Short Communication

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INDOLE DERIVATIVES AS ANTIBACTERIAL AGENTS. STRUCTURE-ACTIVITY RELATIONSHIP

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In an effort to screen antibacterial activity of indole derivatives, various indoles containing diverse groups were prepared. The literature search has revealed that although many studies have been reported on other pharmacological aspects but, to our knowledge, only one such reference exists where some indole derivatives (I) were noted to have exhibited antibacterial property (Archer and Schulenberg 1965).

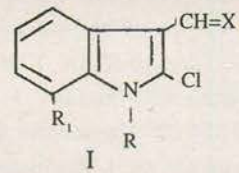
We have therefore undertaken an extensive programme to study the antibacterial activity of indole derivatives. Synthesis of many of these indoles have earlier been reported (Khan and Polya 1970, Khan and Rocha 1979). Their derivatives were prepared by standard procedures and include indoles containing phenyl groups (II-V); aldehyde (VI-XI), ketone (XII-XIII); oxime (XIV-XIX), nitrile (XX), hydrazone (XXI), and carboxyl group (XXII-XXV).

The antibacterial activity of these indole derivatives were determined by the disc diffusion method (Petersdorf and Plorde 1963). The results are presented in Table 1. For comparision purpose ampicillin and Septron were also tested under similar conditions. A qualitative evaluation was thus obtained for these compounds.

As can be seen from Table 1, no compound except II exhibits high *in vitro* broad spectrum antibacterial activity. Different compounds were active against single strain of bacteria. Compounds III, VI, IX, XIII, XIV, XIX, XXII and XXIV were inactive against all strains while compounds XXIII and XXV were weakly active against *E. coli* only.

Except for the compounds IV, XVII and XVIII none of the compounds showed any activity against *S.aureus* (XVII), *E.coli, Pseudomonas* and *Klebsiella* (IV and XVIII). From the limited experience it is felt that *N-nitrophenyl* groups impart some activity and again *meta* and *para* nitro groups seem to be more effective than the *ortho* one.

In conclusion it may be mentioned that these encouraging results may lead to other indole derivatives with antibacterial activity.

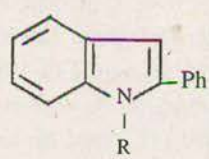


I

R = H,Me,Ph,CH_2Ph, COC_6H_4Cl

R_1= H, Me

X = NHC(=S)$-NH_2$, NNHC(=S)$-NHMe$, NNHC (=NH)NH_2

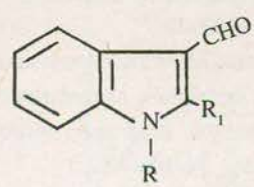


II R = H

III R = o-$NO_2C_6H_4$

IV R = m-$NO_2C_6H_4$

V R = p-$NO_2C_6H_4$



VI R = H, R_1 = Ph

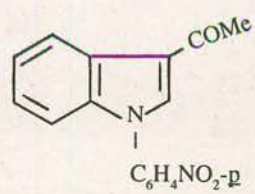
VII R = o-$NO_2C_6H_4$, R_1=Ph

VIII R = m-NO_2C_6H R_1= Ph

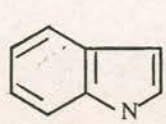
IX R = p-$NO_2C_6H_4$, R_1=Ph

X R = m-$NO_2C_6H_4$, R_1=H

XI R = p-$NO_2C_6H_4$, R_1=H



XII



XIII

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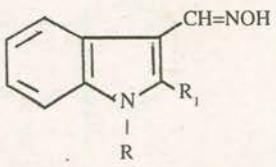


XIV R = o-$NO_2C_6H_4$, R_1 = H

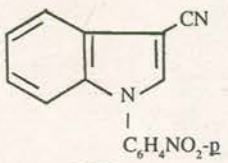
XV R = m-$NO_2C_6H_4$, R_1 = H

XVI R = p-$NO_2C_6H_4$, R_1 = H

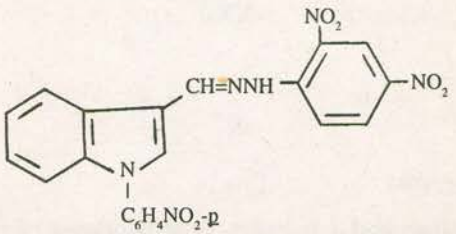
XVII R = o-$NO_2C_6H_4$, R_1 = Ph

XVIII R = m-$NO_2C_6H_4$, R_1 = Ph

XIX R = p-$NO_2C_6H_4$, R_1 = Ph



XX



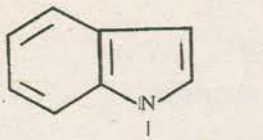
XXI

Table 1

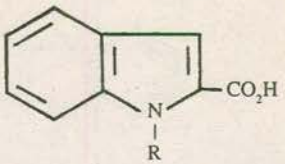
Antibacterial activity of indoles

Compound No.	Gram (+ ve)		Gram (- ve)			
	Staphyl-ocous aureus	*Streptoc-occus viridans*	*Escher-inchia coli*	*Pseudomonas*	*Kleb-siella*	*Proteus providence*
II	-	++	-		-	++
III	-	-	-	-	-	-
IV	-	-	-	-	++	-
V	-	-	-	-	-	++
VI	-	-	-	-	-	-
VII	-	-	-	-	-	++
VIII	-	++	-	-	-	-
IX	-	-	-	-	-	-
X	-	-	-	-	-	++
XI	-	++	-	-	-	-
XII	-	-	-	-	-	++
XIII	-	-	-	-	-	-
XIV	-	-	-	-	-	-
XV	-	-	-	-	-	++
XVI	-	++	-	-	-	-
XVII	++	-	-	-	-	-
XVIII	-	-	-	-	++	-
XIX	-	-	-	-	-	-
XX	-	-	-	-	-	++
XXI	-	++	-	-	-	-
XXII	-	-	-	-	-	-
XXIII	-	-	+	-	-	-
XXIV	-	-	-	-	-	-
XXV	-	-	+	-	-	-
Ampicillin	+	-	+	++	-	-
Septron Trimetho-prim + sulfamethox azole	++	++	++	-	++	-

* - inactive; + partially active; ++ very active



XXII



XXIII R = m-$NO_2C_6H_4$,

XXIV R = p-$NO_2C_6H_4$

XXV R = Ph;

References

M A Khan and J B Polya 1970 Synthesis of Hetrocyclic compound part II *N*-Arylazoles by Ullmann Condensation. *J Chem Soc* (C) **85.**

M A Khan and E K Rocha 1977 Arylindoles I. Synthesis of some *N*-Arylindoles. *Chem Pharm Bull* (Japan) **25** 3110

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S Archer and J W Schulenberg 1965 *Hetrocyclic compound I. Aryloxindole* US Patent **3** 189 617 Chem Abstr **63** 11509.