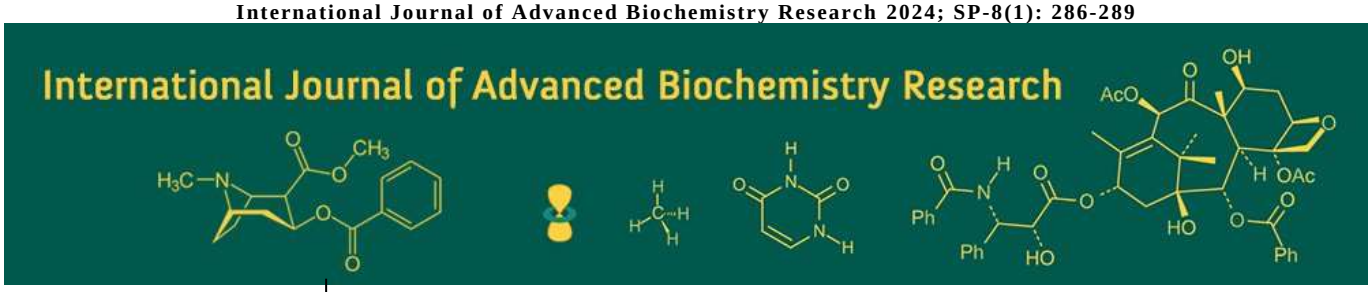

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; SP-8(1): 286-289
www.biochemjournal.com
Received: 05-10-2023
Accepted: 10-11-2023

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Prevalence of *Escherichia coli* O157: H7 in poultry and camel around North West Rajasthan

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DOI: https://doi.org/10.33545/26174693.2024.v8.i1Se.362

Abstract
Enterohemorrhagic *Escherichia coli* (EHEC) is a common zoonotic pathogen that causes most severe disease cases. *Escherichia coli* O157:H7 is a major foodborne pathogen causing severe disease in humans and animals worldwide. Healthy animal are a reservoir of *E. coli* O157:H7, and animal food products and their by-product contaminated with their waste are the most common sources for disease outbreaks. In present study a total of 120 feacel sample were taken from North West rajas than. One hundred twenty samples were collected from camel, (n= 60) and poultry (n= 60). Seventy (58.33%) of the samples were positive for *E. coli* and then they were tested for serotype. The highest prevalence of *E. coli* O157 was found in both fecal samples (8.57%), while in camel fecal samples O7 (28.57%), O26 (14.28%), and three samples were untypable and two were remains blank. *E. coli* O157 also survives well in the environment. In poultry the highest sero group was only O121 (11.42%) followed by O7, O126, O128 (8.57%) and three sample were remains untypable. The abilities to cause human disease, colonize the gastrointestinal tract, and survive in the environment require that *E. coli* O157:H7 adapt to a wide variety of conditions. Three major virulence factors of *E. coli* O157: H7 have been identified including Shiga toxins, products of the pathogenicity and products of the F-like plasmid pO157.The data reported in this study provides some useful baseline in formation for future research such as molecular or epidemiologic works.

Keywords: *E. coli* O157, camel, poultry, diarrhea

Introduction
On a cultural and economic level, Camels are important livestock in India and studies of etiological agents of camelid diseases are limited. *Escherichia coli* is the devastating pathogen of intestenial tract responsible for primary and secondary bacterial infections, including *Coli* septicaemia, *Coli* granuloma, omphalitis, and Hjarre's disease in poultry. Listlessness, depression, weakness, loss of appetite, and sudden death of birds are among the highly generalised clinical indications of illness that are associated with *Coli* septicemia which is dangerous and potentially fatal infection (Kuznetsova *et al*., 2020) [14]. *E. coli* O157:H7 is regarded as one of the most significant food-borne infections among *E. coli* strains that produce Shiga toxin (STEC). It produces diarrhoea that can lead to a number of potentially fatal illnesses, including hemorrhagic *Coli* tis (HC) and hemolyticuremic syndrome (HUS) Peco-Antic, A. (2016) [16]. Camels are distinguished by their remarkable ability to adaptionin the extreme desert environment and their high resistance to many pathogenic microorganisms. Despite it Bessalah *et al*., (2016) [4] pointed that camel diarrhea produced by *E. coli* as the main cause of economic loss associated with poor growth, medication costs, and animal death.
An effective method for epidemiological research is serotyping. "O" antigens have a direct relationship to the immune response in poultry against EHEC (Nolan *et al*., 2013) [15]. Haemolysin, adhesin (Fim), toxins, invasins, capsules, and lipopolysaccharide complex are among the virulence components that have been linked to the pathogenicity of APEC (Saha *et al*., 2020) [20]. There is limited information regarding the prevalence of *E. coli* O157:H7 in North West Rajasthan.

