

CHANGES IN MICROBIOLOGICAL QUALITY OF RAW MILK FROM THE REGION OF WARMIA AND MAZURY IN 1998-2003

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Abstract. This study analyses the changes in the microbiological quality of raw milk in the period from 1998 to 2003, in the region of Warmia and Mazury, Poland. The study material included samples of raw milk purchased from farmers by ten dairy plants. The milk was analysed at the “Lab-Mlek” Sp. z o.o., Milk Analyses Laboratory in Olsztyn. The total bacterial count was determined instrumentally, with a Bactoscan apparatus, manufactured by Foss-Electric A/S. No significant improvement in the microbiological quality of the raw milk from the region of Warmia and Mazury was observed in 2003; such improvement was observed in the years 1998-2001 and was the most rapid in the initial period of the study, i.e. in 1998-1999.

Keywords: raw milk, microbiological quality.

ŽALIO PIENO MIKROBIOLOGINĖS KOKYBĖS POKYČIAI VARMIJOS-MOZŪRIJOS REGIONE 1998–2003 METAIS

Santrauka. Tyrimas analizuoja žalio pieno mikrobiologinės kokybės pokyčius Varmijos-Mozūrijos regione 1998–2003 metais. Tyrimo medžiaga susideda iš 10-ies ūkininkų supirkto žalio pieno mėginių. Pienas buvo ištirtas Olštino pieno tyrimų laboratorijoje „Lab-Mlek“. Bendras bakterijų skaičius nustatytas klasikiniu būdu „Bactoscan“ aparatu, pagamintu „Foss-Electric A/S“. Ryškaus mikrobiologinės kokybės pagerėjimo žaliame piene iš Varmijos-Mozūrijos regiono 2003 m. nepastebėta, tačiau toks pagerėjimas pastebėtas 1998–2001 metais. Jis buvo ryškiausias pradiname tyrimo etape, t. y. 1998–1999 metais.

Raktažodžiai: žalias pienas, mikrobiologinė kokybė.

Introduction. The composition and amount of microflora in the raw material has a decisive effect on the quality and safety of dairy products. Consequently, the total bacterial count in 1 ml is one of the acceptance criteria for milk intended for processing by dairy plants. In Poland, the microbiological requirements for milk purchased from farmers have been changed three times in recent years - in 1998, 2000 and in 2002. The microbiological criteria which are currently in force (Regulation of the Ministry of Agriculture and Rural Development) it is the total bacteria count (TBC) not exceeding 100.000. In advance to distinguish three classes: extra class, with the TBC not exceeding 100,000, class I \leq 400,000 and under quality class milk. Despite being made stricter recently – on 1 January 2002 – the requirements do not fully conform to those in force in EU countries. Directive (Council Directive 92/46EEC) allows for the bacterial count in 1 ml of milk not to exceed 100,000. The production of milk of high microbiological quality is difficult and depends on a number of factors. Among the most important of them are: the health condition of dairy cows, sanitary conditions on a dairy farm and the hygiene of the milking process. Therefore, basic work on the improvement of raw milk should be undertaken on farms and it is there that changes should soon take place which will result in producing milk to meet EU standards. The process of registering farms, currently under way around the country, based on the regulations issued by the Minister of Agriculture and Rural Development, may result in the qualitative

improvement of the raw material purchased from farmers by dairy plants. The registering of farms is associated with fulfilling the requirements laid down in the Regulation (Regulation of the Minister of Agriculture and Rural Development of 18 August 2004) and a failure to fulfil the requirements will result in the rejection of the milk for processing. The study aimed at:

1. assessing the microbiological quality of raw milk processed in 2003 by dairy plants in Warmia and Mazury.
2. checking the dynamics of change in microbiological quality of raw milk between 1998 and 2003.

Materials and Methods. The materials for the study included samples of raw milk purchased by ten dairy farms in Warmia and Mazury. The analyses were conducted in the Milk Analyses Laboratory - “Lab-Mlek” sp. zoo. in Olsztyn, from 1 January to the end of 2003. The milk samples were taken by plant personnel responsible, according to the Standard (Polish Standard PN-A-86040.1985), from individual suppliers and from milk-collecting centres. The total bacterial count (TBC) was determined instrumentally with a Bactoscan apparatus, manufactured by Foss-Electric A/S. The method is accepted in raw milk assessment and is mentioned in the Standard (Polish Standard PN-A-86036.1998) as one of the recommended methods. A total of 165 505 samples of raw milk were analysed microbiologically. The results were subsequently analysed by calculating the sum of samples to evaluate the microbiological class and participation of individual

in particular microbiological classes in the total sample number.

Results and Discussion. The extra class accounted for 63.57%, class I – for 14.6% and unclassified milk samples – for 21.81% of the total number. The changes in microbiological quality within one year are shown in (Figure 1) The course of the curves indicates slight

fluctuations in the milk microbiological quality. The high percentage of unclassified milk (over 20%) is a worrying development. A comparison of these results with those obtained in the study conducted in the years 1998-2002 (Figure 2) shows that the most rapid improvement in milk quality took place in 1998-99.

