

## Synthesis of hydroxy propyloximino-1-benzoyl- indole-2-one derivatives as antibacterial and antifungal activities

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### ABSTRACT

1-Benzoyl indole-2,3-dione (1) 1-Benzoyl-3-oximindole-2-one (2) 3-(2', 3'-Epoxypropyloximino)-1-benzoyl indole-2-one (3) 3-(3'-Substituted phenyl-2'-hydroxy propyloximino)-1-benzoyl indole-2-ones (4-8) 3-(3'-Substituted triazole-2'-hydroxy propyloximino)-1-benzoyl indole-2-ones (9-10) have been synthesized in present study. All the developed congeners of cephalosporin acid evaluated for their antibacterial and antifungal activity. Compound 10 was found to possess potent bactericidal activity in comparison to clinically used chemotherapeutic agents viz. ampicillin; norfloxacin and fluconazole. The structure of all newly hydroxy propyloximino derivatives were confirmed on the basis of spectral and analytical data

**Key words:** Hydroxy propyloximino Derivatives, Antibacterial and Antimicrobial activities.

### INTRODUCTION

Indole and its analogs constitute the active class of compounds possessing wide spectrum of biological activities<sup>1-3</sup>, fungicidal<sup>4</sup> and bactericidal<sup>5</sup>. Various indole derivatives exhibited antidepressive, anti-inflammatory and tuberculostatic<sup>6</sup> activities. Further 2 hydroxy propyloximines are well famed for their antimicrobial and antifungal activities. In the above report and also in continuation of our laboratory work on chemoselective reaction of indole derivatives, a drug strategy has been planned to synthesize several indole derivatives 2 hydroxy propyloximines moieties with the hope to possess better antimicrobial activity<sup>7-10</sup>. All the compounds were screened for their antibacterial and antifungal activities against some selected microbes.

### Chemistry

The chemical synthesis initiates with the reaction of indole-2,3 dione with benzoyl chloride

to yielded 1-Benzoyl indole-2,3-dione (1). 1-Benzoyl-3-oximindole-2-one (2) was prepared with the hydroxylamine hydrochloride and sodium acetate to afforded compound (2). Further 3-(2', 3'-Epoxypropyloximino)-1-benzoyl indole-2-one (3) reacted with sodium methoxide in the presence of epichlorohydrin to gave compound (3). 3-(3'-Substituted phenyl-2'-hydroxy propyloximino)-1-benzoyl indole-2-ones (4-8) with the reaction of various substituted aromatic amines to yielded compound (4-8). 3-(3'-Substituted triazole-2'-hydroxy propyloximino)-1-benzoyl indole-2-ones (9-10) prepared with the (un)substituted triazoles to afforded compound (9-10).

### EXPERIMENTAL

The melting points of the compounds were determined in open glass capillaries with the help of thermonic melting points apparatus (Campbell Electronics, Mumbai, India) and are uncorrected.

The Purity of all the newly synthesized compounds was routinely checked by TLC on silica gel G plates and spots were located by using iodine chamber. IR spectra were recorded on Perkin Elmer 881 spectrophotometer in KBr. <sup>1</sup>H-NMR spectra were recorded on Bruker DPX-300MHz spectrometer and mass spectra were determined on JEOL-JMS-D-300 spectrometer.

#### Step-I: Benzoyl indole-2,3-dione (1)

Indole-2, 3-dione (.01 mol) was dissolved in DMF (50 ml) and benzoylchloride (.01 mol) was added drop wise in it with constant stirring and the mixture refluxed for 3 hrs. The completion of the reaction was checked by TLC. After refluxing excess of DMF was distilled off under vacuo. The reaction mixture cooled, diluted with crushed ice water, filtered, washed, dried and recrystallized from methanol.

