Occurrence of *Campylobacter* in Local Poultry Meat in Pune and Mumbai

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**Abstract**

Microbiological quality of poultry meat samples was evaluated with special emphasis on *Campylobacter* as a poultry meat associated pathogen. 40 hot dressed chicken carcasses from retail outlets of local poultry meat in Pune and Mumbai were processed according to the FDA/CFSAN-BAM rinse method. 95% of the samples were found to be positive for *Campylobacter* with a MPN range between $10^2$-$10^4$ cfu / kg of the sample. Aerobic plate counts were between $10^9$-$10^{10}$ cfu / kg and Enterobacteiraceae counts were between $10^7$-$10^{10}$ cfu / kg of meat sample. *Campylobacter* isolates were identified as *C. jejuni*, *C. coli*, *C. fetus* and *C. lari* according to the FDA/CFSAN-BAM scheme for *Campylobacter* identification and biochemical characterization. *C. lari* and *C. jejuni* were predominant in most of the samples. This study indicates significance of chickens as important reservoirs of this enteric pathogen and in transmission and dissemination of *Campylobacter* associated diseases.

**Introduction**

*Campylobacter*, a gram negative, non-sporulating, motile bacterium, is commonly isolated as a pathogen associated with diarrhoea in many industrialized countries (10). Several incidences of *Campylobacter*iosis have also been reported from almost all parts of India (1, 6-8). Chickens are major reservoirs of and are frequently colonized by pathogenic *Campylobacter* species like *C. jejuni* and *C. coli* (5). *Campylobacter* infections are primarily because of handling and consumption of raw or undercooked poultry and due to cross contamination (10). Studies on isolation of *Campylobacter* from poultry meat have been carried out from the regions Tamilnadu and Calcutta using conventional method (11, 4). However, isolation and enumeration of *Campylobacter* from the carcasses of fresh hot dressed chickens from western regions of Maharashtra has not been reported as yet. Present study aims at isolating *Campylobacter* from poultry carcasses using the Kapadnis-Baseri medium followed by enumerating them by PreT-KB MPN method (2).

**Materials and Methods**

**Poultry samples**

In all 40 different hot dressed chicken carcasses (freshly slaughtered) were purchased from retail outlets in Pune (31) and Mumbai (9) during a span of eleven months. The samples were brought to the laboratory at room temperature and processed within 1 hr.

**Sample processing**

All the samples were processed according to the FDA/CFSAN-BAM rinse method (3). The carcasses were rinsed in sterile peptone water (1%) for 5 minutes on shaker and the rinse liquids were used for further analysis.
Microbiological quality analysis and Campylobacter MPN

Most Probable Number (MPN) of Campylobacter was determined using PreT-KB MPN method (2). At least one typical colony of Campylobacter per meat sample, isolated during MPN, was selected for biochemical identification. Microbiological quality of the rinse liquid was further evaluated by plating serial dilutions on plate count agar and Eosin Methylene Blue agar for Aerobic Plate Counts (APC) and Enterobacteriaceae counts, respectively.

Identification

Campylobacter isolates obtained were purified and identified according to the FDA / CFSAN-BAM biochemical identification scheme (3).

Results

Microbiological quality analysis and Campylobacter MPN

95% of all poultry meat samples were found to be positive for Campylobacter after biochemical identification. The MPN range of Campylobacter was between $10^2$-$10^4$ cfu / kg of the meat sample. APC and Enterobacteriaceae counts were between $10^9$-$10^{10}$ cfu / kg and $10^7$-$10^{10}$ cfu / kg respectively for both Pune and Mumbai regions together as seen in Table 1.

Table 1: Microbial counts of processed meat samples

<table>
<thead>
<tr>
<th>Location (No of samples)</th>
<th>Microbial Counts (CFU / kg. of the poultry meat)</th>
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<tbody>
<tr>
<td></td>
<td>Campylobacter-MPN</td>
</tr>
<tr>
<td>Pune (31)</td>
<td>Min 1.0 x 10^1</td>
</tr>
<tr>
<td></td>
<td>Max 5.0 x 10^4</td>
</tr>
<tr>
<td>Mumbai (9)</td>
<td>Min 1.5 x 10^5</td>
</tr>
<tr>
<td></td>
<td>Max 1.8 x 10^3</td>
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</tbody>
</table>

Seasonal variation in microbiological quality

Isolation rate of Campylobacter from meat samples was observed to be maximum in the month of early December and dropped in January, the winter season. However, the rate increased in the months of March, April, May and July indicating rise in summer and early monsoon seasons. Similar patterns were found for enterobacteriaceae counts and APC, with higher values. (Fig 1)

![Fig 1: Campylobacter, Enterobacteriaceae and Aerobic Plate Counts of meat samples in different months](image-url)
Identification

Campylobacter isolates obtained were identified as \textit{C. jejuni}, \textit{C. coli}, \textit{C. lari} and \textit{C. fetus}. \textit{C. lari} and \textit{C. jejuni} were found to be predominant in most of the samples (Fig 2).

