ABAH BIOFLUX
Animal Biology & Animal Husbandry
International Journal of the Bioflux Society

The highlight of the main microbiologic parameters in buffalo milk and the final product

Aurelia Coroian

University of Agricultural Sciences and Veterinary Medicine, Faculty of Animal Science and Biotechnologies, 3-5 Manastur Street, 400372, Cluj-Napoca, Romania, EU, aureliapece@yahoo.com

Abstract. Research initially envisioned the determination of microbiologic parameters in buffalo milk and the finished product. The average for coliform bacteria was 4.96±0.47, while for the total number of yeasts and moulds, it was 633.47±20.01. *Escherichia coli* was present in three samples out of the 23 buffalo milk samples under analysis and presented the following values: 1.5 *E.coli* x 10^3/ml, 1.1 *E.coli* x 10^3/ml, respectively 2.9 *E.coli* x 10^3/ml. In addition, the total number of germs and number of somatic cells according to two categories (milk from family exploitations and milk from an ecologic farm) were determined. Selective isolations were conducted, of different dilutions of the pure culture on Levin agar (dilutions and incubation for 24 h at 37°C). The determination of the number of coliform bacteria was conducted using Mac-Crady tables.
Key words: buffalo, total germ number, milk, somatic cells.

Introduction. For the last years, Codex Alimentarius and the International Milk Federation grant the utmost importance to buffalo milk and dairy products, including their microbiologic quality (Ganguli 1997). The somatic cell content in buffalo milk is a parameter in the exploitation (the large number of somatic cells reveals buffalos suffering from mammitis leading to economic losses) and hygiene (the mammitis buffalo milk has an abnormal aspect, an altered taste and modified composition) (Pucheanu 2000). As such, it is necessary to be acquainted to all categories of microorganisms that can pollute milk, undertaking the appropriate measures to retain and employ useful ones and remove useless or damaging ones. Milk obtained from buffalos bred in hygienic conditions, milked in hygienic to aseptic conditions contains a very small number of microroganisms: 300-500/ml. Milk obtained from buffalos bred in precarious hygiene conditions contains a large number of microorganisms, even from the initial milking point (Bârzoi & Apostu 2002). Nevertheless, research conducted on the development of the *Listeria monocytogenes* bacterium in starter and junket cultures, showed that these bacteria cannot be considered risky for the quality of ingredients. However, the quality of these ingredients must be considered a critical point (Ganguli 1979). The contamination of milk and dairy products with typhoid and paratyphoid fever agents can occur mainly due to human carriers who handle and process the milk (Ganguli 1979). *Escherichia coli* is the representative species of *Enterobacteriaceae*, which is capable to develop in aerobe and anaerobe conditions (Baumberg et al 1981). It is thus capable to employ carbon and nitrogen as a source to satisfy their energetic and metabolic needs (Kornberg 1966). As such, *E. coli* can multiply, may grow in media containing solely glucose, ammonium and mieneral salts (Pierce & Wehling 1994). *E. coli* can also develop on a variety of media that contain the carbon combination and other substances, but nevertheless prefer glucose media. Glucose is transported along the cytoplasmatic membrane (Konings et al 1981). Specialty literature describes numerous cases of *salmonellosis* produced by integrating milk that was not subjected to thermic treatments, or milk that was not correctly pasteurized. Yeasts and moulds appear very frequently in nature, as their presence indicates inappropriate conditions during the technological process of production and during storage, while their action on certain elements modifies the organoleptic aspects (Nagatani et al 1971). *Salmonella* is a pathogenic enterobaterium for humans, as

well as animals, showing over 2000 serotypes. Toxinfections produced by *Salmonella* germs are more frequent in the warm season, as temperature is a favourable factor for their development and multiplication (Georgescu 2000).