#### Compound 1

Benzoyl indole-2,3-dione. M.P. 140°C; Yield: 80%; (r.s): methanol; (m.f.): C<sub>15</sub>H<sub>9</sub>NO<sub>3</sub>. Elemental analysis: Calcd. C 71.71; H 3.58; N 5.57%; Found: C 71.42; H 3.39; N 5.40%. IR (KBr) (cm<sup>-1</sup>): 1525 (C-N), 1610 (C.....C of aromatic), 1700 (C=O), 3142 (C-H aromatic). <sup>1</sup>H-NMR (CDCl<sub>3</sub>+DMSO-d<sub>6</sub>) δ (ppm): 8.166-8.408 (m, 4H, indolic ArH), 7.379-7.645 (m, 5H, ArH). MS: [M]<sup>+</sup> at m/z 251.

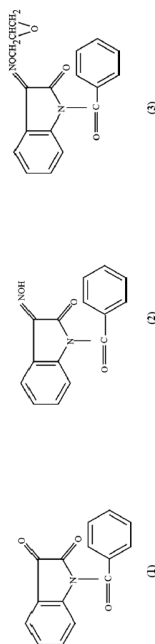
#### Step-II: 1-Benzoyl-3-oximindole-2-one (2)

To a solution of compound 1 (.015 mol) in water (20ml) was added to hydroxylamine hydrochloride (.01 mol) and sodium acetate (.02 mol). The reaction mixture was stirred for 2 h at 55°C. The reaction mixture was kept for 16 h at room temperature and completion of the reaction was checked by TLC. The reaction mixture was poured into ice water, filtered washed with water, dried and recrystallized from methanol.

#### Compound 2

1-Benzoyl-3-oximindole-2-one. M.P. 160°C; Yield: 75%; (r.s): methanol; (m.f.): C<sub>15</sub>H<sub>10</sub>N<sub>2</sub>O<sub>3</sub>. Elemental analysis: Calcd. C 67.66; H 3.75; N 10.52%; Found: C 67.39; H 3.50; N 10.35%. IR (KBr) (cm<sup>-1</sup>): 1525.2 (C-N), 1542 (C=N), 1610 (C.....C of aromatic), 1700.1 (C=O), 3141 (C-H aromatic), 3460 (OH). <sup>1</sup>H-NMR (CDCl<sub>3</sub>+DMSO-d<sub>6</sub>)δ(ppm): 5.005 (SS, 1H, oximindole), 7.365-7.628 (m, 5H, ArH) 8.125-

Table 1(a): Antibacterial and antifungal activity of the compounds: 1-Benzoyl indole-2, 3-dione (1), 1-Benzoyl-3-oximindole-2-one (2) and 3-(2',3'-Epoxypropyloximino)-1-benzoyl indole-2-one (3)



Comp. No.	Bacterial growth inhibition (diameter)			Fungal growth inhibition (diameter)		
	S.aureus	E. coli	P. vulgaris	K. pneumoniae	A. fumigatus	C. albicans ATCC
1	-	11 mm	-	-	-	-
2	6 mm	8 mm	-	-	5 mm	-
3	10 mm	15 mm	-	10 mm	10 mm	16 mm

8.379 (m, 4H, indolic ArH). MS: [M]<sup>+</sup>at m/z 266.

**Step-III: 3-(2', 3'-Epoxypropyloximino)-1-benzoyl indole-2-one (3)**

Compound 2 (.01 mol) was taken in DMF, sodium methoxide (0.5 gm Na in 50 ml methanol) added with shaking. Resultant reaction mixture was refluxed for 2 h. Excess of DMF was distilled off under vacuo. Solution of the residual mass was taken in DMF, solution of epichlorohydrin (.01 mol) in DMF was added drop wise with constant stirring. It was further stirred for 2 h. The completion of the reaction as checked by TLC. The excess of DMF was distilled off under reduced pressure and cooled reaction mixture poured into ice water, filtered, washed with water, dried and triturated with petroleum ether (40-60°C) and recrystallized from methanol.

