of the application of lanthanides.Radiological research of our body systems is unnecessarily utilizing lanthanide-based **X**-ray complex imagery and lanthanide chelates based on contrast enhancing agents for magnetic resonance imaging **(MRI)**.In Lanthanide chelate complex, the most significant property of the chelating agents is their ability to change the activity of the lanthanide ion that is binding to biological systems.Because of their great medical benefit, lanthanide ions and their compounds have gained industrial and academic attention. A number of biologically significant organic compounds in lanthanide metals/ions have been documented to be more biologically active compounds.*

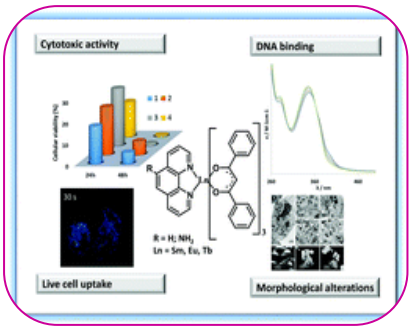
KEYWORDS: *lanthanides,biological and chemicalaspects,coordination compounds, Lanthanide complexes, biological importance.*

INTRODUCTION

The 14 chemically related elements, Lanthanides, are only found in traces on whole body tests. A substantial accumulation of lanthanides, or lanthanides, in various organs occurring in the kidney, liver, bones and spleen, is documented. However, the remaining organs contain much smaller lanthanides concentrations.There have been findings that lanthanides in the eyes differ widely. The key and most striking aspect of lanthanide biochemistry is that the levels of lanthanides obtained in various bodies have been found in a variety of studies to vary widely with the development in different stages in diseases/1/. Webster/2/ registered a significantly higher amount of lanthanide in infrastructure cardiac tissues than normal in 1965.

MRI (magnetic resonance imaging) agents are commonly used as gadolinium compounds. Lanthanides with coumarin and their associated compounds display the biological features of photobiological properties of the antitumor, antitumor, anti-leukemia and anti-HIV activities.In catalysis and organic synthesis, it has also been found that trivalent lanthanide donor compounds are added.

The accumulation of lanthanides in spleen has been routinely studied where lanthanide levels in alcoholics show frequent variance with varying degrees of organ infection.Their results were later applied to investigations into lanthanide liver incidence, as liver is one of the organs exhibiting strong preferences for accumulation of lanthanide.



Lanthanide research have shown that they have a wide range of uses, including medical diagnoses and medical therapies, products, industry and agriculture.Nanotechnology is also a promise that the area of medical applications such as drug delivery and fluorescent tag production can greatly enhance human health in the bio-molecular sensing, in imaging, in cancer and therapy.

Magnetic, catalytic and optical properties of Lanthanide compounds are also employed as biosensors for biological use. The method has been highly popular and is primarily responsible for the continued interest in the biochemistry of lanthanides.

BIOLOGICAL IMPORTANCE OF LANTHANIDE COMPLEXES:

Zhang et al. documented four lanthanide complexes with the ligand hexafluoro acetylacetone (hfac) by using the lanthanide Ion and the radical NITP-P-Cl (Nitronyl Nitroxide). The form of complexes Ln(hfac)3(NITph-p-Cl)2 were synthesized with the use of metals Er, Tb, Dy and Gd and tested against bacteria against the use of antibacterial.

The ligand comprises two phenolic oxygen atoms and two imine nitrogen atoms for central metal coordination.Ligand and its complex LN(III) against certain bacteria have shown biological featural ligand to have a normal antimicrobial activity against *P. aeruginosa* and *E.coli* bacteria and have not demonstrated activity against *P. vularis*, *s.dysenteriae* The foggy, *s. Aureus*, Klebsiella & Serratia demonstrated the highest antimicrobial activity against s in the synthesized La and Pr complexes. These have not had strong antimicrobial activity against *s. aureus.* than the Gd, Nd, Sm, Tb, Er and Dy complex. Both complexes with a ligand lanthanide (N, N-bis(1-naphthaldimine) have shown greater antimicrobial activity with gram-positive bacteria while showing low antimicrobial activity with gram-negative bacteria [15].

P. Kapoor et al. reported on the use of two ligands of 3-acetylcoumarin thiosemicardbasin and ACTSZH and 3-acetylcoumarin semi carbazone (ACSZH) metals in both octahedral complex series **(Figure 1)** one by one. These two lanthanide complexes are synthesized by thermal and microwave methods.

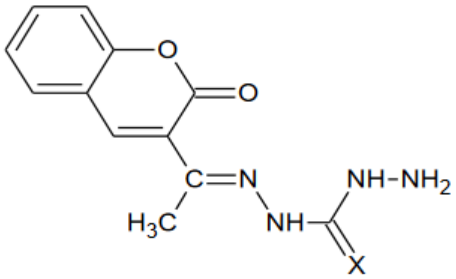


Figure -1: 3-acetylcoumarin thiosemicarbazone (X= S-atom),

3-acetyl coumarin semi carbazone (X= O-atom)

The study of ligands and complex antibacterial and anti-fungal activity was performed on some of the bacterial and fungal strains and confirmed Ln complexes' good biological activities as their uncompromising ligands and the Sm complexes with the same ligands (ACTSZH and ACSZH) as other ligands and parent complexes, as the highest biological activity.

L. Lekha et Al. have reported biological trial N-[(Z)-(5-bromo-2-hydro-xyphenyl) methyl)- 2-hydroxyacetamide (Fig.-2) from L-Serine, 5-bromo-salicylaldehyde for these trivals lanthanid complexes synthesized with Schiff's basis ligand.

