Original Contribution

PRESENCE AND DIFFERENTIATION OF CAMPYLOBACTER SPP. DURING PROCESSING OF DUCKS FOR FOIE GRAS LIVER IN BULGARIA

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ABSTRACT
The aim of this study was to investigate the presence of Campylobacter spp. during the slaughter processing of moulard ducks in Bulgaria. The prevalence of Campylobacter was determined from live bird to prepackaged carcasses and cuts for 4 ducks flocks. Intestinal content and skin of the live ducks was positive in 72.5% and 12.5% of the samples, respectively. After scalding and hot wax Campylobacter was isolated in 12.5% of the samples of skin surfaces. The breast meat with skin (magret) was contaminated in 7.5%. The chilled liver showed 12.5% positive samples. C. jejuni was the most commonly found species (81%) followed by C. coli (19%). C. jejuni subsp. jejuni predominated subspecies C. jejuni subsp. doylei in 85.3% and 14.7% respectively.

Key words: Slaughterhouse, magret, liver, ducks, C. jejuni, C. coli

INTRODUCTION
Fatty liver production is the process of force-feeding (cramming) ducks, which are normally at 10 weeks of age, for a period of 14 days. During this period the weight of the liver will increase from an initial weight of about 40g to a final weight of between 300-700g. Moulard ducks are one of the most popular Foie Gras birds used for fatty liver production. Poultry and poultry products are of great importance as a source of food borne pathogens like Campylobacter spp. Particularly, thermophilic Campylobacter (C. jejuni and C. coli) are considered as a major cause of human Campylobacter gastroenteritis and consumption of undercooked poultry is a leading cause of infections. (1; 2; 3)

Poultry entered the slaughterhouses are carrier of Campylobacter as in their intestinal tract, as well onto their skin and feather (4; 5; 6; 7). This create premise of wide bacterial spread during plant processing. At the slaughterhouse there is a hazard of bacterial contamination of poultry meat, as a different technological steps influence onto increasing or decreasing of microbial contamination (8; 9). Some investigators noted scalding, defeathering and evisceration equipments as a point with significant hazards of Campylobacter cross contamination (9; 10; 11).

Plant processing of Foie gras ducks differ from standard slaughter processing of waterfowl poultry, as important point is strong liver protection and lots of handy operation by workers. The aim of this study was to investigate Campylobacter carrier in Foie Gras ducks at age of slaughter as well prevalence of Campylobacter spp. contamination during plant processing.

MATERIAL AND METHODS
From 4 different Moulard ducks flocks were collected samples after transport and during processing at slaughterhouse. Ducks were at the age of slaughter (84 days) after 2 week period of force feeding for fatty liver generation.

For investigation of Campylobacter spp. carrier after transport 10 birds of each flock were marked and swab samples of skin and feather surfaces were taken off. During the slaughtering process the caecum of the same birds were removed after evisceration.

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For investigation of *Campylobacter* spp. prevalence during the slaughtering process from the same birds were collected swab samples of skin surfaces after feather picking (after hot wax removing) and 25 g samples of breast meat with skin (magret) and liver (foie gras) after chilling.

Samples were worked out in campyloacter enrichment broth (Merck) with selective supplement (Merck) and over selective agar media (Merck) containing selective supplement (Merck).

Incubation was at 37°C and 42°C for 48h at microaerophilic condition achieved by using commercial gas-generating kits. Pure cultures of presumptive *Campylobacter* spp. were biochemically tested for oxidase and catalase production, hyppurat and indoxylacetate hydrolysis and by API Campy® (Bio Mérieux, 20800).

**RESULTS**

Samples from skin and feather of the live birds after transport were in 12,5% *Campylobacter* positive, as all obtained isolates were identified as *C. jejuni* (Table 1).

<table>
<thead>
<tr>
<th>Samples</th>
<th>n</th>
<th><em>Campylobacter</em> positive</th>
<th><em>C. jejuni</em>, (%)</th>
<th><em>C. coli</em>, (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin and feather surfaces</td>
<td>40</td>
<td>5 (12.5%)</td>
<td>100%</td>
<td>-</td>
</tr>
</tbody>
</table>

In the intestinal tract (cecal content) of the same birds *Campylobacter* spp. was detected in 72.5% of the samples and isolates of *C. jejuni* (72.4%) predominated *C. coli* (27.6%). Ducks flocks differed in their intestinal carriers of *Campylobacter* spp. and we found 60%, 80%, 90% and 60% positive samples in respectively flocks from I to IV. (Table 2).