**Compound 3**

3-(2',3'-Epoxypropyloximino)-1-benzoyl-indole-2-one. M.P. 45°C; Yield: 68%; (r.s): methanol; (m.f.): C<sub>18</sub>H<sub>14</sub>N<sub>2</sub>O<sub>4</sub>. Elemental analysis: Calcd. C 67.08; H 4.34; N 8.69%; Found: C 67.36; H 4.14; N 8.38%. IR (KBr) (cm<sup>-1</sup>): 980 (epoxy), 1524.6 (C-N), 1542.2 (C=N), 1610.4 (C.....C of aromatic), 1701 (C=O), 3141.5 (C-H aromatic). 1H-NMR (CDCl<sub>3</sub>+DMSO-d<sub>6</sub>)δ(ppm): 2.864-2.941 (d, 2H, CH-CH<sub>2</sub>), 3.066-3.142 (d, 2H, O-CH<sub>2</sub>-CH), 3.655-3.664 (t, 1H, H<sub>2</sub>C-CH-CH<sub>2</sub>), 7.314-7.611 (m, 5H, ArH) 7.994-8.425 (m, 4H, ArH). MS: [M]<sup>+</sup>at m/z 322.

**Step-IV: 3-(3'-Substituted phenyl- 2'- hydroxy propyloximino) - 1- benzoyl indole-2-ones (4-8)**

A methanolic mixture of compound 3 (.001 mol) was refluxed with various substituted aromatic amines (.001 mol) for 20-24 h. The completion of the reaction was checked by TLC. Excess of methanol distilled off. Thus obtained residual mass was washed with 1 N HCl solution, followed by 1N NaOH and then with water, filtered, dried, and triturated with petroleum ether (40-60°C) and recrystallized from suitable solvents to afford compounds 4-8. The physical, analytical and spectral data of the synthesized compounds (4-8) are given as-

**Compound 4**

3-(3'- Aminophenyl- 2'- hydroxy-propyloximino)- 1-benzoyl- indole-2-one. M.P. 161°C;

Yield: 65%; (r.s): methanol; (m.f.): C<sub>24</sub>H<sub>21</sub>N<sub>3</sub>O<sub>4</sub>. Elemental analysis: Calcd. C 69.39; H 5.06; N 10.12%; Found: C 69.52; H 5.38; N 10.40%. IR (KBr) (cm<sup>-1</sup>): 1525 (C-N), 1542.2 (C=N), 1610.4 (C.....C of aromatic), 1700 (C=O), 3141.2 (C-H aromatic), 3349 (NH), 3459 (OH). 1H-NMR (CDCl<sub>3</sub>+DMSO-d<sub>6</sub>)δ(ppm): 2.671-2.858 (d, 2H, CH-CH<sub>2</sub>), 2.970-3.131 (d, 2H, O-CH<sub>2</sub>), 3.653-3.770 (t, 1H, CH<sub>2</sub>-CH-CH<sub>2</sub>), 4.234 (ss, 1H, OH-CH exchangeable with D<sub>2</sub>O), 4.628 (bs, 1H, NH-Ar CH exchangeable with D<sub>2</sub>O), 7.218-7.800 (m, 10H, ArH) 8.150-8.347 (m, 4H, indolic ArH). MS: [M]<sup>+</sup>at m/z 415.

