ПРОБЛЕМИ БЕЗПЕЧНОСТІ ТОВАРІВ

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THE QUALITY OF FERMENTED DAIRY PRODUCTS AVAILABLE IN THE POLISH MARKET IN CONDITIONS OF IMPLEMENTED HACCP SYSTEM

Introduction. The analysis of threats allows identification of factors the dairy plants can be exposed to during manufacturing of dairy product. Among various contamination types, the microbiological ones should be mentioned in the first place. During production of dairy products, such bacteria as: *Lactococcus sp.*, *Lactobacillus sp.*, *Pseudomonas sp.*, *Enterobacter sp.*, *Flavobacterium sp.*, *Micrococcus sp.*, *Streptococcus sp.*, *Corynebacterium sp.*, *Bacillus sp.*, *Clostridium sp.*, *Staphylococcus sp.* and *Aerobacter sp.* can occur, including also pathogenic bacteria: *Salmonella sp.*, *Campylobacter sp.*, *Listeria sp.*, *Yersinia enterocolitica* or *Staphylococcus aureus*. The contamination caused by mould, its spores and yeast are also present during technological process.

Therefore, the safety of products manufactured in dairy plants depends on many factors: the organization of production (designing the technological line and organization of the work itself), the specific character of produced goods (contamination and impurities contained therein), the applied washing and disinfecting agents, as well as automation of processes performance and their appropriate control.

The aim of presented paper was to assess the quality of three types of fermented dairy products available in Polish market, in respect of their microbiological quality.

Staphylococci count was chosen as the main quality index, since the EC Decree no. 2073/2005 dated November 15, 2005, describes conse-

quences of the presence of this micro-organism in food, stating that metabolism of this bacteria is capable of shaping food safety.

Additionally, the micro-flora influencing organoleptic properties (fungi), and – in the case of products destined for long-term storage – the psychotrophic bacteria were also determined.

Material and test method. Three types of fermented dairy products were subjected to tests: acidophilic milk, cottage cheese and lactic acid/rennet cheese coming from the market. Due to the different expiration periods and different compositions of the products, the additional tests for fungi (acidophilic milk) and psychrotrophic bacteria (lactic acid cheese) were performed, apart from determination of staphylococci count.

Inoculation of tested material was performed using the traditional method of culture with application of appropriate selective media:

- for determination of mould and yeast according to PN–93/A–86034–07 [1]: YGC produced by bioMérieux Company;
- for determination of coagulase-positive staphylococci: agar medium with addition of fibrynogen and rabbit serum according to PN–93/A–86034/13 [2] produced by Baird Parker Company;
- for determination of psychrotrophic bacteria count – nutritive agar produced by Merck Company [3].

The precision of results of mould and yeast determination, using plate method at the temperature of 25 °C was consistent with a standard.

Test results. The acidophilic milk is produced from pasteurized milk, using *Lactobacillus acidophilus* bacteria cultures. Due to sour taste of the curd, the milk most often contains additives of various fruit.

The acidophilic milk coming from the market showed a satisfactory quality. Only 15 % of samples of tested acidophilic milk were stated as containing low staphylococci count. Several samples contaminated with staphylococci were taken from raspberry-flavored acidophilic milk. However, the size of staphylococci population did not exceed 2.5 $\log_{10}$ cfu/g. In grapefruit-flavored milk, the presence of fungi at the level of ca. 1.5 $\log_{10}$ cfu/g was detected (*table 1*). Number of samples of this milk containing fungi was insignificant.

The lactic acid cheese manufactured with various technologies was subjected to tests. Among tested products, there were both cheese cream, homogenized cheese and the cottage cheese. The determined level of

[1] PN–93/A–86034–07. Mleko i przetwory mleczarskie. Badania mikrobiologiczne. Pleśnie i drożdże –oznaczanie liczby metoda płytkową w temperaturze 25 °C.

[2] PN–93/A–86034/13. Mleko i przetwory mleczarskie. Badania mikrobiologiczne. Staphylococcus aureus – wykrywanie obecności, oznaczanie najbardziej prawdopodobnej liczby (NPL), oznaczanie liczby metodą płytkową.

[3] PN–93/A–86034/06. Mleko i przetwory mleczarskie. Badania mikrobiologiczne Drobnoustroje psychrotrofowe-oznaczanie liczby metodą płytkową w temperaturze 6,5 i 21 °C.

staphylococci did not exceed one or several dozens of colony forming units in one gram (*table 2*).

