

Original Research Article

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Antibiotic Resistance in *E. coli* Isolated from Poultry

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ABSTRACT

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A total of 150 samples from poultry were evaluated for avian pathogenic *E. coli*. All the 77 isolates of *E. coli* were tested for *in vitro* sensitivity towards 14 antibacterial drugs. The highest resistance was attributed towards antibiotic ampicillin, colistin, and nitrofurantoin followed by cefixime, cotrimoxazole, doxycycline, tetracycline, amoxyclav, ofloxacin, streptomycin, gentamicin, levofloxacin and amikacin. The highest sensitivity of *E. coli* was towards chloramphenicol antibiotic. Simultaneous resistance to 6 to 11 antibacterial agents was observed in all 77 (100%) isolates.

Introduction

Escherichia coli have been the focus of immense international research after its recognition as a major cause of large scale epidemics of gastrointestinal illnesses in animals and man. Avian colibacillosis is the major disease in chicken which has been reported by several previous studies (Mellata, 2013; Matin *et al.*, 2017; Subedi *et al.*, 2018).

Antimicrobial therapy is an important tool in reducing both the incidence and mortality associated with avian colibacillosis. Commercialized poultry industries consume wide range of antibiotics for disease

prevention and growth promotion. The antimicrobial use in the chicken is expected to rise by 129%, by 2030 in the Asia-Pacific region (Tonu *et al.*, 2011). However, the indiscriminate use is leading to wide spread antimicrobial resistance, which has received considerable National and International attention.

The development of resistance is a complex process associated with the presence of resistance encoding genes that are found inside plasmids or chromosomal genetic material. Integrons are the genetic material responsible for capturing resistance genes that spread via the genetic mobile elements;

transposons and plasmid (Geidam *et al.*, 2012).

Materials and Methods

A total number of 150 samples were collected from chickens, suspected for colibacillosis on post mortem, belonging to various organized farms and backyard poultry situated in and around Mhow and Indore cities. The presumptive isolation of bacterial isolates as *E. coli* was accomplished by colonial and bacterial morphology. Further, identification of bacterial isolates was done by both traditional methods and readymade kits (Hi media). Traditional biochemical tests were carried out as per procedure described by Barrow and Feltham (1993), Cheesbrough (1994) and Collee *et al.*, (1996). Readymade Hi *E. coli* identification kits (Hi Media) were used for identification of isolates.

In vitro antibiotic sensitivity test (AST) of the isolates was conducted as per the method of Bauer *et al.*, (1966). All the 77 isolates of *E. coli* were tested for *in vitro* sensitivity towards 14 antibacterial drugs viz. amikacin, amoxycylav, ampicillin, cefixime, chloramphenicol, co-trimoxazole, colistin, doxycycline, gentamicin, levofloxacin, nitrofurantoin, ofloxacin, streptomycin and tetracycline. The interpretation of result was made in accordance with the instruction supplied by manufacture.

Results and Discussion

All the 77 isolates of *E. coli* were tested for *in vitro* sensitivity towards 14 antibacterial drugs. These 14 antibiotics belonged to the nine groups viz. fluoroquinolones, aminoglycosides, tetracycline, cephalosporins, penicillin, nitrofurantoin, polymyxin, chloramphenicol and sulphonamide. Sensitivity of isolates to various drugs are summarized in Table 1.

E. coli isolates showed variable percentages of sensitivity and resistance to the different antibiotics. The highest sensitivity was attributed towards antibiotic chloramphenicol (71.42%), amikacin (67.53%), and gentamicin (64.93%), followed by levofloxacin (44.15%), tetracycline (42.85%), ofloxacin (16.88%), co-trimoxazole and (9.09%), cefixime (6.49%).

Only intermediate sensitivity was found against amoxycylav and streptomycin. The highest resistance (100%) of *E. coli* was towards ampicillin, colistin and nitrofurantoin (Figure 1).

