

## COMPARISON OF ANTIBIOTIC SENSITIVITY PATTERN BETWEEN PATHOGENIC AND ENTEROHAEMORRHAGIC ESCHERICHIA COLI ISOLATED FROM BUFFALO MEAT

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### SUMMARY

Thirty seven strains of *E. coli* including nine strains of enterohaemorrhagic *Escherichia coli* (EHEC) of serogroups 0111 (5), 0172 (2), 0168 (1) and 010 (1), previously isolated from buffalo meat (buffen) were tested for *in-vitro* antimicrobial susceptibility against 18 antimicrobial agents. About 81.1% isolates showed multiple drug resistance (MDR) patterns and a total of 19 different resistance patterns were observed. *Escherichia coli* strains revealed highest sensitivity to norfloxacin (97.29%), ciprofloxacin (94.59%) and gentamicin (91.89%). The maximum resistance was observed against carbenicillin (86.48%) and ampicillin (64.86%). Intermediary resistance was observed to polymyxin-B (81.08%), neomycin (75.67%) and kanamycin (70.27%). All the nine EHEC serotypes were also highly resistant to carbenicillin (100%) and ampicillin (77.78%) but susceptibility of these isolates to norfloxacin, ciprofloxacin, gentamicin, chloramphenicol and amikacin was 100%. On the basis of multiple drug resistance patterns, all the 9 EHEC isolates were categorized into four resistotypes. The highly resistant group of antibiotics was carbenicillin and ampicillin which was present in 5 isolates. The increased resistance of EHEC strains to above antimicrobial drugs may be due to inadequate use of these antibiotics for prolonged period.

**Key words:** EHEC, buffen, antibiotic sensitivity, multiple drug resistance, resistotypes

*Escherichia coli* is an important cause of diarrhea in man and animals, and enterohaemorrhagic *E. coli* (EHEC) including non-0157 serotype has emerged as an important foodborne enteropathogen for humans causing haemorrhagic colitis (HC), haemolytic uremic syndrome (HUS) and thrombotic thrombocytopenic purpura (TTP). The treatment of EHEC infections with antimicrobials has not yet been recommended, but the experiences revealed antimicrobial agents are effective in reducing the severity of EHEC infection and alleviate the risk of HUS development (Lane and Alexander, 1990, Takeda *et al.*, 1998). Most of the EHEC are sensitive to commonly used antibiotics (Lane and Alexandor, 1990, Wells *et al.*, 1991), but emergence of resistant EHEC strains to different antimicrobials (Kim *et al.*, 1994) is a major problem to human and animal health. Thus, there is emergent need for regular monitoring of antimicrobial drug resistance pattern of EHEC isolates. This communication describes *in-vitro* antibiotic sensitivity pattern of thirty seven strains of *E. coli* including nine EHEC strains isolated from buffalo meat (buffen).

Resistotyping of thirty seven *E. coli* strains

including nine strains of EHEC of serogroups 0111 (5), 0172 (2), 0168 (1) and 010 (1), previously isolated from buffalo meat was done against 18 antimicrobial drugs using modified disc diffusion technique (Bauer *et al.*, 1966). The antibiotic discs used in the present study included ampicillin (10mcg), amikacin (30 mcg), chloramphenicol (30 mcg), carbenicillin (100 mcg), cephotaxime (30 mcg), ciprofloxacin (5 mcg), colistin (10 mcg), gentamicin (30 mcg), kanamycin (30 mcg), neomycin (30 mcg), nalidixic acid (30 mcg), nitrofurantoin (300 mcg), norfloxacin (10 mcg), polymyxin-B (300 units), streptomycin (10 mcg), spectinomycin (100 mcg), tobramycin (10 mcg) and trimethoprim (5 mcg). Their zones of inhibition around the discs were measured and interpreted according to the zone size interpretative chart recommended by Hi-Media.

Antibiotic sensitivity pattern of all the *E. coli* isolates indicated the highest sensitivity to norfloxacin (97.29%) followed by ciprofloxacin and streptomycin (94.59%), colistin and gentamicin (91.89%), and trimethoprim and chloramphenicol (89.19%). Maximum resistance was observed against carbenicillin (86.48%) and ampicillin (64.86%). However, intermediate resistance was observed to antimicrobials like

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**Table 1**  
**Antibiotic sensitivity of *E. coli* strains including nine EHEC serotypes from buffen**