Material and Method. Milk somatic cells were determined according to the SR EN ISO 13366-3-2001 method. The total germ number was determined with the help of the Bactoscan FC; Screening test BRT; Methods for the determination of microbiologic parameters: number of coliform bacteria/ SR ISO 5541/1, number of *Escherichia coli*, SR ISO 11866 STAS 6349/4;

Results and Discussions. The maximum threshold admitted for milk considered healthy was established around 400,000 cells/ml. Over this limit, regardless whether the milk presents sensorial or biochemical modifications or not, it automatically falls into the suspicious category and is removed from the capitalization circuit. Regarding the compliance with buffalo milk quality parameters according to quality classes, the most important components showing profound implications are the total number of somatic cells and the total number of germs (Figs 1-2).

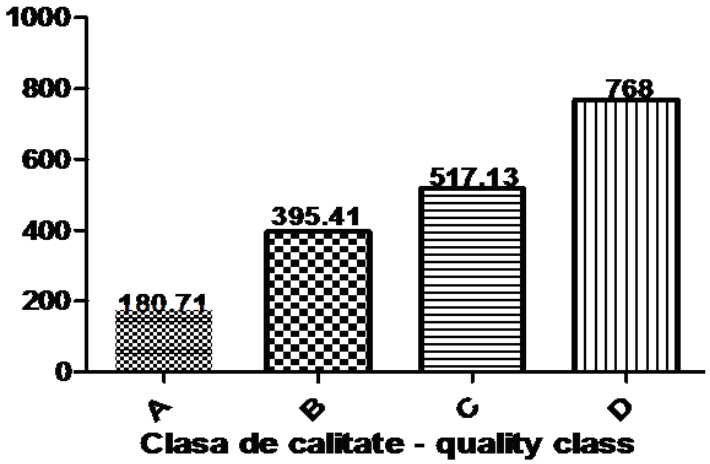

Figure 1. Average values for somatic cells according to the quality class

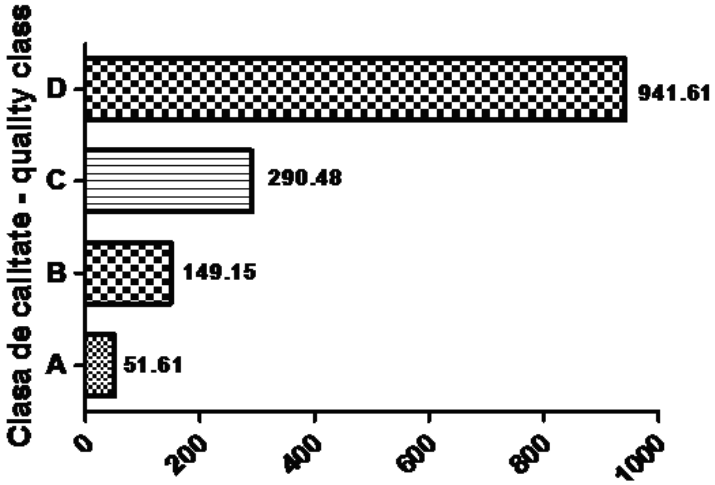

Figure 2. Average values for total germ number according to the quality class

The consequences for the presence of a large number of somatic cells triggers significant economic repercussions on the farm, as: a small price is obtained for the buffalo milk, a reduction of production occurs in bubaline milk, as well as an increase in medication expenses. Figures 1 and 2 are graphic representations of the values for somatic cells and

the total number of germs in the case of milk from buffalos bred in private households. For buffalo milk samples from and ecologic farm, the values were lower, as samples fell within the first two quality classes. International and EU norms stipulate that raw milk should have a number of 100,000 germs/ml. If it is higher, difficulties appear in preservation and thus becomes improper for processing, lacking the appropriate expenses for pasteurizing and sterilisation (Georgescu 2000). In Table 1, there is a presentation of the average values and the variability of buffalo milk samples under microbiologic analysis.

