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Occurrence of campylobacteriosis in cats and rats in Thrissur, Kerala#

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Abstract

Globally, campylobacteriosis is one of the most common causes of gastroenteritis in humans. Campylobacter is an enteric pathogen present as a commensal in the gastrointestinal tract of a wide variety of animals and birds. Poultry, pig and livestock are the main reservoirs and the disease spread mainly by consumption of contaminated meat and milk. Contact with companion animals and contaminated environment (water and soil) also add to the risk of acquiring this infection. In the light of increasing trend of rearing pets in households in the post-covid period, the risk of Campylobacter infection from cats has to be investigated. Rats which are peri-domestic animals may contaminate the livestock farms rearing food animals and so may serve as a source of transmission of the disease. Rectal swabs were collected from cats (70) presented to veterinary hospitals and various households, and caecal samples were collected from rats (60) caught from different households and farm premises of Thrissur district. Campylobacter could not be detected in samples from cats by conventional culture technique and direct broth polymerase chain reaction (PCR). Out of the 60 samples collected from rats, no samples were positive for Campylobacter by conventional culture technique, but six (10 %) samples collected from rats procured from poultry farm premises were found to be positive for Campylobacter spp. by direct broth PCR. Of the six isolates obtained by direct PCR, five were identified as C. jejuni and one as C. coli. The presence of Campylobacter spp. in rat, increase the risk of transmission of the bacteria to farm animals and thereby potentially contaminate the food chain, resulting in human infections. A one health approach is needed to combat the occurrence and transmission of the disease in animals and humans.

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Campylobacter is one among the major pathogenic bacteria causing foodborne gastroenteritis affecting humans all over the world. One in ten people are affected by foodborne diseases globally every year which leads to loss of almost 33 million healthy life years. The infectious dose of Campylobacter in humans is very less and approximately 500 cells can cause the disease. Campylobacteriosis is mainly a foodborne zoonotic disease, but contact with companion animals like dogs and cats, pet birds, contaminated environment (water, soil) can act as a potential source of infection to animals and humans. Rodents like rat and mice also harbour the organism and act as carriers of the disease by contaminating the environment as well as transmitting the pathogen to other reservoir hosts like poultry and pig, thereby contaminating the animal products like meat used for human consumption (Meerburg *et al*., 2006). In cats, Campylobacter is present as a commensal in the gastrointestinal tract, which may or may not cause disease, but can transmit the organism to other animals and humans in contact with them (Thepault *et al*., 2020). The availability of epidemiological data on *Campylobacter* spp. infection in Asia is still very limited, and the prevalence reported by other countries also vary substantially (Kaakoush *et al*., 2015). In the light of all these, the risk of contracting Campylobacter infection from cats and rats has been investigated.

Materials and methods

A total of 70 rectal swabs were collected from cats (35 from cats presented to Teaching Veterinary Clinical Complex (TVCC), Mannuthy and University Veterinary Hospital (UVH), Kokkalai, 35 from household pet cats, both stray and intensively housed) and 60 caecal contents from rats *viz*., *Rattus rattus* (Black rat-20) and *Rattus norvegicus* (Brown rats–40) caught from households rearing animals and from the premises of University Poultry and Duck Farm (UPDF), Mannuthy and Centre for Pig Production and Research (CPPR), Mannuthy, using appropriate rat traps, and euthanising them using inhalant anaesthetic (isoflurane) (Underwood and Anthony, 2020).

