ANTIBACTERIAL ACTIVITY OF COPPER-AMINO ACID COMPLEXES

Pages with reference to book, From 221 To 222

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ABSTRACT

Copper complexes of L-alanine, L-arginine, L-histidine, L-lysine, L-proline and L-threonine were studied for their antibacterial activity against Staphylococcus aureus, Streptococcus pyogenes and Esáherichia Coli. The complexes of 1 -alanine, 1 -proline and 1 -threonine were nearly as active as ampicillin against Strep. Pyogenes. Mixed complexes of these amino acids showed similar effect. Other complexes were also active to a significant extent against all the three strains studied (JPMA 40 : 221, 1990).

Copper-amino acid complexes have been shown to possess anti- inflammatory (AI) activity[1]. The mode of action of such complexes is not yet clear. However, in the past some of the AI drugs used have been those basically developed as antibacterials. For example gold compounds used in the treatment of rheumatoid arthritis inhibited the growth of tubercule bacilli[3], Depsone[4], Indomethacine[5], Levamisol[6] and Pencillamine[7] being standard prescriptions to combat severe rheumatoid arthritis, are known to have antibacterial activity. Some of the copper complexes have also been studied against mycoplasma infections but no systematic study has been carried out in this regard[8,9]. In this communication we report a study of the antibacterial activity of copper-amino acid complexes to understand their mode of action.

MATERIAL AND METHODS

Copper-amino acid complexes were pepared in solution form according to the usualmethod[10,11] mixing 2m mol of amino acid and immol of copper acetate in water. The blue solutions thus obtained were used for testing antibacterial activity. The mixtures of copper complexes were prepared by mixing two parts of amino acid and one part of copper salt in water. The amino acids used were L-alanine, L-arginine, L-bistidine, L-proline and L- threonine. The solution of the complexes were tested for theft antibacterial activity both individually and as admixtures. The complexes of L-alanine, L-proline and L-threonine used in admixtures were selected because they showed significant activity when tested individually. In each case the solution containing equivalent to 10 ug of the complex was loaded on the susceptibility disc and the activity was measured against Staph. aureus, Strep. pyogenes and E. coli in the blood agar and Muller Hinton medium using ampicillin (10 ug) disc as standard according to the standard susceptibility testing method12. The sensitivity of copper acetate and the amino acids (10 ug) each was measured separately.

RESULTS AND DISCUSSION

The sensitivity results are listed in Table.

TABLE. Antibacterial activity of copper-amino acid complexes and their mixtures.

Compounds	Susceptibility Zone(mm)		
	E. Coli	Staph. aureus	Strep. pyogenes
Ampicillin	17mm	20mm	20mm
Copper Acetate	9mm	8mm	10mm
L-Alanine	R	R	R
L-Arginine	R	R	R
L-Histidine	R	R	R
L-Lysine	R	R	R
L-Proline	R	R	R
L-Threonine	R	R	R
Cu(L-Alaninate)$_2$	15mm	15mm	17mm
Cu(L-Argininate)$_2$	9mm	8mm	10mm
Cu (L-Histidinate)$_2$	9mm	8mm	10mm
Cu (L-Lysinate)$_2$	11mm	8mm	15mm
Cu (L-Prolinate)$_2$	15mm	16mm	18mm
Cu (L-Threoninate)$_2$	15mm	15mm	18mm
Cu (L-Alaninate)$_2$ + (L-Prolinate)$_2$	15mm	15mm	18mm
Cu (–Alaninate)$_2$ + (–Threoninate)$_2$	15mm	15mm	18mm
Cu (L-Prolinate)$_2$ + (L-Threoninate)$_2$	15mm	15mm	18mm
Cu (L-Alaninate)$_2$ + (L-Prolinate)$_2$ + (L-Threoninate)$_2$	15mm	15mm	18mm

R = Resistant

All the amino acids tested were resistant. The activity shown by most of the copper-amino acid complexes is greater than that of copper salt indicating that the complexes possess significant antibacterial activity against the strains tested. The copper complexes of alanine, proline and threonine showed antibacterial activity only against streptococcus pyogenes comparable to that of ampicillin, whereas complexes of arginine, histidine, lysine showed less activities against these strains. The three mixed complexes of alinine, proline and threonine have also shown similar effects. From these results it appears that the hypothesis postulating the partial role of antibiotic activity of Al drugs in combating inflammation may be substantive. The knowledge of antibacterial activity of the copper-aminoacid complexes gained through this study, and their possible effectiveness in inflammation strengthens the speculated role of bacterial patbogens in such type of ailment particularly in rheumatoid arthritis[13], and also provides an insight into theft mode of action.

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