**Compound 5**

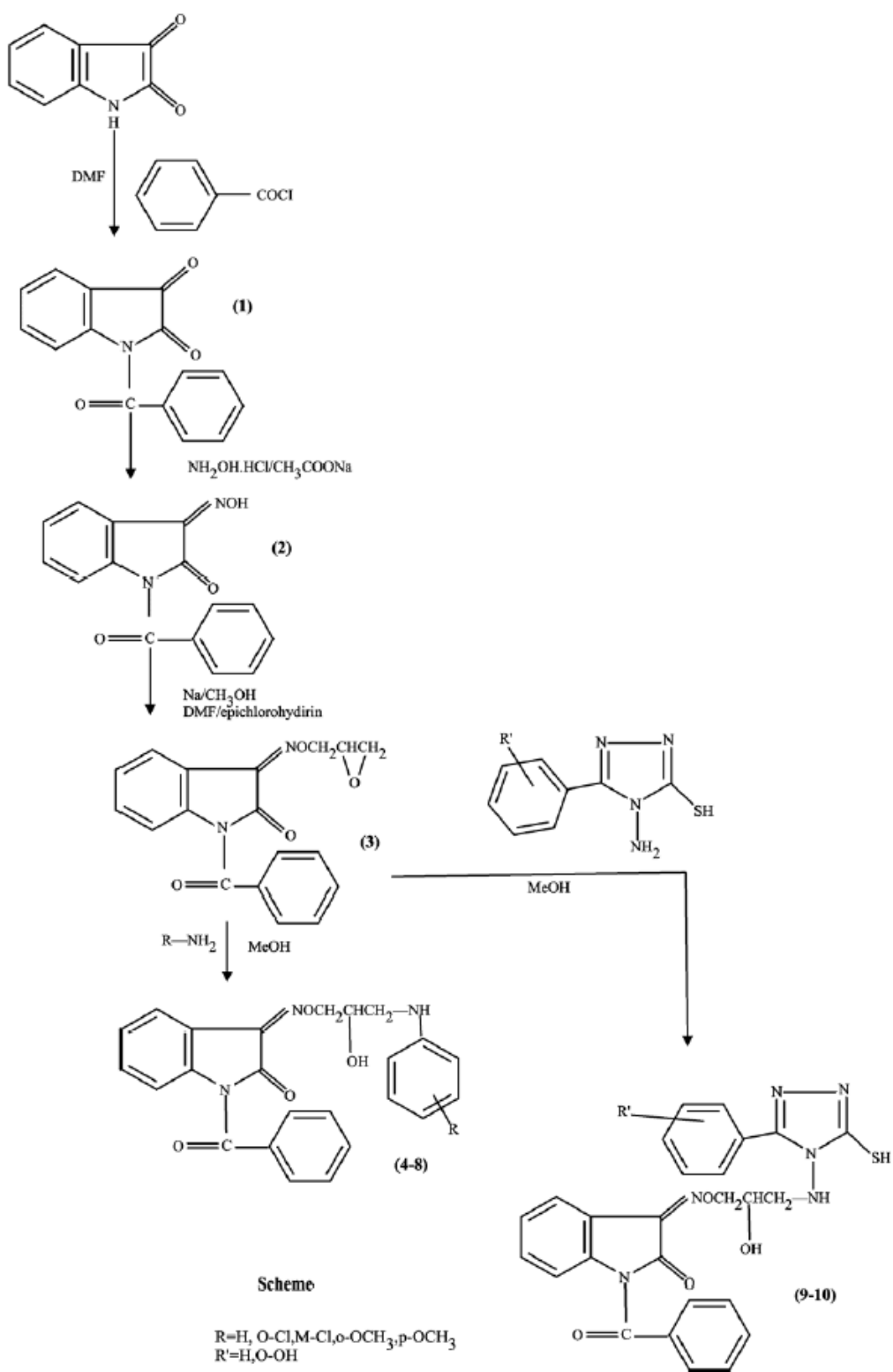
3- [3'- Amino {(o-chloro) phenyl} - 2' - hydroxy-propyloximino]- 1-benzoyl- indole-2-one. M.P. 172°C; Yield: 66%; (r.s): DMF-water; (m.f.): C<sub>24</sub>H<sub>20</sub>N<sub>3</sub>O<sub>4</sub>C<sub>1</sub>. Elemental analysis: Calcd. C 64.14; H 4.45; N 9.35%; Found: C 64.21; H 4.62; N 9.12%. IR (KBr) (cm<sup>-1</sup>): 620 (C-C1), 1525.2 (C-N), 1542 (C=N), 1610.2 (C.....C of aromatic), 1700.2 (C=O), 3141 (C-H aromatic), 3349.2 (NH), 3460 (OH). 1H-NMR (CDCl<sub>3</sub>+DMSO-d<sub>6</sub>)δ(ppm): 2.658-2.824 (d, 2H, CH-CH<sub>2</sub>), 2.984-3.152 (d, 2H, O-CH<sub>2</sub>), 3.642-3.761 (t, 1H, CH<sub>2</sub>-CH-CH<sub>2</sub>), 4.245 (ss, 1H, CH-OH exchangeable with D<sub>2</sub>O), 4.624 (bs, 1H, NH-Ar exchangeable with D<sub>2</sub>O), 7.200-7.786 (m, 9H, ArH) 8.172-8.351 (m, 4H, indolic ArH). MS:[M]<sup>+</sup> at m/z 449.