Table 1

Results obtained on the microbiologic exam for the raw matter buffalo milk

n		*Coliform bacteria/ml*	*Yeasts and moulds/g*	*NTG aerobi mezofili x 10^5/ml*	*Salmonella/25 ml*	*Stafilococ Coagulaza Pozitiv/ml*	*Bacilus cereus*
23	$s \pm s_x$	4.96±0.47	633.47±20.01	4.46±0.11	Absent	Absent	Absent
	s	2.04	87.22	0.48			
	v	41.17	13.17	10.83			

NTG- total number of germs

Table 2 presents the average values and the variability for the main microbiologic parameters in the case of the two cheese categories: buffalo telemea and mouldy cheese. It can be thus observed that *E. coli* and *Salmonella* were absent in the two products under analysis. Coliform bacteria presented a higher content in mouldy cheese, namely an average of 8.65±0.16.

Table 2

Average values and variability for the main microbiologic parameters of the two cheese types

n	*Statistic parameters*	*Escherichia coli/g*	*Coliform bacteria/g*	*Salmonella /25 ml*	*Yeasts and moulds/g*	*Stafilococ coagulazo pozitiv/ml*
			Telemea cheese			
23	$s \pm s_x$	absent	4.44±0.55	absent	523.30±53.77	7.24±0.82
	s		2.62		257.87	3.93
	v		59.02		49.28	54.22
			Mouldy cheese			
19	$s \pm s_x$	absent	8.65±0.16	absent	627.57±16.65	9.83±0.23
	s		0.71		72.58	1.01
	v		8.16		11.57	10.29

Conclusions. Regarding the total germ number in the case of buffalo milk samples collected from Sălaj county breeders, it can be observed that there were samples that fall between lower quality classes C and D. One of the causes for the presence of a large number of germs and somatic cells resides in the fact that milking is conducted manually and in conditions that do not correspond from a hygienic point of view. In the case of the final product *E. coli* and *Salmonella*, they were absent.

References

Baumberg S., Carlile M. J., Collins J. F., Moseley B. E. B., 1981 The evolution of metabolic regulation. In: Molecular and Cellular Aspects of Microbial Evolution, Symposium of the Society for General Microbiology. Cambridge University Press, Cambridge, 229-272.

Bârzoi D., Apostu S., 2002 [Food Microbiology]. Risoprint, Cluj-Napoca. [In Romanian]

Ganguli E. C., 1997 Milk production and quality in Asia. 5-Th World IV, Ceres, Bucharest.

Ganguli N. C., 1979 [Technology of the buffalo milk]. Revue mondiale de Zootehnie, FAO Rome **30**:56-60. [In French]

Georgescu G H., 2000 [Milk and milk products]. Ceres, Bucharest. [In Romanian]

Konings W. N., Hellingwerf K. J., Robillard G. T., 1981 Transport across bacterial membranes. North Holland 257-283.

Kornberg H. L., 1966 The role and control of the glyoxylate cycle in *Escherichia coli*. Biochemical Journal 1-11.

Nagatani H., Shimizu M., Valentine R. C., 1971 The mechanism of ammonia assimilation in nitrogen fixing bacteria. Archiv für Mikrobiologie 164-175.

Pierce M. M., Wehling R. L., 1994 Comparison of sample handling and data treatment methods for determining moisture and fat in Cheddar cheese by near-infrared spectroscopy. J Agric Food Chem **42**:2831-2835.

Pucheanu C., 2000 [Research on knowledge of morphological, physiological and productive parameters at buffalos in relation to various factors of influence]. Doctoral Thesis, Bucharest. [In Romanian]

Received: 23 November 2009. Accepted: 30 December 2009. Published online: 30 December 2009.

Authors:
Aurelia Coroian (since 2009) (other name of the same author: Aurelia Pece), University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Animal Science and Biotechnologies, 3-5 Manastur Street, 400372, Cluj-Napoca, Romania, EU, aureliapece@yahoo.com

How to cite this article:
Coroian A., 2009 The highlight of the main microbiologic parameters in buffalo milk and the final product. ABAH Bioflux **1**(2):67-70.