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Transition Metal Complexes of Novelity Ligands and Their Application in Antidote

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ABSTRACT
Inorganic compounds significantly transition metals have contend associate degree vital role in the development of new metal based mostly medication, during this review a Cursory consider the appliance of those metal complexes within the areas of pharmacy, biological science and cosmetology has been expatiated to give associate degree insight of the contribution of inorganicChemistry towards medication and cosmetic delivery.
Keywords: Metal complexes, pharmaceuticals

1.INTRODUCTION

Transition metal complexes are cationic, neutral or anionic species in which a transition metal is coordinated by ligands. [1]. Research has shown significant progress in utilization of transition metal complexes as drugs to treat several human diseases.Transition metals exhibit different oxidation states and can interact with a number of negatively charged molecules. This activity of transition metals has started the development of metal based drugs with promising Pharmacological application and may offer unique therapeutic opportunities.[2]. The advances in inorganic chemistry provide better opportunities to use metal complexes as therapeutic agents. The mode of action of metal complexes on living organism is differing from non metals. These complexes show a great diversity in action.[3]. Medicinal inorganic chemistry can exploit the unique properties of metal ions for the design of new drugs. This has, for instance, led to the clinical application of chemotherapeutic agents for cancer treatment, such as cisplatin.[4]. The use of transition metal complexes as therapeutic compounds has become more and more pronounced.

2. Synthesis of ligand (Z)-N' (2-aminopyridin -3 –yl)methylene)benzene-1,2 diamine

A solution of 1-phenyl-2,3-dimethyl-4-amino-3-pyrazolin-5-one (0.21628 g, 1 mmol) in ethanol (5 ml) was added to a solution of 2- Amino3- pyridine carboxaldehyde (0.2442 g, 1 mmol) in ethanol (5 ml). The reaction mixture was stirred for 2 h at room temperature then heated to reflux for 2 h and kept at 273 K for 4h. The characteristic Dark brown precipitate obtained was filtered and recrystallized by dissolving in methanol (m.p. 400 K). Yield: 75 %.

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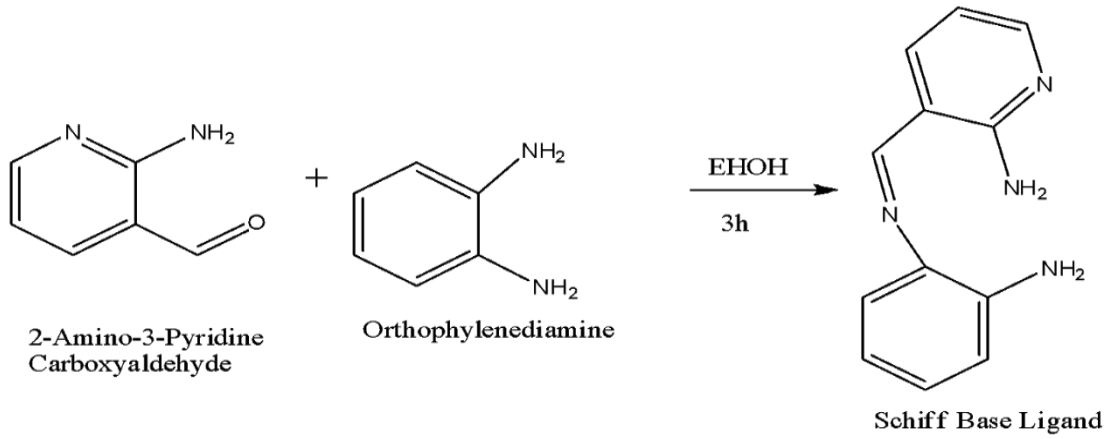
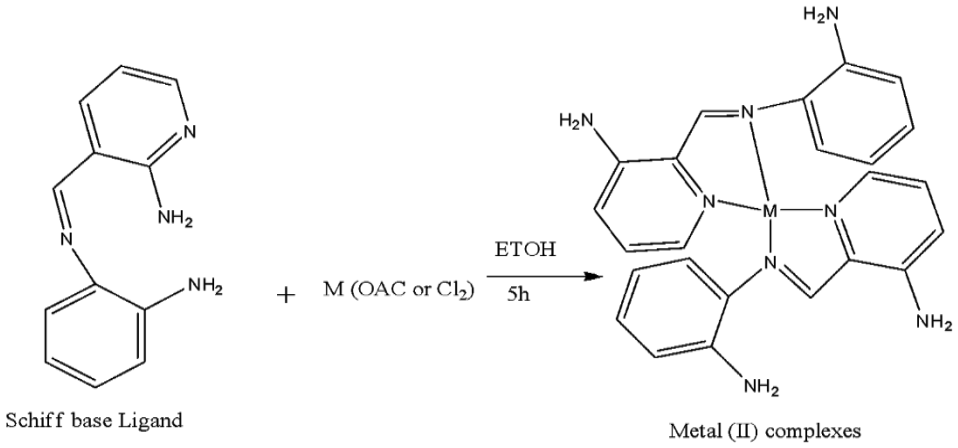


