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Antimicrobial Spectrum of *Escherichia coli* Isolated from Poultry Faecal Samples in and around Ranchi

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A B S T R A C T

Antimicrobial agents are used extensively in order to reducing the enormous losses caused by Escherichia coli infections in poultry industry. A total of 48.67% samples were found positive for *E. coli* out of which 42.46% were from organized farms and 57.53% were from backyard poultry farm. The results of antimicrobial susceptibility tests showed highest sensitive against Erythromycin (75.34%) followed by Ceftrixone (70.55%), Ciprofloxacin (68.49%), Tetracycline (65.75%), Enrofloxacin (55.48%), Gentamycin (50.68%), Chloramphenicol ((44.52%) and Trimethoprim-sulfamethaxazole (15.07%). The highest antibiotics resistance was seen with Trimethoprim-sulfamethaxazole (65.75%) followed by Chloramphenicol (50.68%), Gentamycin (41.78%), Enrofloxacin (35.61%), Ceftrixone (24.65%), Tetracycline (20.55%), Erythromycin (18.49%) and Ciprofloxacin (14.38%). A multidrug resistance was observed in both organized and backyard poultry farming system however study showed heavy usage of antibiotics in organized poultry sector rather than backyard poultry farming system practiced in and around Ranchi, Jharkhand.

Introduction

Escherichia coli a Gram negative bacterium has become a great concern to both veterinary and human practices. Although ubiquitous in nature, it plays a vital role in maintaining homeostasis of intestinal physiology of poultry (Udaykar *et al.*, 2009). It is not detrimental as long as it is kept in check by other intestinal microflora (Barnes *et al.*, 2003) but whenever there is imbalance, it results in colibacillosis, a disease of severe economic significance to all poultry producers worldwide, characterized by diverse array of lesions (Dziva and Stevens, 2008; Ewers *et al.*, 2003). This disease is of immense zoonotic importance since poultry meat is the commonest source of animal protein consumed by human population in most part of the world (Mitra *et al.*, 2009). There is increase in both incidence and severity of colibacillosis and current trends indicate that it is likely to continue and become an even greater problem in the poultry industry (Altekruse *et al.*, 2002). Now, there is considerable increase in prevalence of this disease in poultry indicative of an alarming situation (Omer *et al.*, 2010).

Antibiotics are extensively used in poultry

industry either as a growth promoter or to control infectious diseases (Akond *et al.*, 2009).

Concern about antibiotic resistance and its transmission to human pathogens is important because there resistant bacteria may colonized the human intestinal tract and may contribute resistance genes to human endogenous micro flora through R-factors, conjugative plasmid, or chromosomal elements (Kabir, 2010). Therefore, disease causing microbes that have become resistant to antibiotics drug therapy are an increasing public health problem.

Due to significance of *E. coli* infection in poultry, the present study was undertaken to isolate *E. coli* from faecal samples brought from various organized and backyard poultry farms situated in and around Ranchi and to study their antibiotic resistance pattern of widely available antibiotics.

Materials and Methods

A total of 300 random faecal samples (50 samples each at indifferent seasons i.e. at summer, winter and rainy season from organized and backyard poultry farm) from in and around Ranchi were collected from cloaca using sterile swab and brought to laboratory by keeping in buffered peptone water broth for its Isolation identification and Confirmation. Pre-enriched sample were cultured on MacConky Agar and on eosin methylene blue agar as per standard method (Cowan and Steel, 1970). Gram's staining was done as per method described by Stokes, (1993). Further, biochemical test like IMViC test was done for its confirmation. Antimicrobial drug sensitivity test of Erythromycin (10µg), Ceftriaxone (30µg), Ciprofloxacin (5µg), Tetracycline (30µg), Trimethoprim-sulfamethoxazole (1.25/23.75µg), Chloramphenicol (28µg), Gentamicin (10µg), and Enrofloxacin (5µg) were done through disk diffusion method using standard method (Bauer *et al.*, 1966) and sensitivity were graded as high, moderate and resistant.

Results and Discussion

Morphologic study of *E. coli* isolates showed gram negative rods appeared as pink colonies when cultured on MacConkey media and green metallic colonies on EMB medium. Biochemically, all *E. coli* suspected isolates were lactose fermenting colonies, positive indole, methyl red, and Catalase. Meanwhile all isolates were negative oxidase, urea hydrolysis, citrate utilization, Voges-Proskauer and didn't produce H_2S.

Out of 300 specimens tested, *E. coli* was present in 48.67% samples. The prevalence was higher in backyard poultry farm (57.53%) as compared to organized poultry farm (42.46%). A similar trend of occurrence of *E. coli* in relation to season was recorded in both the management system however, it was highest in rainy season (63%) followed by winter (50%) and summer season (33%) such trend of occurrence indicates that the prevalence of *E. coli* isolates was higher in rainy than summer seasons (Table 1).