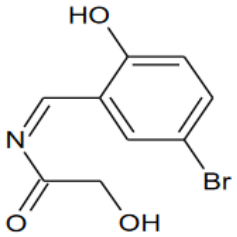


Figure 2: N-[(Z)-(5-bromo-2-hydroxyphenyl)methylidene]-2-hydroxyacetamide

Coordination Chemistry of Lanthanide and Its BiologicalRelevance:

A large amount of literature has shown ample evidence of the primary position of lanthanide interaction with living cells on the external surface only so closer and sincere attention is needed to bind lanthanide to cells.Cell membranes in the structure are definitely highly complex, artificial membranes usually use to understand the relationship between Ln (111) ion / 33/ phospholipid, the main component of the cellular membrane. Ln (1I I) is the first process of absorption of the surface that can be seen as:

Ln (II1)+surface Ln (111)surface (1)

In the case of Ln (1I I), a ligand L (phospholipid), in order to trap a metal ion, is alternatively the first step for the biological system to ensure the absorption by cell membrane.

Ln(11I) L Ln L (externalsurface) (2)

Bothsteps(1)and(2)mustbefollowedbyapassageofthecapturedLn(I11)deepintothecell:

Ln (111) surface La Ln(I11) surface +L

Ln (I 11) surfaceL• Ln (I Il) L • +surface (3)

LnL +L• Ln k • +L (4)

Phosphate, which is highly complex to Ln (III) via polar phosphate end as shown by Figure 3 Lecithin (phosphatidyl choline) is the most prominent phospholipid bio membrane, and forms 1:2 complexes with Ln(III), can result in metal uptake at the membrane and strong attachment to the external surface of the bilayer cell membrane.

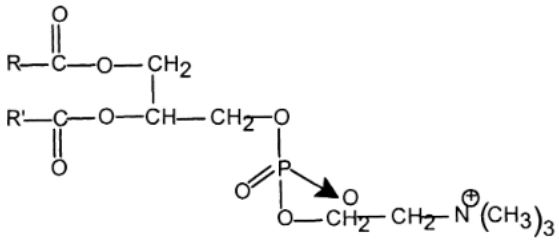


Figure 3: Structure of Lecithin, R and R are long chain alkyl group.

The lanthanide ion is bindable in PO-groups, whereas it's most likely because of interconvertible high affinity sites, which are also known as Relaxed(R) sites, lower affinity and Tense(T). The different binding of Lanthanide ions for vesicle bilayers is different. The ratio R/T is set and approximately 0.14.

In the drug production and during diseases of diagnoses and prognosis, the results above have been found to be very effective in investigating lanthanide compounds (salts, complexes and organized chelates). Such as multi-sclerosis, atherosclerosis, brain and cardiovascular diseases and oncology /33, 3J, 36, 37/.

Biological Evaluation of Lanthanides Actions:

Based on their antioxidant properties and their function as a ROS (reactive Oxygen Species), lanthanides are mediator in various degenerative conditions. The effects of these elements on tissues are likely harmful for human health and need to be explained.In a series of terbium luminescent tests, a macrocyclic polyaminocarboxylateligand (DOTA) reveals the hydrophobicity of the antenna and the

carboxamide pendant arm. The impact of the hydrophobicity of and load on the cell viability and cell association of lanthanide metal complex are investigated.

Another recent research shows three novel compounds synthesized with and then characterized by the Schiff base ligand (bis(N-salicylidene)-3-oxapentane-1,5-diamine H2L). The ligand and its LnIII complexes are linked with DNA in a groove mode, with LnIII complexes being able to scavenge radical hydroxy and radical super-oxides. Their activity as antioxidants was shown in vitro.

In the clinical study of cerebrospinal disorders and general function assessment of the central nervous system, lanthanides chelate are used as contrast agents. 23Na NMR spectroscopic analysis is used in cellular, tissue and whole organ systems with the aid of the chelated lanthanide complex change reagent.

CONCLUSION:

The research on Lanthanide complexes is constantly underlined by its peculiar set of characteristics, including optical, luminous and magnetic fluorescence.

Because of the huge pharmacological value of lanthanide metal complexes with various types of organic compounds, the researchers have become an area of major interest. Due to the coordination of various chelators or ligand structures with possible biological properties, metal complexes of lanthanides are preferable.

REFERENCES:

1. Moeller TH. Coordinationchemistry of the lanthanide element, s-one hundred years of development and understanding. Werner Centennial, Amer. Chem. Soc., I^ Washington. 1967:306-f7.
2. Mehrotra RC, Kapoor PN, Batwara JM. Coordination chemistry of lanthanides with emphasis on derivatives with Ln-OC bonds. Coordination chemistry reviews. 1980 Jan 1;31(1):67-91.
3. Kostova I. Lanthanides as anticancer agents. Current Medicinal Chemistry-Anti-Cancer Agents. 2005 Nov 1;5(6):591-602.
4. Cundari TR, Saunders LC. Modeling lanthanide coordination complexes. Comparison of semiempirical and classical methods. Journal of chemical information and computer sciences. 1998 May 18;38(3):523-8.
5. Grazul M, Budzisz E. Biological activity of metal ions complexes of chromones, coumarins and flavones. Coordination Chemistry Reviews. 2009 Nov 1;253(21-22):2588-98.
6. Zhang CX, Qiao XM, Chen HW, Zhang YY. Syntheses and Biological Activities of Lanthanide Metal Complexes with Nitronly Nitroxide. Synthesis and Reactivity in Inorganic, Metal- Organic, and Nano-Metal Chemistry. 2015 Jan 2;45(1):145-50.
7. Misra S.N., Gagnani M.A., Devi M.I., Shukla R.S., Biological and clinical aspects of lanthanide coordination compounds, Bioinorg Chem Appl., 2004,2 (3-4),155–192.
8. Lu R, Ni J., Mechanism of rare earth effect on liver, J Chinese Rare Earth Soc, 2002.