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ANTIBACTERIAL ACTIVITY OF HYDROXYTRIAZENES AND THEIR TERNARY COMPLEXES WITH VANADIUM (V) AND THIOUREA

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ABSTRACT

Antibacterial activities of four hydroxytriazenes namely 3-hydroxy-3-m-chlorophenyl-1-(4-sulphonamidophenyl)triazene, 3-hydroxy-3-n-propyl-1-(4-sulphonamidophenyl)triazene, 3-hydroxy-3-isopropyl-1-(4-sulphonamidophenyl) triazene, and 3-hydroxy-3-m-tolyl-1-p-chlorophenyltriazene and their ternary complexes with vanadium (V) using thiourea as second ligand have been screened against four bacterial strains viz.: *Pseudomonas aeruginosa, Proteus mirabilis, Klebsiella pneumoniae* and *Escherichia coli* at 100 and 200 ppm. Thus the study has brought about a novel application of this class of analytical reagents as an emerging class of bioactive chemicals.

Key words: Hydroxytriazenes**,** *Pseudomonas aeruginosa, Proteus mirabilis, Klebsiella pneumoniae* and *Escherichia coli*

INTRODUCTION

In the recent years hydroxytriazenes and their metal complexes have found applications as bioactive agents in addition to their usual analytical applications as spectrophotometric and complexometric reagents. In our laboratory, a number of hydroxytriazenes and their metal complexes have been screened for antibacterial[1], antifungal[2], insecticidal[2-7], and some of the pharmacological activities such as anti-inflammatory[8-9], analgesic and wound healing[10]activities. In view of this the present investigation has been devoted to screening some sulphonamide based and other hydroxytriazenes and their ternary complexes with vanadium using thiourea as second ligand. We here report antibacterial activities of four hydroxytriazenes: 3-hydroxy-3-m-chlorophenyl-1-(4-sulphonamidophenyl) triazene(R-A), 3-hydroxy-3-n-propyl-1-(4-sulphonamidophenyl) triazene(R-B), 3-hydroxy-3-isopropyl-1-(4-sulphonamidophenyl) triazene (R-C), and 3-hydroxy-3-m-tolyl-1-p-chlorophenyltriazene(R-D) and their respective ternary complexes with vanadium (V) and thiourea (C-A, C-B, C-C and C-D). The bacterial strains taken are *Pseudomonas aeruginosa, Proteus mirabilis, Klebsiella pneumoniae* and *Escherichia coli*. The results obtained have been compared with standard Ciprofloxacin. All the hydroxytriazenes and their ternary complexes with vanadium (V) and thiourea were characterized before screening, using CHN analysis, melting points determination and IR spectra.

EXPERIMENTAL

Preparation of bacterial bioassay medium

For preparing the bacterial bioassay medium, maize peptone (20 g), Beef extract (6 g), yeast extract (10 g) and agar-agar (40 g) were dissolved in 2 L distilled water and heated for 10 to 15 min. After boiling for a while the medium was sieved through a two-fold muslin cloth. The pH of the medium was adjusted to 7.0 with the help of dil HCl and 0.1 N NaOH. This medium was then transferred into sterilized conical flask, plugged and autoclaved at 15 lbs/cm^2 for 20 minutes. The flask was allowed to cool and placed under aseptic conditions for further experimentations.

Pathogenecity test

Each of chemical i.e. hydroxytriazene or its respective ternary complex with vanadium (V) and thiourea was studied at 200, and 100 ppm in vitro against the individual pathogens using cup or well method. The test compound was weighed and dissolved in DMF. They were mixed with desired quantities of sterilized bacterial bioassay medium under aseptic condition and were then transferred to pre-sterilized Petri plates. On the other hand only medium without test compound was kept to observe control. A 10 mm disc of 7 days old culture of each bacterium was inoculated at center of each Petri plate. The inoculated Petri plates were incubated in BOD incubator at 30° C. The treatment was repeated thrice. Effect of DMF and standard Ciprofloxacin were also studied in the same manner. Observation were recorded when control plates were full of mycelial growth. Mean was calculated for the values obtained.

RESULTS AND DISCUSSION

A perusal of results (Table-1) shows that the antibacterial activities against *Pseudomonas aeruginosa and Escherichia coli* for test compounds as well as their ternary metal complexes with vanadium (V) are quite encouraging. Since the test compounds have shown potent to very good activity at 200 and 100 ppm, there was no point in screening them at higher concentration.

The ligands as well as their ternary complexes are showing equal activities against both of bacteria. The level of activity indicates that hydroxytriazenes can be potent anti bacterial agent if screened further. The easy method of synthesis, good yield further enhance their application as bioactive reagents.

Table-1: Effect of different hydroxytriazenes and their ternary complexes with vanadium (V) and thiourea on different bacteria

Compounds Code No.	Test strains and their activity*							
	Pseudomonas aeruginosa		*Proteus mirabilis*		*Klebsiella pneumoniae*		*Escherichia Coli*	
	At 200 ppm	At 100 ppm	At 200 ppm	At 100 ppm	At 200 ppm	At 100 ppm	At 200 ppm	At 100 ppm
R-A	+ + +	+ +	+	-	+	+	+ +	-
R-B	+ + +	+ +	-	-	+ +	-	+ + +	-
R-C	+ + +	+ + +	-	-	+	-	+ + +	-
R-D	+ + +	+ +	-	+	+ +	-	+ + +	-
C-A	+ +	+ + +	-	-	-	-	+ +	+
C-B	+ + +	+ + +	-	-	-	+ +	+ +	-
C-C	+ +	+ +	-	-	-	+	+	-
C-D	+ +	+ +	-	-	-	-	+ +	+
Ciprofloxacin	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +

* Average of three replications

Here,

- = No inhibition (Antibacterial activity absent)
+ = Zone size 4-8 mm (weak activity)
+ + = Zone size 9-13 mm (moderate activity)
+ + + = Zone size 14-25 mm (potent activity)

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