

## Antibacterial & Antifungal Studies On Some Coordination Compound Of Metals With Ampicillin

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### ABSTRACT

The present paper deals with the microbial studies of the complex Co(II) & Cu(II) with antibiotic drug ampicillin, a formula  $Co(C_{16}H_{19}N_3O_4S)_2WO_4 \cdot 4H_2O$  and  $Cu(C_{16}H_{19}N_3O_4S)_2WO_4 \cdot 3H_2O$  has been suggested on the basis of elemental analysis and molar conductance for the newly synthesized complex. The microbial studies of synthesized complex were studied on pathogenic bacteria using gram +ve (*Bacillus subtilis* and *Staphylococcus aureus*) and gram -ve (*Shigella flexneri*, *Salmonella typhosa*, *Escherichia coli*) and some fungi (*Aspergillus flavus*, *Fusarium oxysporum*, *Chrysosporium pannicale*, *Alternaria solani*, *Candida albicans*).

### INTRODUCTION

In continuation of the work being carried out in our laboratory on the metal vanadate or tungstate or molybdate with organic ligand<sup>1-5</sup>, the present communication describes microbial studies of Co(II) & Cu(II) with ampicillin( $C_{16}H_{19}N_3O_4S$ ) having tungstate as anion.

Ampicillin is used for treatment of microbes causing respiratory, gastrointestinal and genitourinary tract infections. It is available in both generic and brand name prescriptions and can be used as a single drug treatment or in a broad-based antibiotic combination.

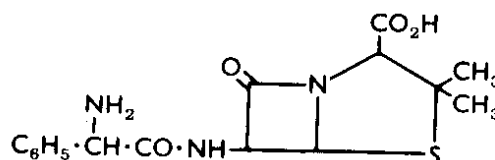


Figure 1: Structure of Ampicillin

### EXPERIMENTAL

Microbial studies of the synthesized complexes were performed at Department of Microbiology, Dr H.S. Gour University Sagar (M.P.) and Govt. Veterinary college Jabalpur (M.P.) using paper disc method Gupta et al.<sup>6</sup>, on the following pathogenic

bacteria using gram +ve (*Bacillus subtilis* and *Staphylococcus aureus*) and gram -ve (*Shigella flexneri*, *Salmonella typhosa*, *Escherichia coli*) and some fungi (*Aspergillus flavus*, *Fusarium oxysporum*, *Chrysosporium pannicale*, *Alternaria solani*, *Candida albicans* ).

## RESULTS AND DISCUSSIONS

The synthesized complexes were screened for the antibacterial and antifungal activity using standard paper disc method<sup>7-10</sup> against gram positive bacterial viz. *Bacillus subtilis* and *Staphylococcus aureus* and gram negative bacteria viz. *Escherichia coli* and *Salmonella typhosa* and fungi *Aspergillus flavus*, *Alternaria solani*, *Candida albicans* , *Fusarium oxysporum* & *Chrysosporium pannicula* . In general all the tested complexes showed higher toxicity against bacterial and fungi under study .

Table 1: Complexes of different metals were marked  
has S1,S2 as follows

<b>S1-</b>	$\text{Co}(\text{C}_{16}\text{H}_{19}\text{N}_3\text{O}_4\text{S})_2\text{WO}_4 \cdot 4\text{H}_2\text{O}$
<b>S2-</b>	$\text{Cu}(\text{C}_{16}\text{H}_{19}\text{N}_3\text{O}_4\text{S})_2 \text{WO}_4 \cdot 3\text{H}_2\text{O}$

### *Antibacterial activity*

From the table 2 it is concluded that complex S2 has shown maximum zone of inhibition against *Shigella flexneri* at the

concentration of 0.1 M even at the concentration of 0.01 M it has shown good zone of inhibition in comparison to other tested complexes.