Variation in resistance and sensitivity percent has been found in various reports. Out of nine antibiotics tested, none of the antibiotic showed 100% resistance against the *E. coli* strains (Sharada *et al.*, 2008; Subedi *et al.*, 2018). Bakhshi *et al.*, (2017) and Chaudhari *et al.*, (2017) reported 100% sensitivity to antibiotic colistin, while, Qabajah and Ashhab (2012) reported 100% resistance against Tetracycline. These findings do not collaborate with the present findings. In our study, the highest percent of *E. coli* isolates were resistant to ampicillin and whereas lowest to amikacin, which is similar to the findings of Subedi *et al.*, (2018). Also, cotrimoxazole and doxycycline, accounted more than 60% resistance among the tested *E. coli* isolates. These resistivity patterns of *E. coli* strains are comparable with the previous studies (Shrestha *et al.*, 2011; Bakhshi *et al.*, 2017; Magray *et al.*, 2017; Manishimwe *et al.*, 2017; Subedi *et al.*, 2018).

Various antibiotics used for AST in this study have also been reported by others viz. Kim *et al.*, (2007), Ogunleye *et al.*, (2008), Sharada *et al.*, (2008), Yadav (2010), Sahoo *et al.*, (2012), Olarinmoye *et al.*, (2013), Chaudhari *et al.*, (2017) and Subedi *et al.*, (2018).

Table.1 Percentage sensitivity of *E. coli* isolates to different antimicrobial agents.

S. No.	Antibiotics	Total no. of isolates (n=77)					
		Sensitive		Intermediate		Resistant	
		No.	%	No.	%	No.	%
1.	Amikacin	52	67.53	15	19.48	10	12.98
2.	Amoxycylav	0	0	36	46.75	41	53.24
3.	Ampicillin	0	0	0	0	77	100.00
4.	Cefixime	5	6.49	10	12.98	62	80.51
5.	Chloramphenicol	55	71.42	22	28.57	0	0.00
6.	Colistin	0	0	0	0	77	100.00
7.	Co-trimoxazole	7	9.09	14	18.18	56	72.72
8.	Doxycycline	5	6.49	23	29.87	49	63.63
9.	Gentamicin	50	64.93	12	15.58	15	19.48
10.	Nitrofurantoin	0	0	0	0	77	100.00
11.	Levofloxacin	34	44.15	31	40.25	12	15.58
12.	Ofloxacin	13	16.88	25	32.46	39	50.64
13.	Streptomycin	0	0	53	68.83	24	31.16
14.	Tetracycline	33	42.85	0	0	44	57.14

Table.2 Multiple drug resistance in *E. coli* isolates.

S. No.	No. of antibiotics	No. of resistant isolates	Percent of resistant isolates (n=77)
1.	6	15	19.48
2.	7	29	37.66
3.	8	17	22.07
4.	9	11	14.28
5.	11	5	6.49

Fig.1 Percentage sensitivity of *E. coli* isolates to different antimicrobial agents.

