Prevalence of *Campylobacter* Species on Fresh Retail Chicken Wings in Northern Ireland

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**ABSTRACT**

*Campylobacter* contamination was surveyed in 153 chicken wing samples purchased from retail outlets in Northern Ireland over a 10-week sampling period; 64.7% of samples were found to be positive for *Campylobacter jejuni/c oli* using the API Campy: Identification System for Campylobacter. These results support the assertion that retail chicken products are commonly contaminated with *Campylobacter* spp. and pose a potential risk to consumers if hygiene and cooking practices are not adequate to prevent cross-contamination and facilitate destruction.

Key Words: *Campylobacter* species, fresh retail chicken wings, Northern Ireland

*Campylobacter* enteritis is the most common form of infective diarrhea in developed countries (22); 306 and 417 *Campylobacter* infections were reported in Northern Ireland in 1991 and 1992, respectively (9). *Campylobacter jejuni* and *Campylobacter coli* are the two species that cause acute enterocolitis in man (21) with *C. jejuni* the predominant causative organism.

Outbreaks of *Campylobacter* enteritis have been associated with consumption of chicken (5,6), and it is now accepted that chicken is the major source of *C. jejuni* (5,18). *Campylobacter coli*, though isolated primarily from pigs (7), may also be isolated from chickens. Several previous studies have made no differentiation between *C. jejuni* and *C. coli* when sampling retail chickens (11,15,23). As Skirrow (21) stated: "*C. jejuni* and *C. coli* are similar organisms and cause the same disease, so their differentiation is only of epidemiological interest."

*Campylobacter jejuni* and *C. coli* have previously been isolated from retail chicken and chicken products with isolation rates ranging from 23.1 to 98% (Table 1). More specifically, the prevalence of *C. jejuni* in retail chicken wings has been stated as 55.5% (25) and 82.9% (14). It has been shown that the skin is a major area of *Campylobacter* contamination in poultry (2). Chicken wings may, therefore, be a particularly high-risk product since they are normally consumed with the skin still attached. The current study was conducted to determine the prevalence of *Campylobacter* spp. in retail chicken wings in Northern Ireland.

**METHODS AND MATERIALS**

**Sampling**

Based on an 82.9% expected prevalence of *C. jejuni* (the highest percentage isolation for retail chicken wings previously recorded) (14), the minimum number of chicken wing packages that were required to accurately estimate the prevalence of *C. jejuni* to within 5%, at a level of significance of 0.05, was 153. One hundred fifty-three packages of fresh chicken wings (600 to 650 g net weight) were purchased from a range of retail food outlets over a 10-week investigation period.

**Isolation of thermophilic Campylobacter**

Samples were tested for the presence of thermophilic campylobacter as follows: The contents of each whole pack of

<p>| Table 1. Isolation rates of <em>C. jejuni</em> (j) and <em>C. coli</em> (c) from retail broiler chickens. |
|----------------------------------------|-----------------------------------------|----------------------------------------|</p>
<table>
<thead>
<tr>
<th>Chicken product sampled</th>
<th>% Isolation</th>
<th>Species isolated</th>
</tr>
</thead>
<tbody>
<tr>
<td>DeBoer and Hahne (8)</td>
<td>Various products</td>
<td>61</td>
</tr>
<tr>
<td>Harris et al. (11)</td>
<td>Whole</td>
<td>23.1</td>
</tr>
<tr>
<td>Hood et al. (12)</td>
<td>Whole</td>
<td>48</td>
</tr>
<tr>
<td>Jones et al. (13)</td>
<td>Whole</td>
<td>31.5</td>
</tr>
<tr>
<td>Kinde et al. (14)</td>
<td>Wings</td>
<td>82.9</td>
</tr>
<tr>
<td>Marinescu et al. (15)</td>
<td>Whole</td>
<td>87.8</td>
</tr>
<tr>
<td>Park et al. (17)</td>
<td>Whole</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>Whole</td>
<td>54</td>
</tr>
<tr>
<td>Simons and Gibbs (20)</td>
<td>Whole</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Whole</td>
<td>80</td>
</tr>
<tr>
<td>Stern and Line (23)</td>
<td>Whole</td>
<td>98</td>
</tr>
<tr>
<td>Svedham et al. (24)</td>
<td>Whole</td>
<td>62.5</td>
</tr>
<tr>
<td>Wesley et al. (25)</td>
<td>Whole</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Wings</td>
<td>55.5</td>
</tr>
</tbody>
</table>
chicken wings (average net weight 625 g) was placed in 2 L of Campylobacter Enrichment Broth (LabM, Bury England) containing 50 ml lysed packed blood cells. Selectivity was achieved by the addition of four vials of LabM Selective Supplement X131 (Cefoperazone, Vancomycin, Trimethoprim and Cylohexamide - 20;20;20;50 mg l\(^{-1}\)). The packages were then incubated for 4 h at 37°C and a further 44 h at 42°C. Whole packs were analyzed, rather than testing a proportion of chicken wings from each package, since bacteria are seldom uniformly dispersed in any milieu. In general, the larger the sample examined the greater the chance of isolating the desired organisms (10).