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{prevalence_campylobacter.png}
\caption{Prevalence of different Campylobacter species in poultry meat samples}
\end{figure}

Discussion

Conventional isolation media incorporate antibiotics, which may result in loss of antibiotic sensitive \textit{Campylobacter} species, and thus, reduced number of Campylobacters may be isolated (9). Enumeration of \textit{Campylobacter} and other bacteria from poultry carcasses has not been attempted so far from regions of western Maharashtra. In this study, hot dressed poultry carcasses were analyzed for presence of \textit{Campylobacter} using KB medium, which is free from antibiotics, and almost 95% of samples were positive for \textit{Campylobacter}, from both Pune and Mumbai regions. Moreover, the isolates were also identified biochemically as \textit{C. jejuni}, \textit{C. lari}, \textit{C. coli} and \textit{C. fetus} which are all pathogenic strains. However, the isolates need to be confirmed by PCR or other molecular typing methods. The results indicate the high risk of infection to handlers and consumers of such poultry products. The MPN observed for \textit{Campylobacter} is much above the human infectious dose in spite of the process of hot dressing. This may be due to the use of antibiotic free KB medium resulting in estimation of antibiotic sensitive strains of \textit{Campylobacter} also. Seasonal variation of \textit{Campylobacter} with respect to APC and enterobacteriaceae counts in different months was also seen and reported for the first time. Proper hygienic conditions while processing poultry meat can reduce the load of \textit{Campylobacter} on the meat surfaces and treatment methods like radiation processing are needed to reduce the risk of infection due to handling or consumption of such poultry products.

References


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**About the authors …**

**Dr Jayant R. Bandekar** joined 20th batch of BARC training school in 1976 after getting Master’s Degree in Microbiology with 1st rank from University of Poona. He was awarded Dr. Homi Bhabha Prize for first rank in radiobiology course in the training school. He obtained Ph. D. Degree in Microbiology from University of Poona. Dr. Bandekar was a post doctoral fellow at the State University of New York, USA. At present, Dr. Bandekar is Head, Food Microbiology Section in Food Technology Division. His major research interest involves food-borne bacterial pathogens and microbiological safety of irradiated foods. He is a research guide for M. Sc. and Ph. D. in Microbiology.

**Mr Amol D. Raut** has completed his M.Sc. (Microbiology) in 2001 from the Department of Microbiology, University of Pune, Pune. Presently he is working towards Ph.D. degree from University of Pune, under the guidance of Prof. Dr. B.P. Kapadnis and Dr. J.R. Bandekar. He has been awarded the Junior Research Fellowship in 2003 under the collaborative programme between B.A.R.C. and University of Pune for the project “Isolation, Identification and radiation resistance of Campylobacter isolated from poultry meat”. Before joining the B.A.R.C. –UoP JRF programme, he was working as a Microbiologist in Research and Development department of Praj Industries Ltd., a Pune based fermentation industry. He has comprehensive experience in the field of alcohol fermentation and was the R&D project leader for Asia’s first alcohol fermentation plant operating on sugarcane juice as a raw material. He was awarded the Chairman’s Best Performance award for consecutive two years, 2002 & 2003 during his tenure at Praj.

**Dr B.P. Kapadnis** obtained his Ph.D. from University of Pune and is currently Professor of Microbiology, Dept. of Microbiology at University of Pune,Pune. He has 25 years of teaching and research experience in the areas of Microbial taxonomy, Applied microbiology and Environmental Microbiology. He has published more than 26 research papers in international as well as national journals. He is a member of International societies like Society for Applied Microbiology and Society for General Microbiology, UK. Besides this he is a life member of Association of Microbiologists of India (AMI) and Association of Medical Microbiologists of India. His current areas of research include Microbial Taxonomy, Plant microbe interactions, bioremediation and microbial biotechnology. He has two patents to his credit based on a new device and medium for isolation of Campylobacter. He has supervised research work at Ph.D. and M.Phil. level. He has collaborative research project with FTD and NABTD, BARC and VSI, Pune.He has ongoing research projects funded by various national funding agencies.