Review

Thermotolerant Campylobacter spp. – Report on monitoring studies performed in 2004–2005 in Poland

Elżbieta Maćkiw *, Janusz Popowski, Lucjan Szponar

Department of Microbiology, Food and Nutrition Safety Department, National Food and Nutrition Institute, ul. Powsińska 61/63, 02-903 Warszawa, Poland

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Abstract

Numerous epidemiological data confirm the gravity of the food-born infections caused by thermotolerant Campylobacter spp. In Poland in 2004–2005 a monitoring study was carried out to detect the presence of thermotolerant Campylobacter spp. in poultry carcasses. In 2004, 385 and in 2005, 240 poultry carcasses were tested. Monitoring tests showed that in 2004 as much as 74% of poultry carcasses were infected with Campylobacter spp. The results of 2005 monitoring tests were very close to those in the previous year and 75.4% of all tested samples were infected.

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Contents

1. Introduction .......................................................... 219
2. Materials and methods ........................................... 220
  2.1. Statistical calculations ........................................ 220
3. Discussion of results ............................................... 220
4. Conclusions ......................................................... 221
References .............................................................. 221

1. Introduction

In recent years in most European countries a clear rise in the number of food-born infections caused by thermotolerant Campylobacter spp. mainly C. jejuni and C. coli was observed (Atterbury, Connerton, Dodd, Rees, & Conner- ton, 2003; Moore et al., 2005; Patrick et al., 2004).

This trend is confirmed by the most recent data collected in 25 EU Member States. The above test data shows that the number of human campylobacterioses in 2004 reached the level of 183,961, and the total campylobacteriosis incidence rate was 47.6 per 100,000 people. Additionally, it should be noted that there are clear differences between EU Member States, since in the Czech Republic the campylobacteriosis incidence rate was 249.6 per 100,000 people, whereas in Poland, France and Greece the incidence rate was from 0.1 to 3.6 (EFSA, 2006).

Also in the United States the campylobacteriosis incident rate has hovered at high level, with approximately 2.4–2.5
million Campylobacter spp. incidents recorded in human population (Bhaduri & Cottrell, 2004; Zhao et al., 2001).

Campylobacteriosis in humans is caused by the consumption of food live C. jejuni cells, and the disease symptoms may be caused already by 500 cells of microorganism (Bhaduri & Cottrell, 2004; Daczkowska-Kozon, 2002; FSAI, 2002).

The source of most Campylobacter spp. infections is food of animal origin including poultry in particular (Atanassova & Ring, 1999; Bhaduri & Cottrell, 2004; Bull et al., 2006; Chan, Tran, Kanenaka, & Kathariou, 2001; Daczkowska-Kozon, 2002; EFSA, 2006; FSAI, 2002; Josefsen et al., 2004; van Gerwe et al., 2005). In Europe the flock contamination rate of poultry farms ranges from 18% to 90%, and is subject to seasonal fluctuations. A significant rise of poultry infections is observed in July and August (Barrios et al., 2006; Patrick et al., 2004).

The current data coming from various European countries show quite a varied level of poultry carcasses contamination with thermotolerant Campylobacter spp. The tests performed in 2004 in 25 EU Member States showed that Campylobacter spp. were present in 2.2–62.2% of fresh poultry meat (EFSA, 2006).

The results of tests carried out in the United States showed that in 70.7% of samples of tested raw meat the presence of Campylobacter spp. was detected (Zhao et al., 2001). Meanwhile a much lower contamination level of poultry carcasses was found out in the tests carried out in South Africa. The above data shows that 32% of tested fresh and frozen poultry carcasses is contaminated with thermotolerant Campylobacter spp. The tests were carried out to detect the presence of Campylobacter spp. in poultry carcasses, from the skin near the neck and breast muscle.

The detection of Campylobacter presence in one or both samples from the carcasses was evaluated as a positive result testifying carcass infection. Failure to detect Campylobacter in any of the two samples taken from a certain carcass was a proof of negative result that is the lack of contamination.

2. Materials and methods

In 2004–2005 in Poland in selected provinces monitoring tests were carried out to detect the presence of Campylobacter spp. in poultry carcasses. The tests were carried out by the laboratories of Provincial Sanitary and Epidemiological Stations, pursuant to the procedure described in the standard PN ISO 10 272: 2002 “Food and feed microbiology. Horizontal method for detection of thermotolerant Campylobacter spp.”. For testing purposes two 25 g samples were taken from poultry carcasses, from the skin near the neck and breast muscle.

The detection of Campylobacter presence in one or both samples from the carcasses was evaluated as a positive result testifying carcass infection. Failure to detect Campylobacter in any of the two samples taken from a certain carcass was a proof of negative result that is the lack of contamination.