**Compound 6**

3- [3'- Amino {(m-chloro) phenyl} - 2' - hydroxy-propyloximino]- 1-benzoyl- indole-2-one. M.P. 180°C; Yield: 64%; (r.s): Acetic acid-water; (m.f.): C<sub>24</sub>H<sub>20</sub>N<sub>3</sub>O<sub>4</sub>C<sub>1</sub>. Elemental analysis: Calcd. C 64.14; H 4.45; N 9.35%; Found: C 64.21; H 4.62; N 9.12%. IR (KBr) (cm<sup>-1</sup>): 620.2 (C-C1), 1525 (C-N), 1542.1 (C=N), 1610 (C.....C of aromatic ring), 1700 (C=O), 3142 (C-H aromatic), 3350 (NH), 3459.2 (OH). 1H-NMR (CDCl<sub>3</sub>+DMSO-d<sub>6</sub>)δ(ppm): 2.642-2.808 (d, 2H, CH-CH<sub>2</sub>), 2.980-3.148 (d, 2H, OCH<sub>3</sub>), 3.637-3.755 (t, 1H, CH<sub>2</sub>-CH-CH<sub>2</sub>), 4.242 (ss, 1H, CH-OH exchangeable with D<sub>2</sub>O), 4.620 (bs, 1H, NH-Ar exchangeable with D<sub>2</sub>O), 7.202-7.772 (m, 9H, ArH) 8.182-8.367 (m, 4H, indolic ArH). MS: [M]<sup>+</sup>at m/z 449.

**Compound 7**

3- [3'- Amino {(o-methoxy) phenyl} - 2' - hydroxy-propyloximino]- 1-benzoyl- indole-2-one.



M.P. 195°C; Yield: 65%; (r.s): DMF-water; (m.f.): C<sub>25</sub>H<sub>23</sub>N<sub>3</sub>O<sub>5</sub>. Elemental analysis: Calcd. C 67.41; H 5.16; N 9.43%; Found: C 64.16; H 5.32; N 9.65%. IR (KBr) (cm<sup>-1</sup>): 1060.4 (C-O-C), 1525.1 (C-N), 1542.1 (C=N), 1610.1 (C.....C of aromatic ring), 1710.1 (C=O), 3142 (C-H aromatic), 3459 (OH). <sup>1</sup>H-NMR (CDCl<sub>3</sub>+DMSO-d<sub>6</sub>)δ(ppm): 2.672-2.850 (d, 2H, CH-CH<sub>2</sub>), 2.972-3.136 (d, 2H, O-CH<sub>2</sub>-CH), 3.657-3.788 (t, 1H, CH<sub>2</sub>-CH-CH<sub>2</sub>), 3.852 (s, 3H, OCH<sub>3</sub>), 4.220 (ss, 1H, CH-OH exchangeable with D<sub>2</sub>O), 4.641 (bs, 1H, NH-Ar exchangeable with D<sub>2</sub>O), 7.220-7.786 (m, 9H, ArH) 8.172-8.370 (m, 4H, indolic ArH). MS: [M]<sup>+</sup> at m/z 445.

#### Compound 8

3- [3'- Amino {(P-methoxy) phenyl} - 2' - hydroxy-propyloximino]- 1-benzoyl- indole-2-one. M.P. 190°C; Yield: 66%; (r.s): DMF-water; (m.f.): C<sub>25</sub>H<sub>23</sub>N<sub>3</sub>O<sub>5</sub>. Elemental analysis: Calcd. C 67.41; H 5.16; N 9.43%; Found: C 67.16; H 5.40; N 9.86%. IR (KBr) (cm<sup>-1</sup>): 1061 (C-O-C), 1525 (C-N), 1542 (C=N), 1610.4 (C.....C of aromatic ring), 1700 (C=O), 3141 (C-H aromatic), 3460 (OH). <sup>1</sup>H-NMR (CDCl<sub>3</sub>+DMSO-d<sub>6</sub>)δ(ppm): 2.676-2.862 (d, 2H, CH-CH<sub>2</sub>), 2.965-3.128 (d, 2H, O-CH<sub>2</sub>), 3.652-3.772 (t, 1H, CH<sub>2</sub>-CH-CH<sub>2</sub>), 3.864 (s, 3H, OCH<sub>3</sub>), 4.237 (ss, 1H, CH-OH exchangeable with D<sub>2</sub>O), 4.629 (bs, 1H, NH-Ar exchangeable with D<sub>2</sub>O), 7.242-7.794 (m, 9H, ArH) 8.162-8.354 (m, 4H, indolic ArH). MS: [M]<sup>+</sup> at m/z 445.