Antimicrobial agent	Number of resistant strains (%)		Number of intermediary sensitive or resistant strains (%)		Number of sensitive strains (%)	
	<i>E. coli</i> *	EHEC	<i>E. coli</i>	EHEC	<i>E. coli</i>	EHEC
Amikacin (30 mcg)	3 (8.1)	-	5 (13.5)	-	29 (78.37)	9 (100)
Ampicillin (10 mcg)	24 (64.86)	7 (77.78)	7 (18.91)	2 (22.23)	6 (16.21)	-
Carbenicillin (100 mcg)	32 (86.48)	9 (100)	5 (13.5)	-	-	-
Cephotaxime (30 mcg)	1 (2.70)	-	11 (29.72)	1 (11.12)	25 (67.56)	8 (88.89)
Chloramphenicol (30 mcg)	1 (2.70)	-	3 (8.10)	-	33 (89.19)	9 (100)
Ciprofloxacin (5 mcg)	2 (5.40)	-	-	-	35 (94.59)	9 (100)
Colistin (10 mcg)	3 (8.10)	-	-	-	34 (91.89)	9 (100)
Gentamicin (10 mcg)	2 (5.40)	-	1 (2.70)	-	34 (91.89)	9 (100)
Kanamycin (30 mcg)	2 (5.40)	-	26 (70.27)	9 (100)	9 (24.32)	-
Nalidixic acid (30 mcg)	1 (2.70)	-	4 (10.80)	-	32 (86.48)	9 (100)
Neomycin (30 mcg)	1 (2.70)	-	28 (75.67)	6 (66.67)	8 (21.62)	3 (33.33)
Nitrofurantoin (300 mcg)	8 (21.62)	-	18 (48.64)	8 (88.89)	11 (29.72)	1 (11.12)
Norfloxacin (10 mcg)	1 (2.70)	-	-	-	36 (97.29)	9 (100)
Polymyxin-B (300 units)	-	-	30 (81.08)	8 (88.89)	7 (18.72)	1 (11.12)
Spectinomycin (100 mcg)	8 (21.62)	-	15 (40.54)	1 (11.12)	14 (37.83)	8 (88.89)
Streptomycin (10 mcg)	2 (5.40)	-	-	-	35 (94.59)	9 (100)
Tobramycin (10 mcg)	-	-	8 (21.62)	1 (11.12)	29 (78.37)	8 (88.89)
Trimethoprim (5 mcg)	4 (10.80)	-	-	2 (22.23)	33 (89.19)	7 (77.78)

\*Number of *E. coli* isolates also includes EHEC strains

**Table 2**  
**Drug resistance pattern of *E. coli* strains including nine EHEC serotypes from buffen**

Sr. no.	No. of resistant strains	Serogroups involved (No. of isolates)	No of antimicrobial drugs to which isolates were resistant	Antimicrobial resistance pattern
1	8	O8, O9, O60, O111(3)*, O172 (2)*	2	Cb, A
2	6	O9, O43, O60, O78, O111 (2)*	1	Cb
3	3	O8, O25, O68*	2	Cb, Nf
4	2	O27, O70	2	Cb, Se
5	1	O109	2	Cb, Na
6	1	O70	2	Cb, G
7	1	Rough	3	Cb, G, Ak
8	1	O109	3	Cb, G, C
9	1	O78	2	Cb, K
10	1	O48	2	Cb, Ak
11	1	Untypable	1	Ak
12	1	O70	3	Cb, Se, Cf
13	1	O73	3	Cb, Se, A
14	1	O25	3	Cb, A, Nf
15	1	O78	3	Cb, N, Nf
16	1	O100	4	Cb, Ce, Nf, Nx
17	1	O10*	3	Cb, A, K
18	1	O60	3	Cb, Se, Nf
19	1	O8	2	Se, Nf

A- ampicillin, Ak- amikacin, C- chloramphenicol, Cb- carbenicillin, Ce- cephotaxime, Cf- ciprofloxacin, Cl = colistin, G- gentamicin, K- kanamycin, N- neomycin, Na- nalidixic acid, Nf- nitrofurantoin, Nx- norfloxacin, S- streptomycin, Pb- polymyxin B, Se- spectinomycin, Tb- tobramycin, Tr- trimethoprim

\* Enterohaemorrhagic *E. coli* strains



polymyxin-B (81.08%), neomycin (75.67%) and kanamycin (70.27%). Similarly all the nine EHEC isolates were highly resistant to carbenicillin (100%) and ampicillin (77.78%) but susceptibility of these isolates to norfloxacin, ciprofloxacin, gentamicin, chloramphenicol, colistin, nalidixic acid and amikacin was 100% (Table 1). EHEC isolates from a wide range of sources including milk, meat and meat products were reported resistant to ampicillin, carbenicillin, polymyxin-B and tetracycline (Orden *et al.*, 2000, Banerjee *et al.*, 2001, Khurana, 2003). However, a high degree of sensitivity of EHEC to similar groups of antimicrobial agents has also been reported earlier (Patil *et al.*, 1999, Vila *et al.*, 2000, Khurana, 2003).

In the present study, about 81.1% isolates of *E. coli* showed multiple drug resistance and a total of 19 different resistance patterns were recorded. However, nine EHEC isolates were categorized into four resistotypes. The highly resistant group of antibiotics was carbenicillin and ampicillin which was present in 5 EHEC isolates (Table 2). Similar observations of multiple drug resistance was seen in *E. coli* isolates by Fule *et al.* (1990) and David *et al.* (1991) who recorded 17 and 19 different resistance patterns, respectively. The results of the present study are also in agreement with Karpe (1993) who reported multiple drug resistance of 79.06% in *E. coli* isolates. The possible explanation for EHEC resistance to the antimicrobial agents used in the current study can be attributed to frequent and inadequate use of these antimicrobials for prolonged period. Antibiotics can interfere with attachment of *E. coli*. Thus the development of antibiotic resistant strains may enhance their capacity of adherence to intestinal epithelium causing haemorrhagic colitis and other syndromes.

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