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THE INFLUENCE OF LOW TEMPERATURE ON MILK AND MILK PRODUCTS MICROORGANISMS

Ştețca Gheorghe, Antonia Odagiu

Faculty of Agriculture, University of Agricultural Sciences and Veterinary Medicine, Mănăştur st., no. 3-5, 400372 Cluj-Napoca, Romania. Contact e-mail stetcagheorghe@yahoo.com

Abstract

The paper aims to emphasize the importance of accomplishing the main exigencies concerned in milk and milk products preservation. The treated issues show that for obtaining milk and milk products appropriate for consumption taking into account two main factors, meaning hygiene and cold (temperature), is necessary. For milk keeping and storage, hygiene – cooling chain must be supplied by the entire milk circuit, meaning from production unit (the farm) up to consumer. The most often encountered and pronounced alterations of milk and milk products, when hygiene and preservation terms are not respected, are connected with taste, and the result is a rancid one and so called the lipase taste, which are attributed to fats alteration, and also the bitter taste determined by the old milk.

INTRODUCTION

Within the process of milk obtaining, beginning from dairy farms, units of milk processing, storage and commercialization, it can be contaminated with different pathogen organisms and produce diseases in consumers.

A large variety of dangers of milk and milk products contamination is reported, and its identification have major importance.

Considering these aspects, the emphasizing of milk and milk products preservation in cold atmosphere was found useful.

MATERIAL AND METHOD

By its composition, milk represents a favorable nutritional environment for bacteria development. Finding in this environment feeding substances and necessary humidity, they can develop in optimal conditions if maintaining temperature is appropriate.

When milk is obtained from healthy cows, milked within normal hygienic conditions, it usually contains 500 – 800 live micro-organisms.

Immediately after milking, it contains a substance with bactericide action - lactenine, which determine the stopping of microorganism multiplication and even inhibit this development resulting sometimes in reducing their presence. In the beginning, the milk microorganisms are not yet prepared and accommodated with new created environmental conditions. This phase is known as “bacterial phase of milk”.

If in this phase an energetic decrease of milk temperature to 0^0C is performed, and then is kept and stored at 4^0C, the bactericide phase of milk may be prolonged up to 2 days.

When milk is not cooled after milking, and not kept and stored at low temperature, bacteria are multiplying very fast and begins ”the phase of logarithmic multiplication of lactic bacteria”. In the mean time, acidity increases until milk is coagulated.

RESULTS AND DISCUSSIONS

In order to understand the role played by cold (temperature) in dynamics of germs multiplication (microbes) some data concerning the duration of ”bactericide period” and their multiplication function of the storage milk temperature are presented (table 1, fig. 1).

Table 1

Duration of the milk bactericide period

Cooling temperature of milk after milking (^{0}C)	Preservation temperature of milk after cooling (^{0}C)	Duration of the bactericide phase
0	4	up to 2 days
5	6	36 - maximum 46 hours
10	10	Up to 10 – 15 hours
15	15	Up to 8 hours

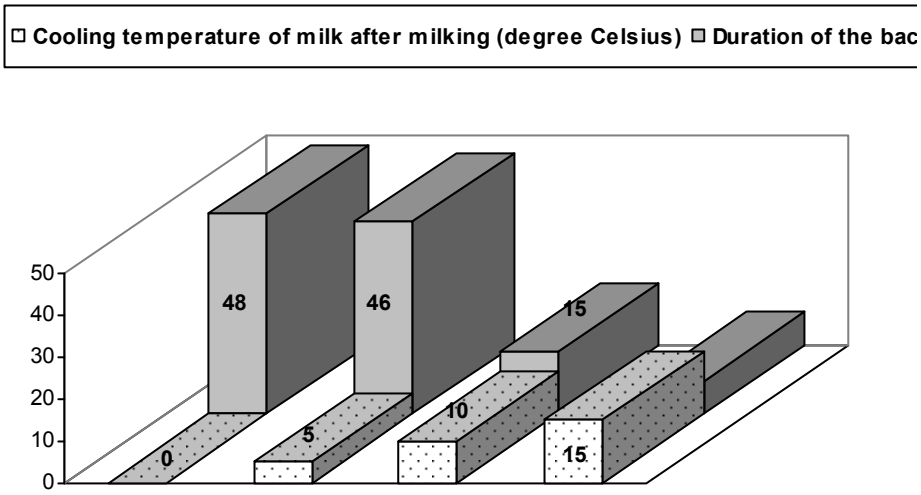

Fig.1. Duration of bactericide period

The variations of the microorganism content in milk within preservation conditions (temperature, duration) are also presented (table 2 and 3, fig. 2).

