OCCURRENCE OF **LISTERIA SP. IN DAIRY PRODUCTS AND CHICKEN CARCASSES**

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Abstract

The investigations were performed on 117 samples of dairy products and 60 samples of chicken carcasses obtained from Wrocław supermarkets. The whole chicken carcass was treated as a sample. No *Listeria* strains were detected in samples of dairy products. On the other hand, *Listeria* strains were present in 35 of the examined samples of chicken carcasses. Twelve strains were defined as *Listeria monocytogenes*.

Key words: chicken carcasses, dairy products, *Listeria*.

Recently *Listeria monocytogenes* has been considered a pathogen transmitted by food. Since the beginning of 80’s, after several foodborne listeriosis outbreaks in Canada (coleslaw salad contaminated with *Listeria*, 1981) and the United States (*Listeria* in soft cheese, 1985) WHO has decided to regard this pathogen as a severe threat of food and consumer’s safety (18). Nowadays, in the USA and European Union countries only a few cases of foodborne listeriosis are noticed per year. In some outbreaks mortality rates can amount even 40% (19). In the USA 46 cases and 7 deaths occurred during foodborne listeriosis outbreak in July and August 2002. In another outbreak in May 1997, in northern part of Italy, 1566 patients suffered from listeriosis.

Milk (mainly unpasteurized), dairy products (specially soft ripened cheeses), poultry meat and products, and raw vegetables are considered to be the most frequently contaminated with *Listeria* organisms (1). Contamination of foodstuffs occurs mainly after heating process as a result of cross-contamination. The presence of microorganisms in ready to eat food is a result of lack of hygiene because *L. monocytogenes* was noticed in slaughter animals and human faeces (6). It is estimated that ca. 5-9% population of healthy people can be carriers of *L. monocytogenes* and among workers of slaughter-houses it can even amount 16%. Raw food such as milk, meat, vegetables can be treated as a threat as well. The heating processes such as cooking, pasteurization should eliminate the bacteria. For example, during boiling the sausage at 72°C the inactivation of the bacteria occurs after 10 min (14). Also pasteurization parameters for whole and skim milk are adequate to ensure inactivation of *L. monocytogenes* (D71.7°C values ranged from 0.9 to 2.7 s) (17), but every divergence from thermal parameters can make *Listeria* easier to survive in food.

Sometimes it is noticed that also other species of *Listeria* such as *L. ivanovii*, *L. innocua* or *L. seeligeri* can cause diseases of animals and humans.

In Poland, there are stated only a few cases of foodborne listeriosis outbreaks per year (9, 10). Probably, the real number of them is much higher but they are unrecognized.

The goal of this study was to determine the prevalence of *Listeria* sp. in dairy products and chicken carcasses coming from retail trade.

Material and Methods

One hundred and seventy-seven samples of food from Wrocław supermarkets were examined: 117 samples of dairy products (pasteurized milk, cheeses, butter, fermented milk drinks) and 60 samples of chicken carcasses.

Samples of dairy products were examined according to PN-ISO 10560 method using *Listeria* Enrichment Broth and Oxford agar as a culture media. The whole chicken carcass was treated as a sample. It was immersed in buffered peptone water and incubated for 4 h at 37°C. After this time the carcass was taken away and the remaining peptone water was incubated at the same temperature for the next 16 h. Afterwards, 10 ml of this medium was inoculated into 90 ml of *Listeria* Enrichment Broth (Merck), incubated for 48 h at 30°C, and then the broth was cultured on Oxford Agar (BTL). After 48 h of incubation at 37°C colonies
morphologically resembling *Listeria* growth were submitted to confirmatory examinations using Gram staining, catalase test, evaluation of haemolytic properties and motility at 25°C and 37°C. The strains expressing these standard features were tested for their biochemical activity using API *Listeria* test (BioMérieux) and API LAB Plus bacterial computer identification program. Similar procedure for the identification of the bacteria was applied in the examination of dairy products.

Results

No *Listeria* strains were found in the examined samples of dairy products, but these bacteria were present in 35 (58.3%), samples of chicken carcasses. The predominant species among the isolated *Listeria* strains was *L. innocua* which was found in 14 (40%) samples. *L. monocytogenes* was isolated from 12 (34.3%) samples, *L. welshimeri* from 6 (17%) samples and *L. grayi* from 3 samples (9%) (Fig. 1).

Biochemical properties of the isolated *Listeria* strains are presented in Table 1.