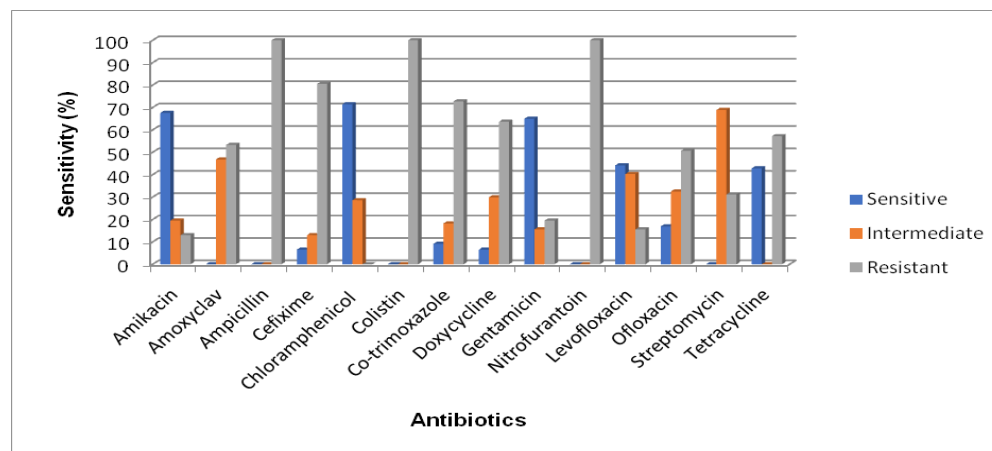
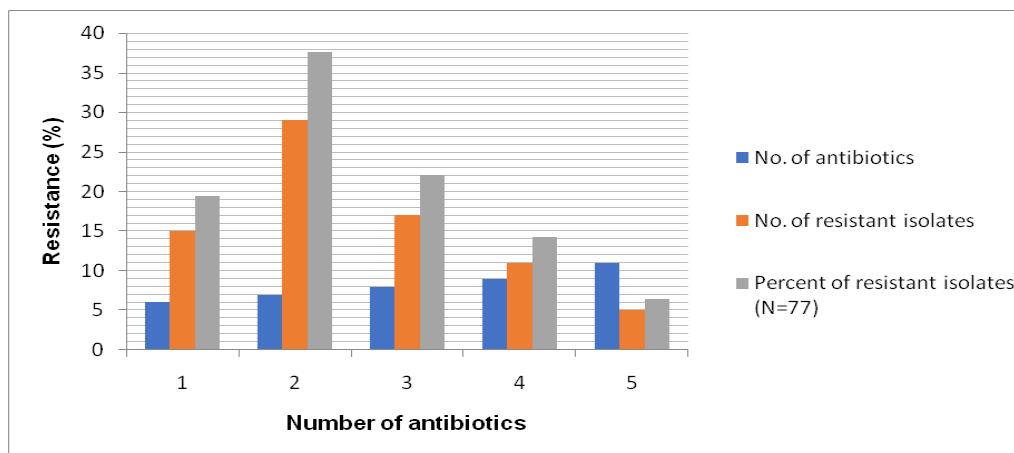


Fig.2 Multiple drug resistance in *E. coli* isolates.



Multi drug resistance

Multiple drug resistance to 6 to 11 antibacterial agents simultaneously was observed in all isolates (Table 2). The maximum (37.66%) isolates were resistant to 7 drugs (Figure 2). None of the isolate was resistant to all the 14 antimicrobial agents.

Multi drug resistance against was also reported by Manishimwe *et al.*, (2017), Amer *et al.*, (2018) and Subedi *et al.*, (2018).

The results of this study are in variance with the findings of other workers, indicating that antibiotic sensitivity pattern varies with different isolates, time and development of multiple drug resistance among different *E. coli* isolates related to transmissible R factor/plasmid.

Selection pressure for the development of MDR plasmids in the gut flora of birds is driven by the routine addition of antibiotics to poultry feed and water for disease prevention and growth promotion (Bager *et al.*, 1997; Van den Bogaard and Stobberingh, 1999).

The usage of antibiotics correlates with the emergence and maintenance of antibiotic resistant traits within pathogenic strains. These

traits are coded by particular genes that may be carried on the bacterial chromosome, plasmids, transposones or on gene cassettes that are incorporated into integrons (Daka *et al.*, 2012) thus are easily transferred among isolates. The transmission of resistance plasmids of *E. coli* from poultry to human have also been reported (Maansouri and Shareifi, 2002).

The level of resistance of organism to a particular drug might be due to the indiscriminate use of the respective drugs. Hence, antibiotic should be used at recommended dosage for appropriate time course preferably after performing the *in vitro* sensitivity testing.

The antibiotic resistant patterns found in this study suggest a serious situation of prevalence of the antibiotic resistant *E. coli* strains among broiler chickens.

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