Against *Salmonella typhosa* good antibacterial activity was observed against almost all the tested complexes. Complex S2 individually shown maximum zone of inhibition against this organism . Against *Escherichia- coli* maximum inhibitory effect were produced by complex S2

*Bacillus subtilis* was found to be more susceptible against complex S1 maximum zone of inhibition were recorded against these tested complexes. Complexes S2 found to be more active and shown higher zone of inhibition against *Staphylococcus aureus* .

On comparing the anti-bacterial efficacy of these tested complexes, it is concluded that though most of the complexes reported satisfactory results for their antibacterial property but complexes S2 in particular gave promising results. From the above study it is observed that complex of Co(II) & Cu(II) with titled ampicillin found to most active against the tested microorganisms. It is found that all the tested complexes exhibit good antibacterial activity at the concentration of 0.1 M. It is interesting to note that inhibitory power of complexes decrease with the increase of their concentration.

For the comparison of the antibacterial properties of these tested complexes against bacteria *Shigella flexneri*, *Salmonella typhosa*, *Escherichia- coli*, *Bacillus subtilis*, *Staphylococcus aureus* the zone of inhibition have been graphically represented in Figure1

Table 2: Antibacterial activity of synthesized complexes

S. No	Bacteria	Concentration	Stain of Bacteria/ Zone of Inhibition (mm*)	
			S1	S2
1	<i>Shigella flexneri</i>	0.01 M	11	18
		0.5 M	19	23
		0.1 M	24	29
2	<i>Salmonella typhosa</i>	0.01 M	11	17
		0.5 M	18	24
		0.1 M	25	30
3	<i>Escherichia-coli</i>	0.01M	09	12
		0.5M	14	20
		0.1M	21	26
4	<i>Bacillus subtilis</i>	0.01M	13	09
		0.5 M	20	15
		0.1 M	24	21
5	<i>Staphylococcus aureus</i>	0.01 M	10	14
		0.5 M	16	21
		0.1 M	22	26

Including diameter of filter-paper disc (6mm)  
 $\text{Co}(\text{C}_{16}\text{H}_{19}\text{N}_3\text{O}_4\text{S})_2\text{WO}_4 \cdot 4\text{H}_2\text{O}$  and  $\text{Cu}(\text{C}_{16}\text{H}_{19}\text{N}_3\text{O}_4\text{S})_2 \text{WO}_4 \cdot 3\text{H}_2\text{O}$

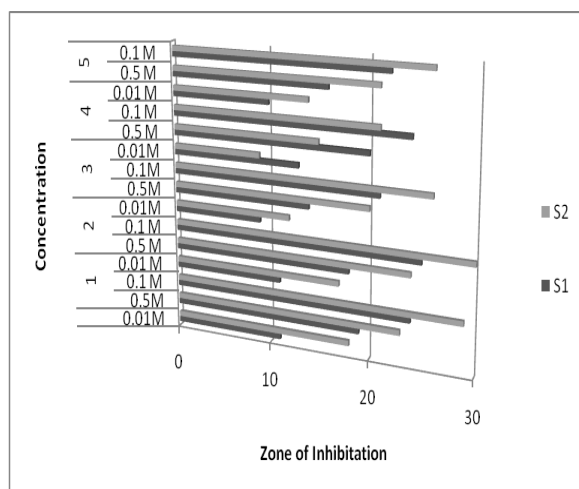


Figure 1: Comparative antibacterial activity of complexes

### Anti fungal activity

Study of anti-fungal activity of complexes S1, S2 was carried out against selected five fungi namely *Aspergillus flavus*, *Candida albicans*, *Alternaria solani*, *Fusarium oxysporum* and *Chrysosporium pannicale*. at varying concentration of complexes 0.1M, 0.5 M and 0.01 M respectively and the results are recorded in terms of zone of inhibition which also includes the diameter of filter paper disc (6mm).

From the table 3 it is observed that at the concentration of 0.1M of complex S2 shown maximum zone of inhibition was recorded against *Aspergillus flavus*

similarly good inhibitory efficacy was also observed at the same concentration of complexes S1 against *Aspergillus flavus*.