All the samples were collected carefully using sterile screw capped tubes with cotton swabs, and transported under chilled conditions in thermocol containers to the laboratory. The samples were immediately transported to the laboratory and were processed within 4 h of collection to ensure that the organisms remain viable and culturable. The samples were processed in the laboratory facility available in the Department of Veterinary Public Health, College of Veterinary and Animal Sciences, Mannuthy. All the samples collected from cats, pet birds and rats were subjected to isolation and identification of *Campylobacter* spp. Swabs collected were transferred to the sterile enrichment broth *i.e*, modified charcoal cefoperazone deoxycholate (mCCD) broth and incubated microaerobically (7% CO_2) at 42°C for 48 h followed by streaking a loopful of the enriched samples on modified charcoal cefoperazone deoxycholate agar (mCCDA) (HiMedia, India) plates supplemented with CAT (Cefoperazone, Amphotericin B and Teicoplanin) selective supplement, Polymyxin B selective supplement and Campylobacter supplement V (Cefoperazone), and incubated under 7% CO_2 at 42 °C for 48 h for isolation of *Campylobacter* spp. (WOAH, 2017). All the samples were subjected to direct broth polymerase chain reaction (PCR) using DNA isolated from 48 h enriched mCCDA broth samples by snap chill method (Englen and Kelley, 2000). Genus confirmation was done by PCR targeting *16S r*RNA (Linton *et al*.,1996) and species identification was done by targeting *lpx*A gene for *C. jejuni* and *C. coli* (Klena *et al*., 2004). The genomic DNA of *Campylobacter jejuni* (NCTC 11168) and *Campylobacter coli* (ATCC 33559) maintained in the department of Veterinary Public Health were used as positive control.

Result and discussion

Among the 70 rectal swabs collected from cats and 60 caecal samples collected from rats, none of the samples were found to be positive for *Campylobacter* spp. by conventional culture technique. Direct broth PCR analysis of the samples resulted in detection of *Campylobacter* spp. from 10 per cent of the samples collected from six brown rats (*Rattus*

Table.1. Occurrence of *Campylobacter* spp. in cats and rats by direct broth PCR

Sl. No.	Species	No. of samples analysed	No. of positive samples		*C. jejuni*	*C. coli*
			Culture method	Direct broth PCR		
1	Cat	70	0	0	0	0
2	Rat	60	0	6	5	1

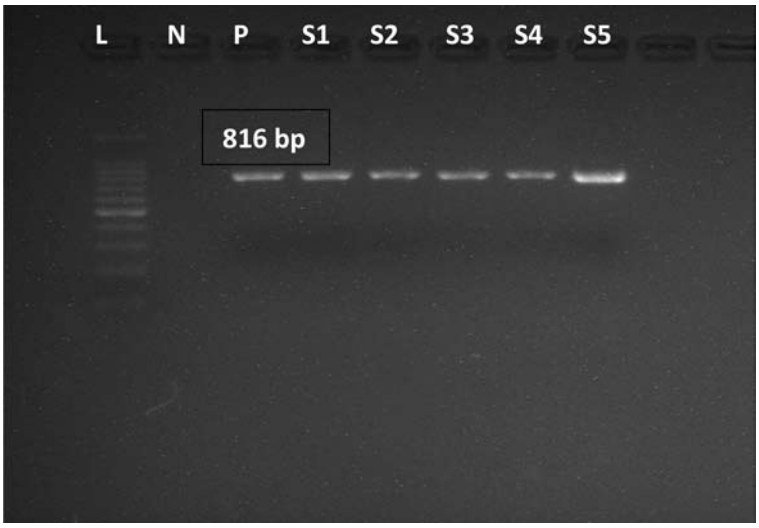

Fig.1 PCR image of *Campylobacter* spp. isolates
L-100 bp ladder; N- Negative control (*E. coli*); P- Positive Control (*C. jejuni* NCTC 11168)
S1, S2, S3, S4, S5 – Samples