Table 1

***Staphylococcus aureus* and *fungi* counts in different kind of acidophilic milk**

Kind of acidophilic milk	Count of staphylococci, Log_{10} cfu/mL	Count of fungi, Log_{10} cfu/mL
Acidophilic milk	0	0
Grapefruit-flavored milk	0	1.57±0.1
Strawberry-flavored milk	0	0
Raspberry-flavored milk	2.34±0.15	0

Table 2

Count of the staphylococci in different kind of curd cheese

Kind of curd cheese	Count of staphylococci in cheese, Log_{10} cfu/g
Cream cheese	1.00±0.10
Homogenized cheese	0.77±0.07
Cream-sour cheese	0.77±0.02
Cottage cheese	0.35±0.05

Among tested lactic acid cheese samples, there were the products packed into different types of packaging. Tests included both products packed with non-hermetical method: into parchment paper and Styrofoam tray, and the products hermetically-packed into plastic packaging. The staphylococci level did not exceed 1.5 log_{10} cfu/g. However, the significant differences in count of psychrotrophic bacteria populations were observed.

The level of psychrotrophic micro-flora was the greatest in products packed into parchment paper.

Lactic acid cheese packed with non-hermetical method showed the level of 4.5 log_{10} cfu/g on the average. Lactic acid cheese packed into cryovac did not show any presence of these micro-organisms, similar to the products packed into polystyrene trays (*table 3*).

Table 3

The microorganisms count in tvarogs origin with different packaging system

Kind of packages	Staphylococci count, Log_{10}cfu/g	Psychrotrophic count, Log_{10}cfu/g
Cryovac	0	0
Parchment paper	4.68±0.15	1.25±0.03
PA/PE	3.3±0.10	1.11±0.02
Polistyren tray	0	0.6±0.05
Parchment paper and PA/PE	2.13±0.05	0.77±0.05

Discussion of results. The bacteriological tests performed on acidophilic milk, in respect of the presence of fungi and staphylococci therein, allowed assessment of sanitary condition of products determined as good.

Yeast and mould compose the undesired micro-flora in dairy products, constituting the significant threat in food and determining its stability to the great extent. The obtained results of mould and yeast determinations in tested products are satisfactory, and they prove the production consistent with GHP. Only one tested sample per twenty showed the presence of yeast and mould at the level of 2.27 $\log_{10}$ cfu/g.

The presence of yeast and mould was observed only in flavored milk (grapefruit), what results in a conclusion that their presence in a product could be caused by fruit additive.

The growth of potentially pathogenic coagulase-positive staphylococci was observed in tested acidophilic milk only in 15 % of samples of one assortment.

Small count of bacteria was detected both in tested dairy beverage and in lactic acid cheese. According to the guidelines, the staphylococci level EC Decree no. 2073/2005 dated November 15, 2005, that does not favor enterotoxin synthesis should be considered as the safe level. Both in dairy beverages and in lactic acid cheese and cottage cheese such a level did not occur.

The performed tests did not show any significant difference in staphylococci count, depending on applied packaging. In all types of packaging applied for lactic acid cheese, the level of these micro-organisms did not exceed the level of 2 $\log_{10}$ cfu/g, what in respect of the decree should be considered as the value ensuring safety. Staphylococci count in lactic acid cheese was even lower, what allows stating that the assortment of lactic acid cheese and cottage cheese consists of products of good quality, which can be recommended for consumption.

In comparison with microbiological quality of lactic acid cheese observed prior to obligatory implementation of HACCP system in all dairy plants, it should be stated that an improvement has occurred as regards microbiological features [4].

The fermented dairy products available in the market are safe products.

У статті І. Стеінки "Якість ферментованих молочних продуктів на польському ринку в умовах HACCP" наведено перелік факторів, які впливають на безпечність товарів, що виробляються на молокозаводах. Це – технологія; джерела зараження мікроорганізмами продукту та домішок, що додаються при виробництві; речовини, які застосовуються для миття та дезинфекції; автоматизація процесу та відповідний контроль тощо. Представлено результати

[4] *Steinka I.* Wpływ hermetycznego pakowania na jakość twarogów i twarożków: Zeszyty Naukowe WSM w Gdyni. – 1999. – No 30. – S. 53-62; *Steinka I.*, Pukszta T. Influence of Mycota in Cottage Cheese on Establishing the Product Quality, Joint Proceedings. – WSM Gdynia, Hochschule Bremerhaven. – 2000. – No 13. – P. 84-92; *Steinka I.*, Kurlenda J. Determination of Microbiological Quality Indicates of Vacuum-Packed Cottage Cheese and Prediction of their Changes during Storage // Polish J. of Food and Nutral Sciences. – 2002. – Vol. 11, No 2. – P. 199-206.

мікробіологічної оцінки упакованих у різні матеріали ферментованих молочних продуктів, що представлені на польському ринку: ацидофільне молоко, сир і сичуговий сир. Після впровадження системи НАССР покращилася якість ферментованих молочних продуктів за мікробіологічними показниками.