FIGURE 1: Synthesis of Schiff base ligand

2.1 Synthesis of metal complexes

An ethanol solution of Metal (II) acetate (1 mmol, 15 mL aqueous ethanol) was added dropwise to a stirred ethanol solution of the Schiff base ligand. The resulting solution was gently heated for 5 h with constant stirring. The precipitate solid was filtered, washed with hot water, and then ethanol followed by ether and dried in vacuo. Yield: 72%; M.p. >200ºC. The complex is soluble in DMF and DMSO, and is partially soluble in chloroform and methanol.



M = Cu(II)OAC, Co(II)OAC, VO(II)OAC, Ru(III)Cl

FIGURE 2 – Synthesis of Metal Complexes

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3. Results and discussion

Analytical, colour and magnetic susceptibility data of all metal complexes are given in Table 1 and are in good agreement with proposed composition.

TABLE 1

Compound	**Empirical formula**	**Molecular Weight**	**Color**	**Elemental analysis calc.(found)**		
				C	H	N
Ligand	$C_{12}H_{12}N_4$	210.24	brown	66.80	5.70	26.40
Cu(II)OAC_2	$C_{24}H_{24}CuN_8$	486.01	brown	59.06	4.96	22.96
Co(II)OAC_2	$C_{24}H_{24}CoN_8$	481.42	brown	59.63	5.00	23.18
VO(II)OAC_2	$C_{24}H_{24}N_8V$	423.40	brown	67.90	5.70	26.40
$RuCl_3$	$C_{24}H_{24}N_8Ru$	523.53	brown	54.85	4.60	21.32

3.1 Table 2 IR Spectrum of ligand and its metal complexes (in cm^{-1})

Compound	**υ*(C=N)***	**υ*(C-N)***	**υ*(M-N)***
Ligand	1633	1315	-
Cu(II)	1622	1216	780
Co(II)	1604	1262	772
Ru(II)	1619	1287	762
VO(II)	1622	1306	762

3.2 Antibacterial activity

The results of the antibacterial activity are tabulated in Table 3. DMSO was used as a negative control and Amikacin was used as positive standards for antibacterial studies. The ligand and metal complexes show greater antimicrobial activity than those of the control drug; this indicates that the complexation with metal enhances the activity of the ligand. This is explained on the basis of Overtone's concept and chelation theory [5]. Chelation tends to make

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the ligand a more powerful and potent bacterial agent, moderate to strong antimicrobial activity. The Co(II) complex exhibits a higher activity than the other metal complexes towards bacterial species. The Cu(II) shows equal activity against *S.Typhi, K.Pneumonia, S.Aureus* bacteria compared to the standard and moderate activity was found against other bacterial species. Co(II) and VO(II) complexes are having low activity compared to the standard. Ru(II) complex displays moderate activity against the bacteria.