Overall effectiveness of antibiotics against *E. coli* isolates is presented in the Table 2. The antibiotic sensitivity pattern showed that Erythromycin (75.34%), was highest sensitive among all the antibiotics followed by Ceftrixone (70.55%), Ciprofloxacin (68.49%), Tetracycline (65.75%), Enrofloxacin (55.48%), Gentamycin (50.68%), Chloramphenicol ((44.52%) and Trimethoprim-sulfamethaxazole (15.07%) while considering the efficacy of antimicrobial agent on the basis of high to moderately sensitive nature in Table 2, Ciprofloxacin (85.61%) was found most effective followed by Erythromycin

(81.50%), Tetracycline (79.45%), c

Ceftriaxone (75.34%), Enrofloxacin (64.38%), Gentamycin (58.22%), Chloramphenicol (49.31%), and Trimethoprim-sulfamethaxazole (34.24%). On the contrary antibiotics showing higher rate of resistance pattern were Trimethoprim-sulfamethaxazole (65.75%), followed by Chloramphenicol (50.68%), Gentamycin (41.78%), Enrofloxacin (35.61%), Ceftrixone (24.65%), Tetracycline (20.55%), Erythromycin (18.49%) and Ciprofloxacin (14.38%). It was noted that *E.coli* had developed more resistance towards Trimethoprim-sulfamethaxazole then other drugs however, it was highly sensitive to Erythromycin and Ciprofloxacin.

Table.1 Prevalence of *Escherichia coli* isolated from poultry faecal samples situated in and around Ranchi

Season	Infected samples	Organised farm (50)	Backyard farm (50)
Summer (100)	33.00%	24.00%	42.00%
Winter (100)	50.00%	44.00%	56.00%
Rainy (100)	63.00%	56.00%	70.00%
Total	48.67%	42.46%	57.53%

Table.2 Antibiotics sensitivity pattern against *Escherichia coli* isolated from poultry faecal samples situated in and around Ranchi

Antibiotics	High sensitive	Moderate sensitive	Resistance
Erythromycin (10µg)	75.34%	6.16%	18.49%
Ceftriaxone (30µg)	70.55%	4.79%	24.65%
Ciprofloxacin (05 µg)	68.49%	17.12%	14.38%
Tetracycline (30 µg)	65.75%	13.69%	20.55%
Trimethoprim-sulfamethaxazole (1.25/23.75 µg)	15.07%	19.17%	65.75%
Chloramphenicol (28 µg)	44.52%	4.79%	50.68%
Gentamycin (10 µg)	50.68%	7.53%	41.78%
Enrofloxacin (05 µg)	55.48%	8.90%	35.61%

The morphological characters used for identification of *E. coli*, isolates gives Gram-negative rods with pink colonies when cultured on MacConkey agar media, green metallic colonies on EMB medium. Nearly similar results were noted by Kumar *et al.*, (1996) and Hogan and Larry (2003).

Bacteriological study was conducted on 300 randomly collected local samples from organized and backyard poultry farm located in and around Ranchi in summer, winter and rainy seasons. A total of 146 samples were found positive for *E. coli* isolates showing overall prevalence of 48.67%.

This study revealed that prevalence of *E. coli* isolated from backyard poultry farm were higher (56.00%) than originated from (41.34%). These results are in agreement with Abd El Tawab, (2014) who isolated *E. coli* at a percentage of 38.00% from poultry farm.

The incidence of *E. coli* among examined samples was 63% in rainy season which was higher than that in winter (50%) and summer season (33%). This variation may be attributed to defects in the environmental condition, poor hygienic condition of water feed and litters in rainy season. Moreover, overcrowding and poor ventilation (high amount of ammonia in air) may be the high incidence of *E. coli* infection in winter than in summer season. These results agreed with those obtained by Nehal (2009), Mahajan *et al.,* (1994) and Ayoub (2007).

The results of antibiotic sensitivity tests (Table 2) revealed Erythromycin and Ciprofloxacin as most proper antibiotics with the highest *in vitro* efficiency followed by Tetracycline, Ceftriaxone, Enrofloxacin, Gentamycin, Chloramphenicol and Trimethoprim-Sulfamethaxazole. These results go in parallel with those results obtained by Sharada *et al.,* (2010), Tapan *et al.,* (2012) and Abd El Tawab, (2014).

A multiple drug resistance with high degree of antimicrobials resistance was found against Trimethoprim-Sulfamethaxazole followed by Chloramphenicol, Gentamycin, Enrofloxacin, Ceftrixone, Tetracycline, Erythromycin and Ciprofloxacin. The results were nearly similar to that obtained by Sharada *et al.,* (2010). Development of multiple drug resistance against *E. coli* revealed indiscriminate usage of antibiotics in poultry farming leading to resistance in Gram negative bacilli as reported by Oteo *et al.,* 2005 where all *E. coli* tested were resistant to Ciprofloxacin, an another fluoroquinolone drugs. Moreover, pathogen acquires antibiotic resistance through episomal transfer of resistance factor (Tabatabaei and Nasirian, 2003).

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