

Biological Application of New Organic Derivatives on Bacterial Growth

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Abstract

The growth of strains of deferent types of pathogenic bacteria isolated from different sites of infection , *Escherichia coli* ,*klebsiella pneumonia* ,*staphylococcus aurous* ,*staphylococcus epidermis* , *streptococcus pneumonia*, *streptococcus agalactiae* , *streptococcus mutans*, has been investigated about inhibitory effect of new synthesized complex organic compound consisting of (Ni^{+2} or Co^{+2}). The results reveled that cobalt (II) complex which contain chelating dicarboxylate ligands has action inhibitory effect on such pathogenic bacteria while Ni (II) Shows no effect even in highly concentration but only on the *streptococcus agalactiae*.

Key word : Pathogenic bacteria , Diacetic acid derivative , antibacterial activity .

1. Introduction

Acetoactice acid (also calld diacetic acid) is the organic compound with the formula CH_3COCH_2COOH . It is the simplest beta – keto acid group and like other members of this class is unstable . The methyl and ethyl esters, which are quite stable, are produced on a large scale industrially as precursors to dyes (Franz and Wolfgangy ,2005), however many researchers synthesis a derivatives of the diacetic acid compound to evaluate their effectness on the pathogenic bacteria . One of these study shows the effect of Ni (II) , Cu(II) , and Zn(II) coordination compounds with modified diammine 2,2'-ethane - dilydiimino diacetic acid (EDTA) were prepared and characterized against four pathogenic bacteria (Saeed et al ., 2011).Metal complex compounds many effect living systems , this has been known for over a hundred years in respect of curane – like activity in mammals of some metal – ammines

The antibacterial activities of transition metal complexes have chelating agents such as 8- hydroxyl quinoline inhibit growth of bacteria when complex with many metals (Ahmed and Gillard ,1989). Previous research reported the synthesis of 5- nitroindazole derivatives with various biological effects such as anti bacterial (Muaria ,et al ; 2010) , antituberculosis (Cheptea et al ., 2009) anti pyretic (Cheptea et al ., 2012- A) and even antitumoral (Cheptea et al ., 2012 –B) , However it is thought that the chemical structure of pectin (the presence of hydroxyl , carboxyl and amide groups) is responsible for its . mucoadhesivity towards gastrointestinal mucus (Liu et al ., 2005) depending on environmental pH , so in case of administration compounds , the variation of environment pH must be considered .

The aim of this study is to focused on the application of 2-2' - (1-4-phenylene bis (a zan – 1-yl-1-ylidene))diacetic acid – M^{+2} (where $M^{+2}= Ni^{+2}$ or Co^{+2}) which will abbreviated of to be R –DAA- Ni^{+2} and R – DAA – Co^{+2} , to evaluate the activity of such derivatives as antibacterial growth .

2. Materials and Methods :

2.1- preparation of (R-DAA- Ni^{+2} and R –DAA – Co^{+2}) according to method suggested by (Sultan and Musa , in progress,2013) .

2.2- Bacterial strains :

Clinical strains of *streptococcus pneumonia* , *streptococcus agalactiae* , *streptococcus mutans*, *staphylococcus aureus* ,*Eseherichia coli* , *klebsiella pneumonia* , where obtained from department of Microbiology – College of Medicine – Babylon university ,and these bacterial strains were maintained on freshly prepared blood agar .

2.3- Preparation of different concentration of R-DAA- Ni^{+2} and R-DAA- Co^{+2} .

Different concentration of both complexes were prepared to study the antibacterial effect (40,50,70 Mm) (Personal communication ,2013).

2.4- Antibacterial activity :

The activity measured according to methods illustrated previously by (Ewadh et al ., 2013).

3. Results :

The present study results about biological application of new organic derivatives on different gram positive and gram negative bacteria activity reveled that the compound (R-DAA- Co^{+2}) has significant effect in different

concentration (Table 1) while the other complex compound (R-DAA-Ni⁺²) showed no effect using different concentration on different bacteria isolates (Table 2).

4. Discussion :

The high antimicrobial activities of all metal complexes showed that complexation of the organic ligands to the metal ion substantially enhanced their activities (Dharmraj et al., 2001).

From the results showed in table 1 and 2, it appears that antibacterial activities of the ligands and their metal complexes have screened against seven different bacteria preliminary screening for both complexes was performed at different concentration (40,50,70 mM). Each complex was found to be acting in different mode and bacteria, that (R-DAA-Ni⁺²) shows no effect on bacterial growth but only on the *st. agalactiae* with minimum inhibitory concentration (MIC) of 50 mM with inhibitory zone (18 mm) while in concentration of 70 mM shows inhibitory zone (20 mm) however the other complex (R-DAA-Co⁺²) shows an effect (MIC) of 50 mM in gram - ve bacteria (*Escherichia coli*) while the other concentration 70 mM shows inhibitory zone (16 mm). This latest concentration (70 mM) shows an inhibitory effect also in *st. agalactiae* and *st. mutans* with inhibitory zone (22 mM & 20 mM) respectively. The most effective complex proven to be the (R-DAA-Co⁺²) and such increased activity of metal chelates has been explained previously by Tweedy's theory that chelation reduces the polarity of the ligands due to partial sharing of its negative charge with the metal, favoring transportation of the complexes across the lipid layer of the cell membrane which cause disruption of cellulose metabolism and the microorganism dies (Tweedy, 1964).

Further study need to perform the effect of mixing both complexes to show its maximum effect on the different bacterial growth.

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Table (1): showed the effect of (R - DAA - Co⁺²) in different concentration on Bacterial isolates.

Bacterial isolates	R - DAA - Co ⁺²		
	40	50	70
E .coli	-ve	+ve (12 mm)	+Ve (16 mm)
K .pnemoniae	-ve	-ve	-ve
S.aureus	-ve	-ve	-ve
S .epidermidis	-ve	-ve	-ve
St .pnemoniae	-ve	-ve	-ve
St .agalactiae	-ve	-ve	+ve (22 mm)
St. mutans	-ve	-ve	+ve (20 mm)

Table (2) showed the effect of (R –DAA-Ni⁺²) in different con . on Bacterial isolates .

Bacterial isolate	R –DAA-Ni ⁺²	mM	
	40	50	70
E.coli	-ve	-ve	-ve
K .pnenumiae	-ve	-ve	-ve
S . aureus	-ve	-ve	-ve
S .epidermidis	-ve	-ve	-ve
St .pnumoniae	-ve	-ve	-ve
St .agalactiae	-ve	-ve (18 mm)	-ve (20 mm)
St .mutans	-ve	-ve	-ve

Note :- (R –DAA-Ni⁺²) showed no effect in different isolates .

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