#### Step-IVb: 3- (3'- Substituted triazolo-2'- hydroxy propyloximino-1-benzoyl indole-2-ones (9-10)

Compound 3 (.001 mol) and (un) substituted triazoles (.001 mol) in ethanol (50 ml) were refluxed for 6-8 h. The completion of the reaction was checked by TLC. The ethanol was distilled off. The reaction mixture was diluted with ice water, filtered, washed with water, dried triturated with carbon tetrachloride and recrystallized from appropriate solvents to yield compounds 9-10. The relevant data are given as-

#### Compound 9

3- [3'- Amino-3"-phenyl-5'-thiol-1,2,4-triazolo] - 2' - hydroxy propyloximino]- 1-benzoyl-indole-2-one. M.P. 187°C; Yield: 67%; (r.s): Methanol; (m.f.): C<sub>26</sub>H<sub>22</sub>N<sub>6</sub>SO<sub>4</sub>. Elemental analysis: Calcd. C 60.70; H 4.28; N 16.34%; Found: C 60.50; H 4.48; N 16.59%. IR (KBr) (cm<sup>-1</sup>): 1295 (N-N), 1524.4 (C=N), 1541 (C=N), 1610 (C.....C of aromatic ring), 1700.2 (C=O), 2710 (SH), 3141.2 (C-H aromatic), 3459.3 (OH). <sup>1</sup>H-NMR (CDCl<sub>3</sub>+DMSO-d<sub>6</sub>)δ (ppm): 2.689 (d, 2H, CH-CH<sub>2</sub>), 2.970-3.140 (d, 2H, O-CH<sub>2</sub>-CH), 3.661-3.780 (t, 1H, CH<sub>2</sub>-CH-CH<sub>2</sub>), 4.244 (ss, 1H, OH-CH exchangeable with D<sub>2</sub>O), 4.638 (bs, 1H, NH exchangeable with D<sub>2</sub>O), 7.159-7.820 (m, 10H, ArH) 8.122-8.346 (m, 4H, indolic ArH), 11.475 (bs, 1H, SH). MS: [M]<sup>+</sup> at m/z 514.

3- [3'- Amino-3"- (o-hydroxy) phenyl-5'-thiol-1,2,4-triazolo] - 2' - hydroxy propyloximino]- 1-benzoyl- indole-2-one. M.P. 198°C; Yield: 66%; (r.s): Methanol; (m.f.): C<sub>26</sub>H<sub>22</sub>N<sub>6</sub>SO<sub>5</sub>. Elemental analysis: Calcd. C 58.86; H 4.15; N 15.84%; Found: C 58.66; H 4.37; N 15.56%. IR (KBr) (cm<sup>-1</sup>): 1295.2 (N-N), 1524.4 (C-N), 1541 (C=N), 1610 (C.....C of aromatic ring), 1700 (C=O), 2710.2 (SH), 3142 (C-H aromatic), 3460 (OH). <sup>1</sup>H-NMR (CDCl<sub>3</sub>+DMSO-d<sub>6</sub>) δ (ppm): 2.693-2.856 (d, 2H, CH-CH<sub>2</sub>), 2.966-3.127 (d, 2H, O-CH<sub>2</sub>-CH), 3.650-3.769 (t, 1H, CH<sub>2</sub>-CH-CH<sub>2</sub>), 4.256 (ss, 1H, OH-CH exchangeable with D<sub>2</sub>O), 4.652 (bs, 1H, NH exchangeable with D<sub>2</sub>O), 7.420-7.812 (m, 9H, ArH) 8.120-8.349 (m, 4H, indolic ArH), 11.464 (bs, 1H, SH), 12.215 (ss, 1H, ArOH Exchangeable with D<sub>2</sub>O). MS: [M]<sup>+</sup> at m/z 530.

