

Microbiological criteria in the production of sterilised milk

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Introduction

Ultra high temperature milk processing is generally defined as heating milk between 135 and 145°C for 1-10 s. The product defined in this way indicates that it does not contain vegetative forms of microorganisms and it has been packaged in a hermetically sealed container to be stable at room temperature. This is difficult to achieve 100% of the time and so some ultr-high temperature milks contain microorganisms. Many of these are thermophilic spore-forming bacteria, whose spores survive the heat treatment.

Sterilized milk may be regarded as ready-to-eat foods. In this context, a parallel can be drawn with microbiological criteria for ready-to-eat foods. The food safety criterion for ready-to-eat foods provides for testing for *Listeria monocytogenes* and the limit value is absence in 25ml (M=m, n=5, c=0). However, regular testing does not apply to the criterion under normal circumstances for heat-treated or otherwise processed food that effectively eliminates *Listeria monocytogenes* when recontamination is no longer possible after such treatment. Sterilized milk is produced at temperatures that destroy *Listeria monocytogenes*. The recommended microbiological criteria for sterilized milk for colony count are M<1CFU (colony-forming unit)/ml (n=5, c=0), and for number of sulphite-reducing anaerobic bacteria are M<1CFU/ml (n=5, c=0).

The aim of the research was to determine the safety of sterilized milk and hygiene conditions in the production process based on the test results of sterilized milk in the production process, as well as to consider a proposal for recommended microorganisms to be tested in the sterilized milk production process.

Materials and Methods

Samples of sterilized milk come from a dairy from the Republic of Srpska (Bosnia and Herzegovina), and were sampled over a six-month period (January-June). Within self-control, 302 samples from production and 21 samples from the distribution centre were tested. Each sample consisted of 5 units.

Laboratory testing of samples was performed at the Public Veterinary Institute of the Republic of Srpska "Dr Vaso Butozan" Banja Luka.

For microbiological testing of sterilized milk were used methods BAS EN ISO 4833-1, BAS ISO 15213 and BAS EN ISO 11290-1.

Results

Table 1. Test results of sterilized milk for the presence of *Listeria monocytogenes*

Month of sampling/ Number of samples	Parameter	Sampling plan		Interpretation of results
		n	c	
January / 2	<i>Listeria monocytogenes</i>	5	0	2 satisfactory (100%)
February / 4	<i>Listeria monocytogenes</i>	5	0	4 satisfactory (100%)
March / 4	<i>Listeria monocytogenes</i>	5	0	4 satisfactory (100%)
April / 4	<i>Listeria monocytogenes</i>	5	0	4 satisfactory (100%)
May / 4	<i>Listeria monocytogenes</i>	5	0	4 satisfactory (100%)
June / 3	<i>Listeria monocytogenes</i>	5	0	3 satisfactory (100%)

Table 2. Results of self-control in the process of production of sterilized milk according to the recommended criteria

Month of sampling/ Number of samples	Parameter	Sampling plan		Interpretation of results
		n	c	
January / 50	Colony count	5	0	44 satisfactory (88%) 6 unsatisfactory (12%)
	Sulphite-reducing anaerobic bacteria	5	0	50 satisfactory (100%)
February / 37	Colony count	5	0	32 satisfactory (86,50%) 5 unsatisfactory (13,50%)
	Sulphite-reducing anaerobic bacteria	5	0	37 satisfactory (100%)
March / 52	Colony count	5	0	49 satisfactory (94,20%) 3 unsatisfactory (5,80%)
	Sulphite-reducing anaerobic bacteria	5	0	52 satisfactory (100%)
April / 71	Colony count	5	0	52 satisfactory (73,20%) 19 unsatisfactory (26,80%)
	Sulphite-reducing anaerobic bacteria	5	0	70 satisfactory (98,60) 1 unsatisfactory (1,40%)
May / 43	Colony count	5	0	40 satisfactory (93%) 3 unsatisfactory (7%)
	Sulphite-reducing anaerobic bacteria	5	0	43 satisfactory (100%)
June / 49	Colony count	5	0	49 satisfactory (100%)
	Sulphite-reducing anaerobic bacteria	5	0	49 satisfactory (100%)

Conclusion

In the self-control of sterilized milk, 12.30% of the samples were unsatisfactory according to the recommended criteria. An increased colony count was the cause in 97.30% of unsatisfactory samples, while in 2.70% of the samples the cause was sulphite-reducing anaerobic bacteria. *Listeria monocytogenes* was not detected in any of the samples tested. The main cause of unsatisfactory samples of sterilized milk are aerobic bacteria, with or without the possibility of spore formation. In the self-control of sterilized milk, it is justified to test the colony count and sulphite-reducing anaerobic bacteria according to the recommended criteria. There is a reasonable risk of post-contamination in the production of sterilized milk, and for this reason special attention should be paid to controlling the sterility of packaging and the packaging process of sterilized milk.