Table 3 Minimum inhibition Concentration (MIC) data of the synthesized ligand and metal complexes against growth of bacteria

Compound	Salmonellatyphi	Klebsiella	Staphylococci aureus
Standard(Amikacin)	**17**	**18**	**16**
Ligand	**16**	**16**	**17**
$[Cu(L)]OAC_2$	**13**	**10**	**R**
$[Co(L)]OAC_2$	**12**	**R**	**10**
$[Ru(L)]Cl_3$	**15**	**17**	**14**
$[VO(L)]OAC_2$	**11**	**15**	**14**

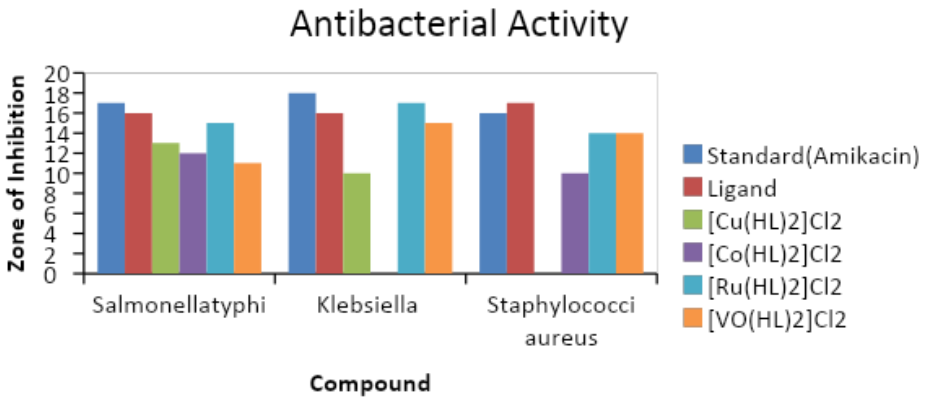

Figure 3 : Zone of Inhibition for Synthesized compounds against various pathogenic bacteria

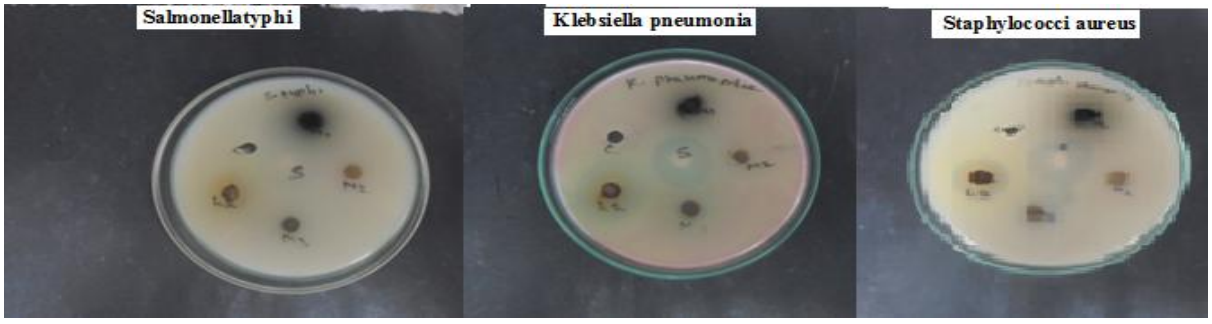

Figure 4 :Image Zone of Inhibition of Synthesized compounds against various pathogenic bacteria

