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PREVALENCE OF *CAMPYLOBACTER* SPECIES IN POULTRY MEAT IN THE ESFAHAN CITY, IRAN

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Summary

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A surveillance study was carried out to determine the prevalence of *Campylobacter* spp. in poultry meat in Iran. Over a 24-month period (January 2006 – May 2008), a total of 800 poultry meat samples from raw chicken (n=280), quail (n=248), turkey (n=212) and ostrich (n=60) meat were procured from the Esfahan city of Iran and analyzed. The highest prevalence (68.4%) of *Campylobacter* spp. was recorded in quail meat, followed by chicken meat (56.1%), turkey meat (27.4%) and ostrich meat (11.7%). The overall prevalence of *Campylobacter* spp. in studied samples was 47.1% (377 from 800), out of which 76.4% were identified as *C. jejuni* and 23.6% as *C. coli*. It was concluded that a high proportion of poultry meat marketed in Esfahan, Iran, was contaminated by *Campylobacter* spp. and that consumption of undercooked or cooked contaminated poultry products presented a possible risk for consumers.

Key words: *Campylobacter*, chicken, ostrich, poultry meat, quail, turkey

INTRODUCTION

Campylobacter spp. could cause serious complications related to acute bacterial enteric disease in humans throughout the world (Nachamkin, 1995; Mead *et al*., 1999). The most important pathogenic strains belong to the group of thermotolerant campylobacteria. *C. jejuni* and *C. coli* are associated with human illness (Wesley *et al*., 2000). *Campylobacter* spp. is a common contaminant of poultry carcasses in poultry processing plants (Jorgensen *et al*., 2002; Son *et al.,* 2007). During slaughtering. the damage of intestinal tract integrity can lead to direct contamination. Contamination can also occur directly through air, bird to bird, via equipment and water (Jones *et al.,* 1991; Corry & Atabay, 2001).

Several epidemiological studies demonstrated high prevalence of this microorganism in chickens, ducks and turkeys, ranging from 40% to 100% (Ridsdale *et al.,* 1998; Dickins *et al*., 2002).

The consumption and handling of poultry and poultry products are a major source of human campylobacterial enteritis (Corry & Atabay, 2001). The prevalence of pathogens in poultry and poultry products, especially chickens, is well documented, but their presence in poultry meat marketed has not been extensively investigated. One study investigating the contamination of retail raw chicken in Tehran has been reported (Taremi *et al*., 2006) but there is no published report about the prevalence of *Campylobacter*

spp. from raw quail, turkey and ostrich meat in Iran.

Therefore, this study was conducted to establish the prevalence of thermoresistant *Campylobacter* spp. strains in raw chicken, turkey, quail and ostrich meat in the Esfahan city, Iran.

MATERIALS AND METHODS

Samples

A total of 800 poultry meat samples including raw chicken (n=280), turkey (n=212), quail (n=248) and ostrich (n=60) samples were procured over a 2-year period from January 2006 to May 2008.

Samples were transported to the laboratory on the day of collection in isolated bags containing ice packs and analyzed within 24 h.

Microbiological analysis

Twenty five grammes of each sample were added to 225 mL *Campylobacter* enrichment broth base (Preston enrichment broth base, HIMEDIA, India, M899) supplemented with *Campylobacter* selective supplement IV (HIMEDIA, India, FD042) and 25 mL defibrinated sheep blood for each 475 mL of media for preenrichment. Then, samples were inoculated (42 ^{o}C, 24 h) in a microaerophilic condition using a gas mixture of 5% O_2, 10% CO_2, 85% N_2. Subcultures were then streaked onto *Campylobacter* selective agar base (HIMEDIA, India, M994) supplemented with an antibiotic supplement for selective isolation of *Campylobacter* spp. (HIMEDIA, India, FD006) and 5% (v/v) defibrinated sheep blood and incubated for 48 h at 42 ^{o}C under the same conditions. Colonies were examined morphologically and Gram stained for presumptive identification of positive samples. After the initial characterization, presumptive *Campylobacter* spp. were confirmed using an analytical profile Index kit (API®, Biomérieux, France). The confirmation of the identity of isolates was based on characteristic reactions for hippurate hydrolysis, indoxyl acetate hydrolysis and urease activity.

Statistical analysis

Statistical analysis of results was performed with Chi-square test and Fisher's exact two–tailed test (SPSS Chicago, IL). A value of $P<0.05$ was considered statistically significant.

RESULTS

The prevalence of *Campylobacter* spp. isolated from the various examined poultry meat samples is summarized in Table 1. Out of 800 meat samples examined, 377 (47.1%) were found to be contaminated with *Campylobacter*. *Campylobacter* spp. were detected in 56.1% , 27.4%, 68.4% and 11.7% of chicken, turkey, quail and ostrich meat samples, respectively. There were significant differences ($P<0.05$) between the different meat samples. The most prevalent species recovered from samples was *Campylobacter jejuni,* with 76.4% of the isolates confirmed. The remaining 23.6% of isolates were identified as *C. coli* (Table 1).