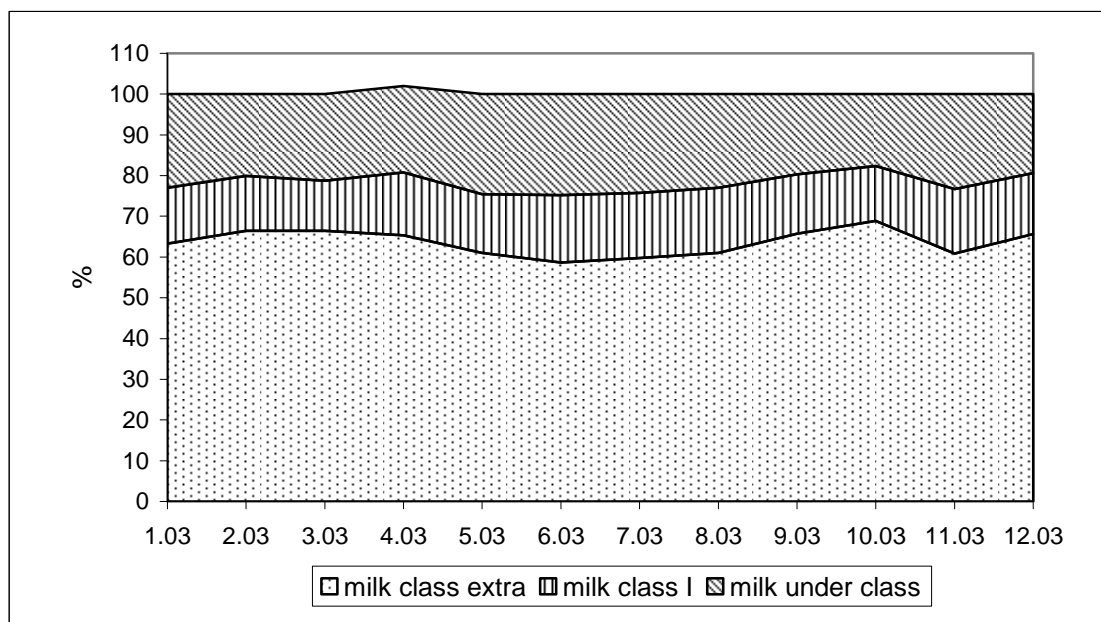


Diagram 1. Percentage of particular microbiological classes of raw milk in the period under study.



Diagram 2. Percentage of particular microbiological classes of raw milk from 1998 to 2003

During the study, a different method of raw milk microbiological classification was in force. From the beginning of the study, i.e. from June 1998 to December 1999, according to the Standard (Polish Standard PN-A-8602.1995) raw milk was classified as: extra (TBC \leq 100,000), class I (TBC \leq 400,000), class II (TBC \leq 1 million), class III (TBC $>$ 1 million). During that period, the proportion of particular microbiological classes was as follows: extra – 42.82%, class I – 21.65%, class II – 13.35% and class III – 22.22% (Cichosz et al.1999). From 1 January 2000, according to the standard, as amended in 1999, class III was deleted and the milk of the corresponding microbiological parameters was included in the “unclassified milk” category and banned from being purchased for food processing. According to research results (Wiszniewska et al. 2001), the portion of “extra” raw milk increased in that time to 56%, whereas for class I and II the values decreased to 20% and 10.5%, respectively. The unclassified milk samples accounted for 13.5% of the total number. This tendency continued in subsequent years and at the end of 2002 the extra class milk accounted for over 60% of the samples with a simultaneous decrease in the amount of unclassified milk (Sztejn et al. 2003). In 2003, no significant improvement in the microbiological quality of milk was observed, with only a slight fluctuations in the percentage of particular classes throughout the year. This fact raises some concern, as neither class I nor unclassified milk meet EU requirements, and both collectively accounted for 36% of the samples.

Summing up these results, it can be stated that a significant, yet insufficient, improvement in the microbiological quality of raw milk purchased from farmers in Warmia and Mazury took place during the analysed period. A further improvement requires the fulfilment of a range of conditions connected primarily with the hygiene of obtaining and storing the milk at dairy farms (Krzyżanowski et al. 1997, Litwińczuk 2001). Modernising the several thousand farms will entail considerable financial outlays (Murawski 2001).

Tab. 1. Percentage of particular milk class distribution in Poland according to the data of the Chief Veterinary Inspectorate

Classes of milk	Percentage of particular classes of raw milk data obtained on the date		
	15 June 1999	15 June 2000	15 June 2001
Extra	30	40	56
I	35	25	24
II	23	35	19
III	12		1

Comparing these results with the microbiological quality of milk purchased in other parts of the country (Joint publicatio 2001) it is apparent that the microbiological quality in the region of Warmia and Mazury was significantly higher in 1998-2001, as shown in the percentage of milk samples included in the extra

class. The results obtained by numerous authors (Kotowski et al.2001,Kroll et al. 2000, Litwińczuk 2001, Rózańska 2001) found differences that can be observed regionally in the microbiological quality of raw milk. Rózańska is of the opinion that they are associated to the level of agriculture in the region and the dairy farm size. A comparison of the 2002 results with the national average published by GIW and GISIPAR (Chief Veterinary Inspectorate and the Chief Inspectorate of Agricultural Products Purchase and Processing) (Anon. 2003) found the quality of milk in the region slightly lower (Table 1).

The data for the Province of Warmia and Mazury, obtained from the Provincial Veterinary Inspectorate indicate that of the existing 35 thousand farms, only 2701 have more than 20 cows, with 5 being the most common number of cattle. The milk purchased by processing plants comes from farms with various numbers of cattle and different conditions of milk collection; not all of them will be able to meet the requirements laid down in EU directives and regulations (Council Directive 92/46 EEC, Regulation of the Minister of Agriculture and Rural Development of 18 August 2004).

Conclusions.

1. No significant improvement in microbiological quality of raw milk from the region of Warmia and Mazury was observed in 2003.

2. Considerable improvement was observed in the years 1998-2001.

3. The improvement was the most rapid in the first part of the study, i.e. in the years 1998 - 1999.

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