Materials and Methods: The work was carried out in the Department of Veterinary Microbiology, College of Veterinary and Animal Sciences., Bikaner during 2021-2022.

Sample collection

A total number of 120 feaces samples were collected from chickens and camel exhibiting different geographical conditions like from various organized poultry farms, backyard poultry and people reareing camel, different villages situated in and around Bikaner cities. All samples were collected aseptically in sterile Hi-media swab sample collection kit and transported to department lab and kept at 4 °C till further use.

Isolation and identification of *E. coli*

Samples were enriched in brain heart infusion (BHI) broth with incubation at 37 °C for 24 hrs followed by subculture on nutrient agar, MacConkey agar and selective media eosin methylene blue (EMB) agar. The organisms were confirmed on the basis of bacterial morphology, cultural characteristics (Cheesbrough, 1994) [8].

Serotyping of *E. coli*

The identified *E. coli* isolates were sent to National Salmonella and Escherichia Centre, Central Research Institute, Kasauli (H.P.) for serotyping of somatic (O) antigen.

Result

In present study, out of 120 samples, 70 (58.33%) *E. coli* isolates were recovered from fecal sample on the morphological and cultural characteristics of *E. coli* were confirmed on the basis of previous observations recommended by Edwards and Ewing (1972) [10]. The biochemical behaviour of the isolates in accordance of Edwards and Ewing (1972) [10] and Sahoo *et al*., (2012) [21]. All *E. coli* isolates were exhibited purple-black colonies with dark centre metallic sheen on EMB agar (Fig 1). Higher incidences of *E. coli* in poultry were also noted in a number of investigations (Peer *et al*., 2013; Ammar *et al*., 2014) [17, 3]. Although, a low no of investigation only 24% of *E. coli* cases study by Debbarma *et al*., (2020) [9] found. Young aged broilers exhibit high affinity to disease in compared to older chickens (Radwan *et al.,* 2020) [18]. 106 *E. coli* isolates were also found by Kumar and Gupta (2019) [13] from broilers that had *Coli bacillosis.*

All isolates were serotyped from National Salmonella and Escherichia Centre, Central Research Institute, Kasauli, (H.P.). All the 35 *E. coli* isolates from poultry were typed serologically into different 'O' serogroups and O121 (11.42%) serotype was the most prevalent followed by O126, O128, O157, O88, O7 (8.57% each), O17, O26, O57, O63, O83 (5.71% each), O2, O11, O98 (2.85% each) and three untypable (8.57%) strains were recovered (Table 1.1). The present findings are similar to that reported by Kaushik *et al*., (2018) [12] with *E. coli* isolates belonging to serogroups O2, O7 (4.61%). Our results revealed lower percentage of *E. coli* O2 serotype which is similar to findings of Eid *et al*., (2019) [11], Shankar *et al*., (2010) [24]. On the other hand, Peer *et al*., (2013) [17] reported serogroups prevalence as O2 (3.92%), O26 (3.92%), O88 (2.94%), O101 (1.96%). Hooda *et al*., (2011) [26] reported the serogroups O2 (14.47%), O7 (1.31%), O101 (7.89%) and five serotypes (6.57%) were untypable. O26 associated with disease birds 4.3% in chickens. Singh *et al.,* (2023) [25] *E. coli* O84 and O149 were found most prevelaent and none of sample found with O157 serogroup.

Table 1: Serogrouping of *E. coli* isolates from poultry

S. No.	Sero group	Total no. of *E. coli* isolates	Prevalence of serogroups (%)
1	O2	1	2.85%
2	O7	3	8.57%
3	O11	1	2.85%
4	O17	2	5.71%
5	O26	2	5.71%
6	O57	2	5.71%
7	O63	2	5.71%
8	O83	2	5.71%
9	O88	3	8.57%
10	O98	1	2.85%
11	O121	4	11.42%
12	0126	3	8.57%
13	O128	3	8.57%
14	O157	3	8.57%
15	Untypable	3	8.57%