2.1. Statistical calculations

Confidence semi-interval was calculated for the determination of bacteria present in the population of poultry carcasses in Poland, using the formula for fraction standard error

\[ SE_p = \sqrt{\frac{pq}{n}} \]

where \( n \) is the total number of all samples tested and \( p \) and \( q \) are the fractions of contaminated and non-contaminated samples.

The confidence semi-interval is \( \mu SE_p \) i.e. \( \mu \sqrt{\frac{a}{n}} \) where \( \mu \) read out of \( t \) distribution tables for large populations amounts to 1.96 with confidence interval \( (\alpha - 1) = 0.95 \).

3. Discussion of results

In 2004 the monitoring tests covered the total number of 385 poultry carcasses. In provinces where monitoring tests were carried out the number of contaminated carcasses ranged from 20% to 93% (Table 1).

Meanwhile in 2005 the monitoring tests covered 240 poultry carcasses, whereas the number of contaminated carcasses ranged from 0% to 100% (Table 1).

The results of monitoring tests in 2005 with 75.4% of all tested samples contaminated with Campylobacter spp. are very close to the results obtained in the previous year when this figure accounted for 74%, and the number of poultry carcasses being much higher and amounting to the level of 385.
The statistical analysis of results showed that in 2004 the fraction of poultry carcasses in Poland, contaminated with *Campylobacter* spp. could fluctuate by 4.4%, i.e. it amounted to 74 ± 4.4%, and in 2005 it may fluctuate by 5.5% that is it amounted to 75.4 ± 5.5%.

The monitoring tests performed in 2004–2005 allowed to estimate the scale of contamination of poultry carcasses with *Campylobacter* spp. in Poland. Unfortunately the obtained result is much higher than the analogical data collected in most EU countries (2.2–62.2%) (EFSA, 2006).

In Europe slightly lower *Campylobacter* contamination rates of broiler flocks is observed in Nordic countries such as Sweden and Finland, partly as a result of cold climate, but also due to stringent biosecurity programmes and good manufacturing practice (GMP).

Over the past 3 years, Denmark, Norway and Sweden have all experienced a decrease in the number of *Campylobacter* positive broiler flocks. This may, in part, be explained by the implemented monitoring programmes and effective control strategies in food animals, especially broiler chickens. Monitoring programmes for *Campylobacter* in broilers have been implemented in Austria, Denmark, Finland, Italy (Veneto region), Norway, The Netherlands and Sweden. The programmes share common traits and generally focus on a high level of biosecurity at the farm level to prevent flocks from being infected and logistic slaughter i.e. slaughtering positive flocks at the end of the day to prevent cross-contamination at the slaughterhouse (EFSA, 2006).

In Estonia effective quality-control programme in large-scale poultry processing plant accounted for the lower contamination levels of fresh chicken meat compared to contamination level with the same type of products of small-scale plant. Of the raw chicken products of Estonian origin, 15.8% were positive for *Campylobacter*. The prevalence of *Campylobacter* in the products of the small-scale poultry meat plant (35.6%) was significantly higher than in those originated from the large-scale company (6.3%) 

\( P < 0.001 \) (Roasto, Praakle, Korkeala, Elias, & Hänninen, 2005).

Unfortunately still the source of contamination remains food of animal origin, primarily poultry carcasses (Atanassova & Ring, 1999; Bhaduri & Cottrell, 2004; Bull et al., 2006; Chan et al., 2001; FSAI, 2002; Josefsen et al., 2004; van Gerwe et al., 2005).

Therefore, it is legitimate to continue monitoring the contamination rate of poultry carcasses with *Campylobacter* bacteria. However, it is not necessary to eliminate the contaminated poultry carcasses from the market. However, special attention has to be paid to educate the society about the ways of *Campylobacter* infection spreading (consumption of raw or undercooked meat and improper hygienic habits).

### 4. Conclusions

- In 2004 and 2005 the presence of thermotolerant *Campylobacter* spp. in poultry carcasses was monitored. In total the selected laboratories of the Provincial Sanitary and Epidemiological Stations tested 385 and 240 poultry carcasses.
- The monitoring tests carried out in Poland in 2004 showed that 283 poultry carcasses were contaminated with *Campylobacter* bacteria that accounted for 74 ± 4.4% of all samples tested.
- The results of monitoring tests in 2005 were very similar to those obtained in the previous year, and amounted to 75 ± 5.5%, and the number of tested poultry carcasses was lower and amounted to 240.
- The literature data about Western Europe and the United States confirm a high contaminate rate of food of animal origin including primarily poultry carcasses contaminated with *Campylobacter* bacteria.

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