Table 3: Antifungal activity of synthesized complexes

S. No	Fungi	Concentration	Stain of Fungi/ Zone of Inhibition (mm*)	
			S1	S2
1	<i>Aspergillus flavus</i>	0.01 M	11	15
		0.5 M	17	23
		0.1 M	25	29
2	<i>Candida albicans</i>	0.01 M	10	15
		0.5 M	17	21
		0.1 M	23	27
3	<i>Alternaria solani</i>	0.01M	10	13
		0.5M	15	22
		0.1M	23	26
4	<i>Fusarium oxysporum</i>	0.01M	11	09
		0.5 M	17	13
		0.1 M	24	20
5	<i>Chrysosporium pannicale</i>	0.01 M	11	14
		0.5 M	16	22
		0.1 M	23	27
Including diameter of filter-paper disc (6mm) Co(C <sub>16</sub> H <sub>19</sub> N <sub>3</sub> O <sub>4</sub> S) <sub>2</sub> WO <sub>4</sub> .4H <sub>2</sub> O and Cu(C <sub>16</sub> H <sub>19</sub> N <sub>3</sub> O <sub>4</sub> S) <sub>2</sub> WO <sub>4</sub> .3H <sub>2</sub> O				

Against *Candida albicans* at the concentration of 0.1M complex S2 have shown maximum activity but similarly, considerable zone of inhibition were also recorded in case of complexes S2. It is evident from the result even at the concentration of 0.01 M all the complexes were found to be active against *Candida albicans*

Maximum zone of inhibition were recorded by all the complexes at the concentration of 0.1M against *Alternaria solani*. All the complexes at the concentration of 0.5 M have also gave promising results. The complex S1 at the concentration of 0.1 M produced maximum zone of inhibition against *Fusarium oxysporum*.

Microorganism *Chrysosporium pannicale* was found susceptible against all the complexes tested at their concentration of 0.1M and 0.5 M. Complex S2 was found to possess good antifungal activity at 0.1 M concentration

For the comparison of the antifungal properties of these tested complexes against bacteria *Aspergillus flavus*, *Candida albicans*, *Alternaria solani*, *Fusarium oxysporum* and *Chrysosporium pannicale* the zone of inhibition have been graphically represented in Figure 2

Antimicrobial properties of the original drug against selected microorganism were also compared.

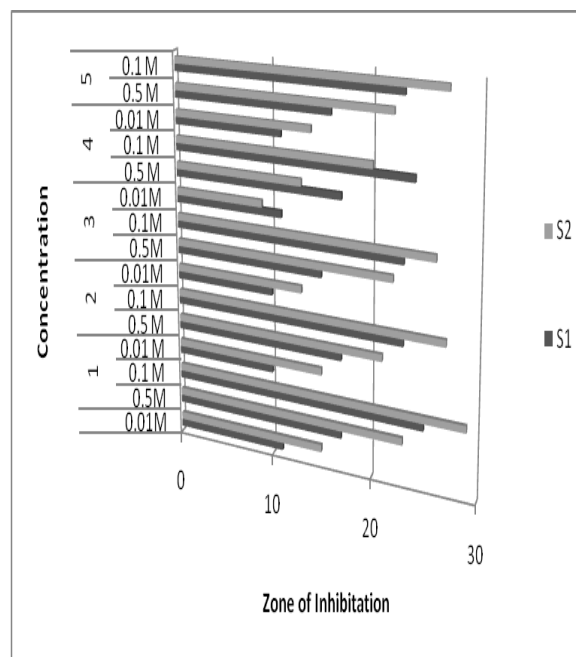


Figure 2- Comparative antifungal activity of complexes

## CONCLUSIONS

The synthesized complex have shown promising result compared to the commercial original drug ampicillin.

## ACKNOWLEDGMENTS

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