Samples collected from camel fecal and 35 *E. coli* isolates were typed serologically groups and most predominant serogroup was O7 with prevalence rate (28.57%) followed by O26 (14.28%), O126 and O157 (8.57%), O121 (5.71%), O2, O11, O57, O63, O83, O118, O134 having prevalence rate of 2.85%. Two isolates were remains blank and three were untypable. The role of ETEC in diarrheal disease has been firmly established in many species (pigs, calves, sheep, lambs and humans). In camels the clinical significance of ETEC appears to be limited. Chauhan and Kaushik (1991) [7] described the isolation of *E. coli* belonging to the serogroup O2, O8, O83, O103 and O120 from seven diarrheic camels. Strains belonging to the serogroups O2, O8 and O83 were found to be enterotoxigenic (Bessalah *et al.,* 2016) [4].

These results are somewhat consistent with Adamu *et al*., (2018) [1], who found that O26 was the main serotype in camel fecal samples (43.5%). These results are nearly comparable to those obtained by Shahein *et al*., (2021) [23], who isolated several *E. coli* serotypes from fecal samples of camel neonates, including O26, O103, O111, and O45 in a percentage of 33.3, 25, 25. Al-Gburi, N. M. (2016) [2] results showed that *E. coli* O157 were isolated in 19 out of 100(19%) camel fecal samples. In contrast Rahimi, E. (2012) [19] finding that *E. coli* O157 was not isolated from camel fecal samples.

Table 2: Serogrouping of *E. coli* isolates from camel:

S. No.	Sero group	Total no. of *E. coli* isolates	Prevalence of serogroups (%)
1	O2	1	2.85
2	O7	10	28.57
3	O11	1	2.85
4	O26	5	14.28
5	O57	1	2.85
6	O63	1	2.85
7	O83	1	2.85
8	O118	1	2.85
9	O121	2	5.71
10	O126	3	8.57
11	O134	1	2.85
12	0157	3	8.57
13	BLANK	2	5.71
14	Untypable	3	8.57

Bosilevac *et al.*, 2015 [5] found that *E. coli* O157 was present in feces sample of cattle, goats, camels, and sheep, respectively (10.7, 1.4, 2.4, and 2.4%***)*** which is similar to our study. In contrast the incidence of *E. coli* was found to be just one (0.66%) typical isolate (*E. coli* O157) and two (1.33%) atypical isolates (Sami and Adeli, 2013). Shahein *et al.*, 2021 had found none of isolates of O157 serogroup and only found O26, O103, O111 and O45. The incidence of disease in camel excrement was less, indicating that the probable causes of the low amount of verotoxigenic *E. coli* O157 in camel excrement could be connected to the STE Cenvironment and or to the camels themselves and camel fecal samples may have been infected by non-verotoxigenic *E. coli* O157 serotype.

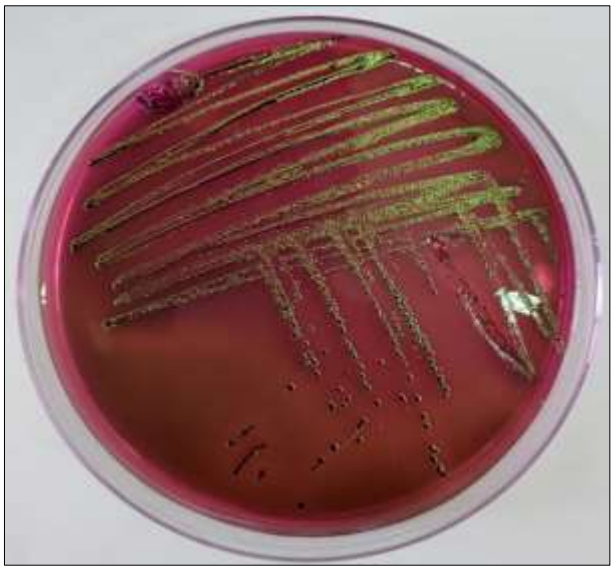

Fig 1: *E. coli* isolation on EMB agar plate showing characterstic metallic sheen

Conclusion

Although camels have special circumstances, other livestock and poultry birds are on high risk which afflicted with various ailments, such as diarrhoea, which are brought on by microbes. Enteropathogenic *E. coli* serotypes isolated from camel and poultry demonstrated factor with virulence and their ability to generate toxins, and putative implications for zoonotic disease transmission.

Conflict of Interest

The author says there is no conflict of interest

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