#### Compound 10

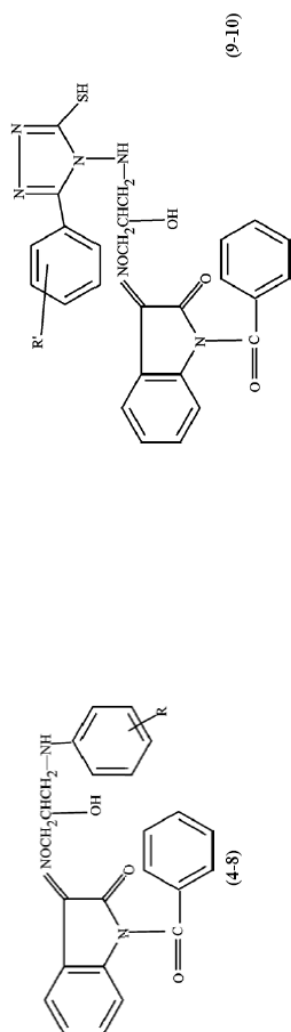
3- [3'- Amino-3"- (o-hydroxy) phenyl-5'-thiol-1,2,4-triazolo] - 2' - hydroxy propyloximino]- 1-benzoyl- indole-2-one. M.P. 198°C; Yield: 66%; (r.s): Methanol; (m.f.): C<sub>26</sub>H<sub>22</sub>N<sub>6</sub>SO<sub>5</sub>. Elemental analysis: Calcd. C 58.86; H 4.15; N 15.84%; Found: C 58.66; H 4.37; N 15.56%. IR (KBr) (cm<sup>-1</sup>): 1295.2 (N-N), 1524.4 (C-N), 1541 (C=N), 1610 (C.....C of aromatic ring), 1700 (C=O), 2710.2 (SH), 3142 (C-H aromatic), 3460 (OH). <sup>1</sup>H-NMR (CDCl<sub>3</sub>+DMSO-d<sub>6</sub>) δ (ppm): 2.693-2.856 (d, 2H, CH-CH<sub>2</sub>), 2.966-3.127 (d, 2H, O-CH<sub>2</sub>-CH), 3.650-3.769 (t, 1H, CH<sub>2</sub>-CH-CH<sub>2</sub>), 4.256 (ss, 1H, OH-CH exchangeable with D<sub>2</sub>O), 4.652 (bs, 1H, NH exchangeable with D<sub>2</sub>O), 7.420-7.812 (m, 9H, ArH) 8.120-8.349 (m, 4H, indolic ArH), 11.464 (bs, 1H, SH), 12.215 (ss, 1H, ArOH Exchangeable with D<sub>2</sub>O). MS: [M]<sup>+</sup> at m/z 530.

#### Methods for biological activity

##### Filter paper disc method (Gould & Bowie, 1950) Antibacterial activity

Antibacterial activity of methanolic solution of compounds and standard drug was performed by preparing standard size of blank Whatmann filter paper-1 discs (6.5 mm). Paper discs sterilized by dry heat at 140°C for 1h, saturated with the test solution and the known standard reference antibiotic solution separately. These discs were air-dried at room temp. to remove any residual solvent which might interfere with the determination. The discs were then placed on the surface of a sterilized agar nutrient medium that had been inoculated with the test organism (by using a sterile swab) and air-dried to remove the surface moisture. Thickness of the agar medium was kept equal in all Petri dishes and standard discs, Ampicillin norfloxacin and Fluconazole were used in each plate as a control. Before incubation, Petri dishes were placed for 1h in a cold room (5°C) to allow diffusion of the compounds from the disc into the agar plate. These

Table 1(b): Antibacterial and antifungal activity of the compounds: 3-(3'-Substituted phenyl-2'-hydroxy propylximino)-1-benzoyl indole-2-one. (4-8) and 3-(3'-Amino-3"-substituted phenyl-5-thio-1,1,2,4-triazolo)-2'-hydroxy propylximino-1-benzoyl indole-2-one. (9-10)