Table 2 shows the seasonal prevalence of *Campylobacter* spp. in poultry meat samples. The highest incidence of *Campylobacter* spp. (66.5%) occurred in summer months over the years. The incidence during the other seasons of the study was also relatively high and in general, greater than 25%.

Table 1. Prevalence of *Campylobacter* spp. isolated from various poultry meats in Esfahan city , Iran.

Meat	Number of samples	*Campylobacter* spp. positive	*C. jejuni*	*C. coli*
Chicken	280	157 (56.1) [a]	140 (89.2) [a]	17 (10.8) [a]
Turkey	248	68 (27.4) [b]	53 (77.9) [b]	15 (22.1) [a]
Quail	212	145 (68.4) [a]	92 (63.4) [c]	53 (36.6) [b]
Ostrich	60	7 (11.7) [c]	3 (42.9) [b,c]	4 (57.1) [a]
Total	800	377 (47.1)	288 (76.4)	89 (23.6)

Results are expressed as number of *Campylobacter*-positive samples (%); [a,b,c] values within raws with different superscripts differed significantly (P<0.05) in the chi-square test for independence.

Table 2. Seasonal prevalence of *Campylobacter* spp. in poultry meats in Esfahan city, Iran.

Season	Poultry meat samples				Total
	Chicken	Turkey	Quail	Ostrich	
Spring	37/70 (52.9) [a]	21/62 (33.9) [a]	42/53 (79.2) [a]	2/15 (13.3) [a]	102/200 (51.5) [a]
Summer	58/70 (82.9) [b]	26/62 (41.9) [a]	45/53 (84.9) [a]	4/15 (26.7) [a]	133/200 (66.5) [b]
Autumn	40/70 (57.1) [a]	14/62 (22.6) [a]	37/53 (69.8) [a]	1/15 (6.7) [a]	92/200 (46.0) [a]
Winter	22/70 (31.4) [c]	7/62 (11.3) [b]	21/53 (39.6) [b]	0/15 (0.0) [a]	50/200 (25.0) [c]

Results are expressed as number of *Campylobacter*-positive samples/number of samples analyzed (%); [a,b,c] values within raws with different superscripts differed significantly (P<0.05) in the chi-square test for independence.

DISCUSSION

This is the first report of the isolation of *Campylobacter* spp. from turkey, quail and ostrich raw meat in Iran. Overall, 47.1% of all poultry meat samples were *Campylobacter* positive (377 positive samples out of 800). Quail and chicken samples were most frequently contaminated with this enteropathogen with isolation rates of 68.4% and 56.1%, respectively. *Campylobacter* spp. was recovered at lower prevalence in meat samples from other poultry species, with an isolation rate of 27.4% in turkey and 11.7% in ostrich samples examined. Raw poultry meat contamination with *Campylobacter* is common. A wide range (20–100%) in the prevalence of *Campylobacter* in fresh chicken and turkey meat has been reported in different countries (Cloak *et al*., 2001; Dominguez *et al*., 2002; Jorgensen *et al*., 2002; Alter *et al*., 2004), but there are very few data about prevalence of microbial contamination on quail and ostrich meat. Our results showed that the *Campylobacter* prevalence in poultry products in Iran are similar to those observed in other countries. The observance of good hygiene practices during slaughtering and processing of carcasses, contamination rate could be significantly lower

below. Thus, the high number of isolates in quail meat samples in the present study may be due to cross–contamination during manual procedures related to slaughtering and packaging.

Our study showed an overall prevalence of 23.6% for *C. coli*. *C. coli* was recovered at lower prevalence in chicken meat samples compared to other meats ($P<0.05$) with an isolation rate of 10.8%. A review by Corry & Atabay (2001) reported a *C. coli* incidence of 6% to 50% on poultry carcasses. *C. jejuni* has been reported to be the most frequent species recovered from poultry (Kramer *et al*., 2000; Jorgensen *et al*., 2002) and food of animal origin (Zanetti *et al*., 1996). Isolation rates of *C. jejuni* of up to 100% have been found in freshly slaughtered chickens and turkeys (Lee *et al*., 1994; Jorgensen *et al*., 2002). Our results on the prevalence of *C. jejuni* in poultry meat samples are in agreement with data from other countries (Atanassova & Ring, 1999; Cloack *et al*., 2001, Alter *et al*., 2004; Hussain *et al*., 2007).

In general, the comparison between different studies should be prudent as reported variations in *Campylobacter* spp. prevalence may be due to the use of different sampling and analytical techniques employed, as well as to season-related differences (Logue *et al*., 2003).

Table 2 shows a seasonal pattern in the *Campylobacter* detection rates in our study. The highest prevalence was observed in the summer season (66.5%), and the lowest in winter (25.0%), which is in agreement with previous studies that reported peak prevalence in the warmer months (Kapperud *et al*., 1993; Willis & Murray, 1997; Peterson *et al*., 2001).

In conclusion, the prevalence of *Campylobacter* spp. in poultry meat in Esfahan city, Iran was found to be high (41.7%). Therefore, *Campylobacter* contamination of carcasses during processing constitutes a risk for consumers. Further studies are necessary to determine whether and how meat safety can be improved via elimination/reduction of microbial contamination on poultry carcasses.

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