Following enrichment, a 0.1-ml loop of enrichment broth from each package was streaked onto duplicate Campylobacter Blood Free Selective Medium (BFSM) plates (LabM, Bury England) (Antibiotic Supplement X121 - Cefoperazone/Amphterocin). The plates were then incubated at 37°C for 48 h under microaerobic conditions (5% \(O_2\), 10% \(CO_2\), 85% N\(_2\)). An incubation temperature of 37°C was chosen since higher recovery rates have been reported at 37°C than at 42°C with BFSM (4).

**Bacterial identification**

Colonies were microscopically examined for typical cell morphology. Those exhibiting the characteristic gram-negative curved spiral rod morphology of Campylobacter spp. were restreaked to ensure purity. Purified isolates were speciated using a range of biochemical tests including catalase, oxidase, motility, hippurate hydrolysis, hydrogen sulphide production, and antibiotic sensitivity tests (Nalidixic acid 30 \(\mu\)g; Cephalothin 30 \(\mu\)g). Isolates conforming to the biochemical profile for Campylobacter spp. were noted and subsequently confirmed to species level using API Campy: Identification System for Campylobacter (bioMérieux SA, Marcy-l’Etoile France).

**RESULTS**

Campylobacter spp. were isolated from 99 (64.7%) of the 153 packets of chicken wings sampled. Twenty-one (13.7%) of these Campylobacter isolates could not be speciated by the API Campy system. Seventy isolates (45.7%) were identified as C. jejuni/coli — 45 (29.4%) C. jejuni and 25 (16.3%) C. coli. Other minor isolates were 3 (2%) C. jejuni subsp. doylei, 2 (1.3%) C. fetus subsp. fetus and 3 (2%) C. cryaerophilia (Table 2).

**DISCUSSION**

Retail chickens are commonly contaminated with Campylobacter spp. (24) with 64.7% of the packets of chicken wings sampled in this survey as positive. C. jejuni/coli may remain viable on chicken products during commercial refrigeration (26) thus posing a potential risk to consumers following purchase of such products. The areas of risk would be twofold: (i) if raw chicken was a source of cross-contamination for other foods in the kitchen, and (ii) if the chicken was undercooked before ingestion. C. jejuni/coli are easily destroyed by conventional cooking methods (1). However, a recent survey on consumer awareness of food hygiene revealed that less than one-third of respondents appreciated the need to handle raw meats separately from other foods (16). Therefore, even if chicken products are cooked correctly, cross-contamination to other foodstuffs may occur during preparation. Research has shown that cross-contamination with C. jejuni from raw chicken to utensils, hands and cooked foods occurs readily in domestic situations (8).

The minimal infective dose for C. jejuni may be as low as 500 to 800 organisms (3,19). Excellent hygiene and cooking practices are, therefore, essential following the purchase of chicken products such as chicken wings to ensure that the handling or consumption of such products does not result in Campylobacter enteritis.

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**REFERENCES**


**TABLE 2. The API Campy Identification of Isolates (Total No. of isolates: 99).**

<table>
<thead>
<tr>
<th>Campylobacter genus only</th>
<th>C. jejuni</th>
<th>C. coli</th>
<th>C. jejuni subsp. doylei</th>
<th>C. fetus subsp. fetus</th>
<th>C. cryaerophilia</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>45</td>
<td>25</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

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proliferation of L. monocytogenes, would, of course, compromise the storage-life of the product, thus negating any beneficial effects of packaging beef under CAP.

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REFERENCES