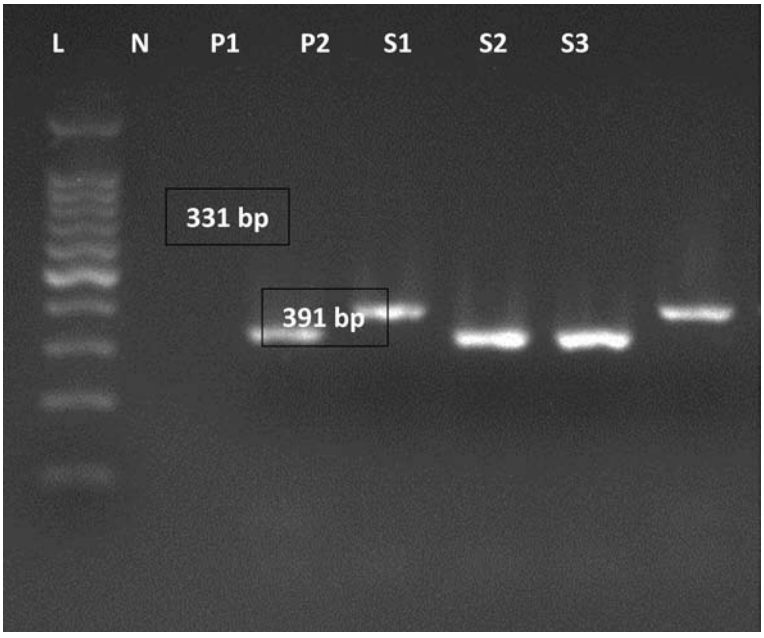

Fig. 2 PCR image of *C. jejuni* and *C. coli* isolates
L-100 bp ladder;N- Negative Control (*E. coli*);P1- Positive Control (*C. jejuni*)
P2 – Positive control (*C. coli*);S1, S2, S3- Samples

norvegicus) caught from poultry farm premises and out of the six positive samples, five were identified as *C. jejuni* and one as *C. coli* (Table. 1) and Fig. 1 and 2.

The results of the present study on cats were in accordance with Spain *et al*. (2001), who reported a prevalence of 0.08 per cent from 263 cat faecal samples examined for *Campylobacter* spp., where the samples were collected from private owned cats and from those kept in shelter homes. A higher prevalence of *Campylobacter* spp. in cats than the present study was reported by Torkan *et al*. (2018) as 22 per cent from faecal samples of cats collected from 50 cats in Isfahan and Shahrekord cities in Iran as well as Goni (2017) reported a prevalence of 32.6 per cent and 12.5 per cent for *Campylobacter* spp. in rectal swabs collected from 46 stray cats and 40 pet cats, respectively in Selangor, Malaysia. The results obtained from the study on rats was in agreement with Backhans *et al*. (2013), where two out of the 58 intestinal samples collected from brown rats caught from pig and poultry farm premises were positive for *Campylobacter* spp. Compared to the present study (10%), a slightly higher prevalence was observed by Meerburg *et al*. (2006) as 12.5 per cent from brown rats caught from poultry and pig farm premises. A higher prevalence rate of 26.15 per cent in pigs (Vivekanandhan *et al*., 2022) and 31.67 per cent in poultry (Kavya *et al*., 2023) for *Campylobacter* spp. were reported from different farms in Thrissur district, which indicated that there are chances of cross-contamination from these hosts to other potential reservoirs like rats. The lower or no detection of *Campylobacter* spp. by conventional culture technique and the detection of it from the same samples by direct PCR may be due to the presence of sub-lethal injured or viable but non-culturable cells in the clinical samples (Milton *et al*., 2017).

Conclusion

Campylobacter spp. was detected in the caecal samples of brown rats and *C. jejuni* was the predominant species detected by direct broth PCR. Farm personnel should be made aware of biosecurity measures to be practiced in the farms to prevent the transmission of the bacteria into other reservoir hosts. To eliminate Campylobacter from entering food chain and to prevent its transmission, strict biosecurity measures must be implemented in farm animal production sector and use of novel control strategies like use of phytochemicals, feed additives, bacteriophage therapy might be adopted. Pet associated Campylobacter infections, can be prevented by making improvements in pet animal management as well as by practising personal hygienic measures.

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Conflict of interest

The authors declare that they have no conflict of interest.

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