**DISCUSSION**

The obtained results for *Campylobacter* showed relatively high percentage of carriage (72.5%) in intestinal tract in fatten ducks and relatively low percentage of carriage on skin and feathers (12.5%) after transportation. Tsai & Hsiang (2005) isolated *Campylobacter* in 43.5% of investigated birds and in 92% of all
Table 3 Prevalence of Campylobacter spp. in liver, skin and meat samples from 4 different flocks of ducks for liver during processing

<table>
<thead>
<tr>
<th>Samples</th>
<th>Flocks (batches)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>n (%)</td>
</tr>
<tr>
<td>Caecal content</td>
<td>6 (60%)</td>
</tr>
<tr>
<td>Skin surfaces</td>
<td>-</td>
</tr>
<tr>
<td>Breast meat with skin (magret)</td>
<td>-</td>
</tr>
<tr>
<td>Liver</td>
<td>1(10%)</td>
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</tbody>
</table>

investigated farms. Differentiation by species showed that 94.8% were C. jejuni, and hardly 5.2% - C. coli. Fallacara et al., (2001) found out C. jejuni in 50% of all samples of wild ducks. Authors did not found significant differences in bacteria carriage between different kinds of birds. Uradzinsk et al., 1987, defined Campylobacter carriage in different kind of birds for slaughtering and found Campylobacter positive samples in 86% of all ducks, 60.7% of all broilers, 58% of all geese and 14% turkeys.

During the survey, after picking the feathers and following hot wax, we found Campylobacter in two flocks (II и III) in 30% and 20% respectively. Birds showed high carriage of Campylobacter in intestine track 80% and 90%, respectively. That high “start” contamination in the beginning of the slaughtering process determines the contamination in birds carcasses after scalding and defeathering. According to Slavik et al. (1994) at scalding at 56°C temperature of the water, appears the biggest reduction effect, but nevertheless Campylobacter presence on birds skin surface remains significant (log10 3.39).

Our results showed that after scalding at 64°C of water temperature and following defeathering and hot wax (60°C) 12.5% of all samples were Campylobacter positive. All survived bacteria, including Campylobacter remain on bird carcass and therefore are prerequisite for spreading contamination to other birds in following slaughter processing. Szteyn & Uradzinsk, 1994, proved Campylobacter contamination in 32.7% of samples of duck carcasses before disemboweling and after disemboweling in 23.6% of birds Campylobacter are detected in birds body cavities. According to Kasrazaden & Genigeorgis Campylobacter are isolated in 6.7% from duck skin during slaughtering process. In that certain slaughtering house the disemboweling is hand made in order to ensure maximum preservation of the liver from mechanical injuries.

A large number of scientists emphasize that workers in the slaughtering house contribute to bird cross-contamination (12; 13). The results from our study confirm that assumption. Campylobacter were investigated in 7.5% and 12.5% of samples, respectively in breast meat (magret) and liver during the processing from the workers.

A large number of scientists investigated that the presence of Campylobacter spp. in liver differs between 34.5% and 36% (14; 15; 16). Our results showed significantly lower percentage of Campylobacter positive samples, which is most probably due to the changes of liver structure because of fattening.

The results from the study of fatty liver showed that the most commonly isolated Campylobacter spp. was C. jejuni followed by C. coli. If differentiating C. jejuni in subspecies, C. jejuni subsp. jejuni appeared in 69.3% of the samples, followed by C. jejuni subsp. doylei in 30.7% of samples. Atabay et al., (1997) proved C. jejuni subsp. jejuni in all of investigated ducks in the farm. Carbita et al., 1992, determined carriage of thermophilic Campylobacter in 40.5% of the ducks, as C. jejuni predominated C. coli. Ridsdale et al., 1998, isolated C. jejuni subsp. jejuni, C. coli and C. upsaliensis in caecal content, while from the carcasses only C. jejuni subsp. jejuni and C. coli. are isolated.
CONCLUSION

Study results showed that Foie Gras ducks are carriers of Campylobacter spp., but at the same time the specific slaughtering process seems to restrict bacteria spreading and following contamination of cut products, such as fatty liver and magret that are of greatest significance in this type of poultry production. Low percentage of Campylobacter detection in fatty liver is probably related to the increase of fat content in the liver and further unsuitable conditions for bacteria growth. C. jejuni subsp. jejuni is predominately isolated thermophilic Campylobacter spp. during slaughter processing of ducks for foie gras liver.

REFERENCES