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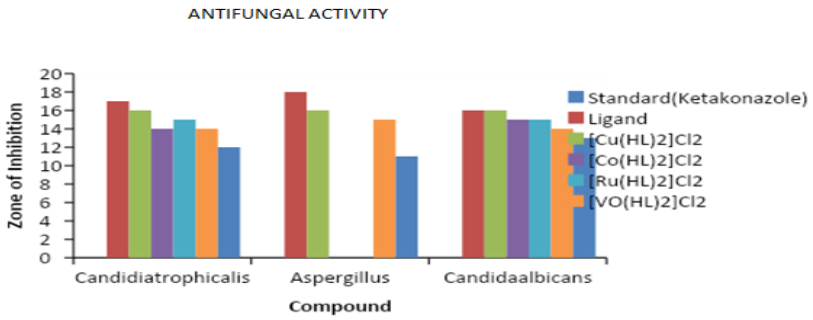
3.3 Antifungal activity

To provide a medicinal scope in the field of bioinorganic chemistry, consequently, the metal complexes synthesized have been evaluated for their antifungal actions. The antifungal tests were carried out using the disc diffusion method [6-9]. The Schiff base ligands and their metal complexes were screened in vitro in order to find out the antifungal activity against Aspergillus Niger, Candidatrophicala and Candidaalbicans. The results of the antifungal studies are presented in Table which reveal that the metal complexes are toxic than the free ligands against the same organisms. As the number of alkyl group in the ligand increases, it will decrease antifungicidal activity of the complexes.[10-12] The increase in the antifungal activity of the metal complexes inhibits multiplication process of the microbes by blocking their active sites. Such increased activity on metal chelation can be explained on the basis of Tweed'schelatingtheory. The chelation also increases the lipophilic nature and the interaction between the metal ion and the lipid is favored. This may lead to the breakdown of the permeability barrier of the cell resulting in interference with the normal cell processes.[13-14] While chelation is not the only factor for antimicrobial activity, it is an intricate blend of several aspects such as nature of the metal ion and the ligand, the geometry of the metal complexes, the lipophilicity, the presence of co-ligands, the steric and pharmacokinetic factors.[15]The synthesized compounds having amino acid moieties also show good activity.

Table 4 Minimum inhibition Concentration (MIC) data of the synthesized ligand and metal complexes against growth of fungi

Compound	Candidiatrophicalis	Aspergillus	Candidaalbicans
Standard(Ketakonazole)	17	18	16
Ligand	16	16	16
$[Cu(HL)_2]Cl_2$	14	R	15
$[Co(HL)_2]Cl_2$	15	R	15
$[Ru(HL)_2]Cl_2$	14	15	14
$[VO(HL)_2]Cl_2$	12	11	13

Figure 5 Zone of Inhibition for synthesized compounds against various pathogenic fungal



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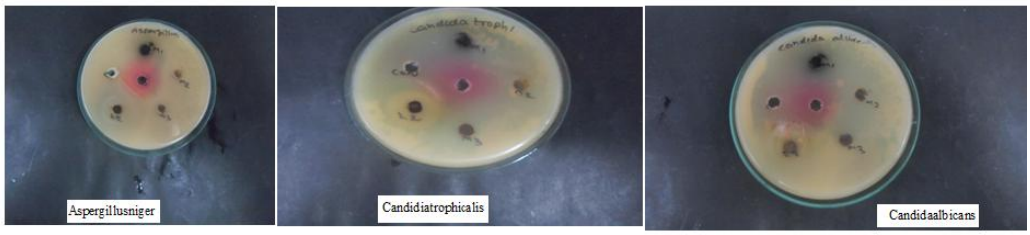

Figure 6. Images Zone of Inhibition of synthesized compounds against various pathogenic Fungi

4. Conclusion

The metal chelates of ligand have been structurally characterized**.** Elemental Analysis values are in good agreement with the values calculated from molecular formula assigned to these complexes.The results of antimicrobial screening showed that the complexes are more potent than the free ligand. And a few drugwere centered in line with application of Bio coordination chemistry that seems to be crucial for up the look of compounds to scale back toxic ant aspect effects and perceive their mechanisms of action. This is a light-weight forged for chemist fascinated by developing greener style of medicine.

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