Table 2

The variations of the microorganisms content in milked milk within normal hygienic conditions

Time interval	Number of microorganisms/Ml			
	5^0C	10^0C	15^0C	Over 20^0C
Immediately after milking	500 – 800	-	-	-
After 24 hours	6000	1 million	2.5 millions	Over 7.5 millions
After 48 hours	8000	30 millions	220 millions	Over 450 millions
After 70 hours	11000	350 millions	600 millions	-

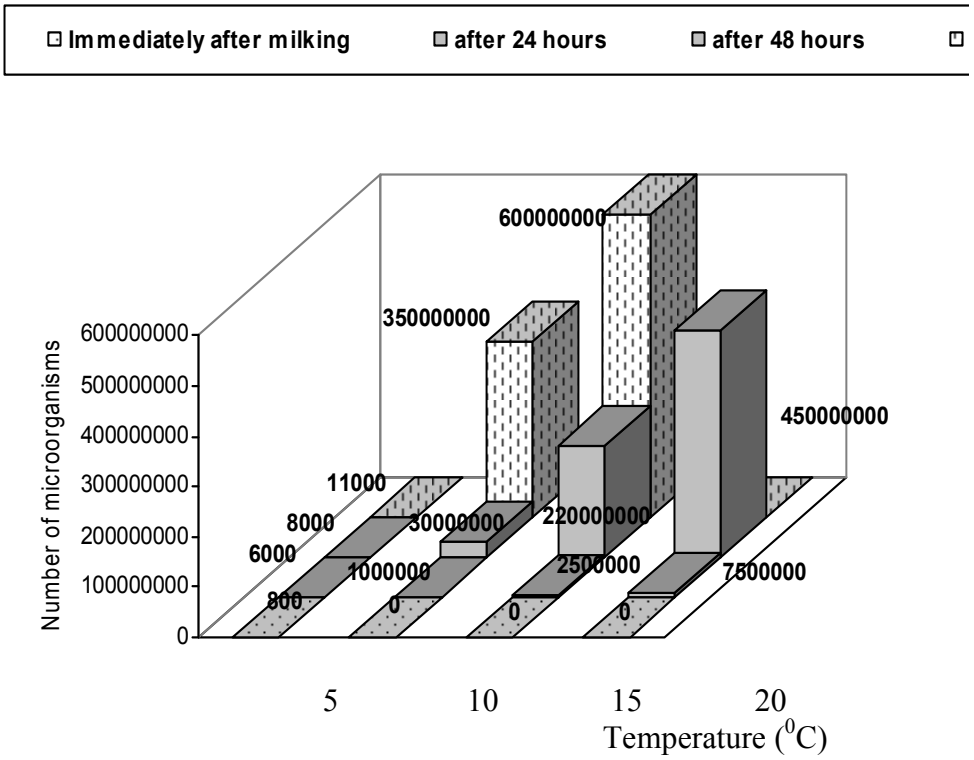

Fig.2. The variations of the microorganisms content in milked milk within normal hygienic conditions function of temperature

Table 3

The variations of the microorganisms content in milked milk within non hygienic conditions

Time interval	Number of microorganisms/Ml			
	5^0C	10^0C	15^0C	Over 20^0C
Immediately after milking	10000	-	-	-
After 24 hours	350000	20 millions	30 millions	Over 80 millions
After 48 hours	450000	6000 millions	Over 900 millions	-
After 70 hours	750000	2.2 billions	Over 9 billions	-

The presented data (tables 1 – 3, fig. 1 – 3) show that for obtaining milk appropriate for consumption is necessary to take into account two main factors: hygiene and cold (temperature).

By its rich composition, milk is one of the most complete foods, but we do not have to forget that both milk destined to processing industry and direct consumption, must not be considered only under the point of view of chemical composition (nutritional value) but also under the microorganism charge.

Milk with removed cream (without fat) is less harmful (or not at all) compared to a strong contamined milk.