![Fig. 1. Frequency of isolation of *Listeria* sp. from chicken carcasses.](image)

### Table 1

<table>
<thead>
<tr>
<th>Biochemical test</th>
<th><em>Listeria monocytogenes</em> (n=12)</th>
<th><em>Listeria innocua</em> (n=14)</th>
<th><em>Listeria welshimeri</em> (n=6)</th>
<th><em>Listeria grayi</em> (n=3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive result (%)</td>
<td>Negative result (%)</td>
<td>Positive result (%)</td>
<td>Negative result (%)</td>
</tr>
<tr>
<td>DIM</td>
<td>0 (0)</td>
<td>12 (100.0)</td>
<td>14 (100.0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>ESC</td>
<td>12 (100.0)</td>
<td>0 (0)</td>
<td>14 (100.0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>αMAN</td>
<td>12 (100.0)</td>
<td>0 (0)</td>
<td>14 (100.0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>DARL</td>
<td>12 (100.0)</td>
<td>0 (0)</td>
<td>14 (100.0)</td>
<td>0 (0)</td>
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<tr>
<td>XYL</td>
<td>0 (0)</td>
<td>12 (100.0)</td>
<td>0 (0)</td>
<td>14 (100.0)</td>
</tr>
<tr>
<td>RHA</td>
<td>12 (100.0)</td>
<td>0 (0)</td>
<td>12 (85.7)</td>
<td>2 (14.3)</td>
</tr>
<tr>
<td>MDG</td>
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<td>0 (0)</td>
<td>14 (100.0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>RIB</td>
<td>3 (25.0)</td>
<td>9 (75.0)</td>
<td>0 (0)</td>
<td>14 (100.0)</td>
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<tr>
<td>G1P</td>
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<td>12 (100.0)</td>
<td>0 (0)</td>
<td>14 (100.0)</td>
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<tr>
<td>TAG</td>
<td>1 (8.3)</td>
<td>11 (91.7)</td>
<td>0 (0)</td>
<td>14 (100.0)</td>
</tr>
<tr>
<td>βHEM</td>
<td>11 (91.7)</td>
<td>1 (8.3)</td>
<td>0 (0)</td>
<td>14 (100.0)</td>
</tr>
</tbody>
</table>
Discussion

The lack of listeria isolation from milk and dairy products suggests that thermal treatment used in processing procedures was effective. Probably, this is also a consequence of improvement of sanitary conditions in Polish dairies. With the introduction of risk assessment systems such as GMP/GHP and HACCP according to EU requirements, production methods which are available at the Polish market are made of pasteurized milk and also are often produced with use of different technological processes which are able to inactivate these bacteria, such as extra heating, adding of lactic starter cultures, etc. Kwiatek et al. (13) in surveys carried out in Poland 11 years ago reported that L. monocytogenes contaminated 56.2% of the examined farm-bulk milk samples. On the other hand, the similar investigations of collected milk carried out in other countries did not report so high percentage of contamination. For example in France, a time-series bacteriological analysis carried out on milk collected on farms from 1997 to 2001 showed the presence of L. monocytogenes in 0–2.4% of samples. Besides, a seasonal effect influencing the obtained results (with the peak in winter) was observed as well (15). A survey of raw milk carried out in the USA presents average contamination of milk with Listeria species about 4% (17). In Denmark, quarter milk samples were examined for the presence of L. monocytogenes during 23-year period. The percentage of cows infected with this pathogen varied from 0.01 to 0.1% (mean 0.04%) (8).

Among dairy products L. monocytogenes is the most frequently present in products made of unpasteurized milk and in soft ripened cheeses. In the Netherlands, it was found that L. monocytogenes was present in 7 of 69 examined samples of soft cheese produced from unpasteurized milk (2). Likewise, de Boer and Kuik (3) found this pathogen in 2 of 28 samples of ripened cheeses.

Our investigations of chicken carcasses have confirmed the results obtained by other authors. Similar percentage (60%) of contamination of chicken carcasses with Listeria bacteria reported Kwiatek (11). But, on the other hand, there was reported in our researches a higher percentage of isolation of L. innocua than L. monocytogenes - 40% and 31.4% of all isolated strains, respectively. The considerably higher level of contamination of chicken carcasses from supermarkets in Spain reported Capita et al. (4). Listeria were isolated from 95% of the examined carcasses and 32% of them were recognized as L. monocytogenes and 66% as L. innocua.

The surveys of chicken carcasses and poultry raw meat from shops in Finland proved that L. monocytogenes was present in 62% of the examined samples (16). Similar researches in Belgium reported that 38.2% of raw chicken carcasses were contaminated with this pathogen.

The surveys of raw minced poultry meat performed in Japan indicated the presence of L. monocytogenes in 37% of the examined samples (7).

The frequency of isolation of the examined bacteria and valuation of the level of contamination depends on quantity of samples and on the technique of sampling (swab, cutting, rinse). At present the most popular method is taking swabs from carcass surface or cutting 25 g of meat. The examination of whole chicken carcass as a single sample made possible to detect its real contamination with listeriae. It was also proved that L. monocytogenes should be regarded as a very serious threat to consumer’s health.

References


