Oriental Journal of Chemistry Vol. **25**(2), 453-454 (2009)

Antibacterial activities of some binary and ternary transition metal complexes

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(Received: October 30, 2008; Accepted: December 04, 2008)

ABTRRACT

The antibacterial activities of the ligands, ampicillin (AMP) and cephalexin (CEP) and their binary and ternary complexes using aspartic acid (ASP) as primary ligand with Co (II), Ni (II), Cu (II) and Zn (II) were tested against human pathogenic bacteria using the Kirby-Bauer's disc diffusion method. The test organisms used are *B.subtilis, S.aureus* (*Gram positive*) *E.coli* and *P. aeruginosa* (*Gram negative*). It is observed that the organism, *P.aerugonisa* is resistant to all the test complexes. The antibacterial activity of binary and ternary complexes of Cu (II is more against *E.coli* and *S. aureus*.

Key words: Antibacterial activity, transition metal complexes.

INTRODUCTION

The biocidal activity of metal ion, ligand and its complexes towards some fungi and bacteria has been studied by Oberoi et al[1]. Gershon et al[2,3] reported that the activity of metal chelate is considerably increased as compared to that of the free metal and the ligand on their complexation. The observations of antifungal and antibacterial activities of the complexes show that they are more active as compared to the free metal and ligand involved. The increased activity of the complex is probably due to a comparatively faster diffusion of the metal complex through the cells of the fungi[4-6]. The increased biocidal activity of the metal chelates as compared to that of metal ions and ligands was observed[7, 8].

The antibacterial activities of the binary and ternary complexes were tested against the pathogenic bacteria using the Kirby-Bauer's disc diffusion method[9]. The test organisms used are *B. subtilis, S.aureus* (*Gram positive*) *E.coli* and *P. aeruginosa* (*Gram negative*).

EXPERIMENTAL

Well characterized microbial cultures used in the present study were obtained from National Chemical Laboratory, Pune (*B.subtilis*) and Department of Microbiology, Dairy Technology College, Warud (*S. aureus*, *E. coli* and *P. aeruginosa*) .The culture media used were from HiMedia (India) nutrient agar.

The medium was prepared by suspending 28 g of ingredients in distilled water. Boil to dissolve the medium completely, adjust the pH with dilute NaOH and simultaneously dilute the solution with distilled water so that the final volume of the solution be 1000 mL and pH 7.4 (± 0.2). The medium was sterilized in autoclave at 15 lb/inch2 pressure at 1250°C for 15 minutes. After sterilization it was cooled down to about 500°C and poured carefully into sterile petriplates so that the depth of medium was 15 mm and allowed to solidify.

The different stock solutions of ligands, binary and ternary complex systems were prepared and stored in refrigerator until used.

Punch discs of 5.5 mm diameter from Whatman filter paper No. 1, dispense batches of 100 in screw capped bottles and sterilize by dry heat at 1400°C for an hour. 1 mL of test system solution was added in each bottle of 100 discs and as the whole of this volume will be absorbed, assumes that each disc will contain 0.01 mL test solution. Store the disc in wet condition.

Test procedure

- A sterile cotton swab was dipped into a culture suspension.
- The entire nutrient agar surface in each plate was inoculated, first in a horizontal direction and then in vertical direction to ensure the even distribution of the organism on the agar surface using the swab.
- The agar surface was allowed to dry for 5 minutes.
- The wet discs prepared were then placed near the edge of the agar surface of inoculated plate and were pressed gently with the sterile forceps to ensure firm contact with the agar surface.
- All the plates were incubated at 370°C for 24 hours in an inverted position.

After incubation the visible clear areas of growth free zones (zones of inhibition) produced by diffusion of test systems from the discs were measured by Vernier Caliper and reported in mm.

The width of zones of inhibition depends upon the following factors.

- Presence of inhibitor (activity of the complex),
- Composition of antibiotic disc (concentration of the complex),
- Size of inoculums,
- Concentration of agar in the medium,
- Thickness of the medium in the plate,
- Condition and time of incubation.

RESULTS

The It is observed that the organism, *P.aerugonisa* is resistant to all the test complexes.

In general, antibacterial activity of binary and ternary complexes of metals is more as compare to the ligand systems. The increased activity of metal complexes may be due to comparatively faster diffusion through the cells of the microorganisms[4-6] or due to their increased liophilic nature[10].

The concentration of antibiotics in ternary complexes was less as compare to ligand systems alone or binary complexes, but their antibacterial activity are found more. The antibacterial activity of binary and ternary complexes of Cu (II), in particular is more against *E.coli* and *S. aureus*.

ACNOWLEDGEMENTS

The author is thankful to UGC and Principal, P. N. College, Pusad for providing necessary facilities.

REFERENCES

1. Oberoi, M., Chaturvedi, S.,Chaturvedi, R. and Chaturvedi, G.K. *J. Indian Chem. Soc*., **63**: 616 (1986).
2. Gershon, H., Parmegiani, R. and Nicerson, W.J. *Appl. Microbiol.,* **10**: 556 (1962).
3. Gershon, H. and Parmegiani, R. *Appl. Microbiol*., **11**: 62 (1963).
4. Shel, A.M., Sharief, E.F.,Gharib, A. and Ammar, Y.A. *J. Indian Chem. Soc*., **60**: 1017 (1983).
5. Shashindharam, P. and Ramchandra, L.K. *J. Indian Chem. Soc.,* **62**: 920(1985).
6. Sharma, R.C.,Tripathi, S.P. and Sharma, R.S. *Curr. Sci*., **52**: 410 (1983).
7. Saxena, R.C. and Srivastava, V.S. *J. Indian Chem. Soc*., **64**: 633 (1987).
8. Parasher, R.K., Sharma, R.C. and Kumar A. *Inorg. Chim. Acta*., **151**: 206 (1988).
9. Bauer, A.W., Kirby, W.M.M., Sherris, J.C. and Turek, M. Antibiotic Susceptibility: Testing by a Standardized Single Disc Method, *Am. J. Clinical Pathology*, **45**: 493 (1966).
10. Agarwal, S.K.,Jain, J. and Chand, S. *Asian J. Chem*., **14**: 489 (2002).