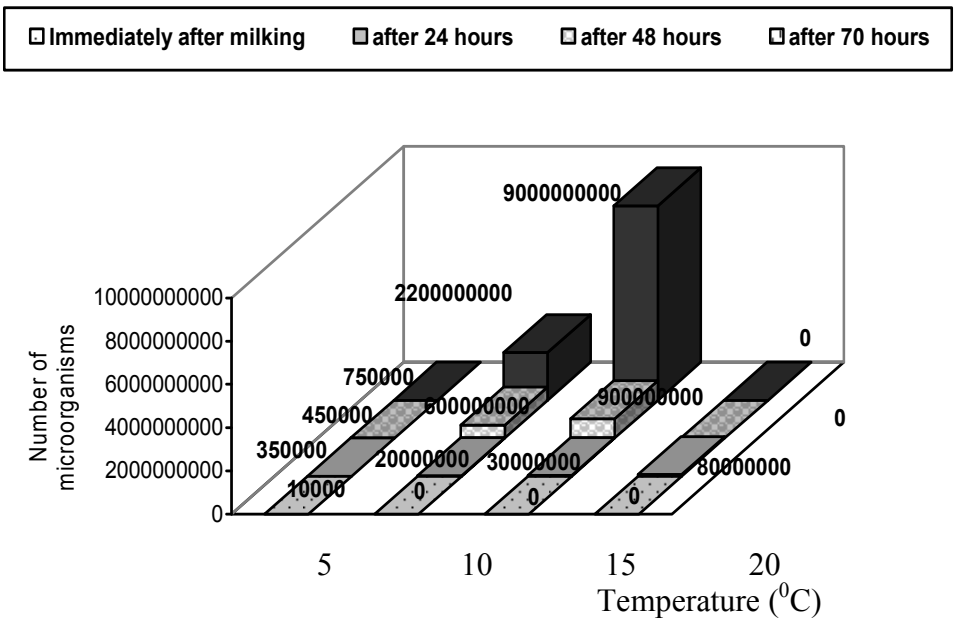

Fig.3. The variations of the microorganisms content in milked milk within non hygienic conditions function of temperature

The presented data (tables 1 – 3, fig. 1 – 3) show that for obtaining milk appropriate for consumption is necessary to take into account two main factors: hygiene and cold (temperature).

By its rich composition, milk is one of the most complete foods, but we do not have to forget that both milk destined to processing industry and direct consumption, must not be considered only under the point of view of chemical composition (nutritional value) but also under the microorganism charge. Milk with removed cream (without fat) is less harmful (or not at all) compared to a strong contamined milk.

CONCLUSIONS

- For milk keeping and storage, hygiene – cooling chain must be supplied by the entire milk circuit, meaning from production unit (the farm) up to consumer. The best and practice solution indicated from hygiene – qualitative point of view is the milk refrigeration immediately after milking within normal hygienic conditions. This solution may be very easy applied only within specialized farms (cow, sheep and goat farms) which possess cooling systems. The maximum cooling duration varies between one and two hours and a half at 4 – 5^0C. Within private particular system where adequate cooling systems are missing and milk quantity is lower (about 8 – 10 barrels), the cooling is performed in cold water, natural or artificial ice, or if there are lower quantities, about 20 – 30 l milk, it can be kept and stored not boiled up to 24 hours at refrigerator temperature. Concerning the industrial system, the milk cooling system (refrigerating chain) must be continued in processing units, too. It must be cooled after pasteurization up to 1 – 3^0C, then it is bottled, kept and stored until delivery. The storage temperature must be maximum 6^0C. At this temperature milk is distributed within delivery network.

- The delivery network contains only pasteurized milk and the storage and keeping temperature may be increased (up to 6 – 10^0C) during a pre-established period (by producer, up to 6 – 10^0C) mentioned on milk labels. The milk technological processed using the UTH (Ultra High Temperature) method may also be kept at room temperature, 2 – 6^0C, for maximum 70 hours, but only after package removing. If we keep the milk at 4^0C the microorganism multiplication in milk is very much delayed, and it may be kept in this conditions maximum 2 days. We can notice that, during keeping and storage in refrigerated state during a longer time at 0 – 4^0C, both raw and pasteurized milk

partially modify the organoleptic traits. These alterations are produced by the action of some bacteria that are developing at temperatures around 0^0C and have the property of decompose the proteic substances and fats. The most often encountered and pronounced alterations are connected with taste, and the result is a rancid one and so called the lipase taste, which are attributed to milk fats alteration. It can also be noticed the bitter and old milk taste. In refrigerator the milk may not be kept more than 2 – 3 days as refrigerated milk.

- The same situation is encountered for milk products too. The cream, after obtaining, must be immediately to cooling process. It can be easily performed if we introduce the barrels with cream in cold water, or in ice or other cooling sources. The keeping temperature must be of 0 – 2^0C. The cold keeping, in normal hygienic conditions that can supply the quality and hygiene of the milk products, is compulsory for their great majority. Each product has its own limit keeping time within precise temperature and humidity time. During this time, products possess unaltered original organoleptic traits. The analyzed data show that if the temperature and humidity conditions are not respected, the keeping term may be reduced in great extent (from some months to some days). In Penteleu, Dalia and Teleorman cheeses is the recommended keeping temperature is over 4^0C bunt not over 15^0C the keeping limit time is reduced to 30 days compared to 6 months that is the normal keeping time at 4^0C. Concerning the pre-packed cheeses, whatever variety, the keeping duration is limited at 20 days when the pre-packaging is performed under vacuum, and keeping temperature is within the interval 8 – 18^0C. When pre-packaging is not performed under vacuum, but taking into account the temperature, the keeping recommended period is not more than 8 days. In Dobrogea cheese the keeping duration at 2 – 7^0C is of 10 months, but it can be easily reduced to 2 – 2.5 months when the temperature is within the interval 7 – 15^0C. The same situation is encountered for other types of cheese specialties where the recommended keeping temperature interval is of 2 – 7^0C for 3 months period. If the keeping temperature interval will be 7 – 15^0Cthe keeping duration is reduced to 30 days. More interesting is the keeping process used for Feta maturated specialty that can be preserved within the temperature interval of interval 4 – 7^0C without modifying the organoleptic traits.

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