Comp. No.	R	R'	Bacterial growth inhibition (diameter)			Fungal growth inhibition (diameter)			
			<i>S.aureus</i>	<i>E. coli</i>	<i>P. vulgaris</i>	<i>K. pneumoniae</i>	<i>A. fumigatus</i>	<i>C. albicans</i>	<i>C. albicans</i> ATCC
4	H	-	-	-	5 mm	-	6 mm	-	8 mm
5	o-C1	-	5 mm	10 mm	-	4 mm	6 mm	10 mm	8 mm
6	m-C1	-	16 mm	18 mm	10 mm	-	12 mm	12 mm	12 mm
7	o-OCH <sub>3</sub>	-	-	8 mm	-	7 mm	-	15 mm	-
8	p-OCH <sub>3</sub>	-	8 mm	-	10 mm	-	-	-	-
9	-	H	-	6 mm	10 mm	-	-	-	7 mm
10	-	o-OH	22 mm	18 mm	8 mm	6 mm	16 mm	12 mm	20 mm
Carbenicillin	-	19 mm	14 mm	18 mm	13 mm	-	-	-	-
Norfloxacin	-	20 mm	20 mm	16 mm	16 mm	-	-	-	-
Fluconazole	-	-	-	-	-	-	-	29 mm	25 mm

discs were now incubated at 37°C for 20-24h after which the zone of inhibition or depressed growth was measured.

#### Antifungal activity

For antifungal screening, spore suspension (5mL) of each test organisms (72 h culture) was added to sterilized Sabouraud dextrose agar (Himedia Lab. Ltd., Mumbai) medium at 35-40°C by thorough shaking. The petri dishes were seeded with the mixture and the paper discs of the methanolic solution of compound and the reference antibiotic (Fluconazole) as the control was placed in the same manner as in antibacterial activity determination. These Petri dishes were incubated at 30°C for 48h. The zone of inhibition was considered as an indicator the antifungal activity.

#### Biological Evaluation

Various substituted congeners of indole prepared in scheme V, were screened for antibacterial and antifungal activities against different species of bacteria and fungus respectively mentioned in tables Ia-Ib

Compound 1-Benzoyl-indole-2,3-dione was found to be active only against *E.coli* by showing i.z. of 6 mm. Compound 2 exhibited i.z. of 6 mm, 18mm and 5mm against *S.aureus*, *E.coli* and *A.fumigatus* respectively. However, compound 2 showed less antibacterial activity but devoid of antifungal activity. Reaction of epichlorohydrin with compound 2, resulted into formation of a new epoxy substituted benzoyl indole derivative (3). This compound possessed moderate degree of antibacterial and antifungal activities.

The 3-(2'3'-epoxypropyloximino)-1-benzoyl-indole-2-one on addition of different aromatic amines gave compounds 4-8. These compounds showed much better antibacterial as well as antifungal activities than the parent compound no. 3. The compounds 5 and 6, which were substituted with 2-chloro and 3-chloro group respectively showed promising antibacterial and antifungal activities. However, compounds 4,7,8 substituted with H, 2-OCH<sub>3</sub> and 4-OCH<sub>3</sub> respectively showed less biological activities.

The incorporation of substituted triazole in compound 3 resulted in formation of compounds 9 and 10. The screening results revealed that compound 10 possessed maximum activities than the remaining other derivatives of this series.

#### DISCUSSION

- On the basis of structure activity relationship, it may concluded that-
- Epoxy linkage (4-8) is beneficial from the points of antibacterial and antifungal activities.
- Incorporation of aromatic amines causes an increase in biological activity but m-chloro substituted amine containing indole derivatives (6) shows milder inhibition zones against used different pathogenic stains.
- Triazole moiety bearing compound (10) leads to more potency.
- The screening data cleared that compound 10 is more potent in respect to clinically used chemotherapeutic agents as carbenicillin (19 mm), norfloxacin (20 mm) against *S. aureus* and close to fluconazole (29 mm) against *C. albicans* ATCC.

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