

DETERMINATION OF QUALITATIVE INDICATORS OF MILK FOR FOOD SAFETY

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Abstract

The article presents the results of studies on the problem of the content of somatic cells in cow's milk. It is shown that with an increase in the number of somatic cells, the composition of milk and its physicochemical properties change. These changes, in turn, lead to a deterioration in its technological properties, a decrease in the quality characteristics of milk and finished products. The quality of milk depends on many factors and is determined by many indicators separately identified in the standard. One of the main and important indicators is the number of somatic cells - cells of various tissues and organs. The number of somatic cells depends on a number of factors, such as the age of the cow, breed, physiological state of the animal, periods of lactation, breast diseases of various etiologies. Inside the udder there is a constant renewal of epithelial tissue cells, old cells die and are rejected. Milk, even from a healthy cow, always contains somatic cells that have been shed from the secretor part of the udder. In particular, these are cells of cylindrical, squamous and cubic epithelium of the mammary gland, leukocytes, erythrocytes.

Keywords: quality, milk, safety, somatic cell.

Introduction

Milk is a valuable product in human nutrition. In our country, milk production volumes are successfully increasing and, at the same time, the demand for high-quality dairy products, which must meet consumer requirements both in terms of biological value and safety, is growing. Milk and dairy products in circulation on the territory of the Republic of Uzbekistan must be safe and meet the requirements specified in the Technical Regulations "Requirements for the safety of milk and dairy products", Resolution of the Cabinet of Ministers of the Republic of Uzbekistan, dated 07/07/2017 No. 474.

The quality of milk depends on many factors and is determined by many indicators, separately highlighted in the standard. One of the main and important indicators is the number of somatic cells - cells of various tissues and organs. The number of somatic cells depends on a number

of factors, such as the age of the cow, breed, physiological state of the animal, lactation periods, and mammary gland diseases of various etiologies. Inside the udder, epithelial tissue cells are constantly renewed; old cells die and are rejected. Milk, even from a healthy cow, always contains somatic cells that have been rejected from the secretory part of the udder. In particular, these are cells of the cylindrical, flat and cubic epithelium of the mammary gland, leukocytes, erythrocytes. The physiological norm for the content of somatic cells in milk is considered to be from 100 to 500 thousand/cm³. Milk mixed with colostrum, as well as milk obtained from cows in the last 7 days of lactation (old milk), with a subclinical form of mastitis or with other disorders of the animal's body condition is considered abnormal, in which the content of somatic cells increases by more than 500 thousand/cm³. The content of som cells up to 90 thousand/cm³ is not the norm; rather, it is an indicator of falsification of raw milk - the milk is diluted, pasteurized, sterilized. It should be noted that somatic cells, unlike bacteria, do not multiply in milked milk.

Farms do not always have the opportunity to control the content of somatic cells before submitting raw milk for processing. Due to the increased content of somatic cells, milk may not be accepted or its grade may be reduced, and farms may incur losses. A high somatic cell count is a signal of the presence of sick animals in the herd, therefore, urgent measures must be taken. By controlling this parameter, dairy farmers can quickly initiate treatment and thus avoid deterioration in milk quality. Therefore, determining the number of somatic cells in milk is mandatory and very important when assessing the quality of milk for food safety.

Methods and materials

The scientific and production experiment was carried out at the "Suyunov Jura Bobo" farm, Ishtykhan district, Samarkand region. This farm specializes in the production of livestock products, including milk production.

For the research, cows in their second lactation, black-and-white Holstein-friesian breed, were used. Feeding rates, composition and nutritional value of feed were determined based on reference data from A.P. Kalashnikov. Cows were fed on the basis of the diet adopted on the farm. When feeding the cows, additional feed additives "ProBioKorm" were used, made on the basis of wheat bran containing bacteria of the genera *Lactobacillus*, *Bifidobacterium*, *Propionibacterium* and spore-forming bacteria - *Bacillissubtilis*, which is a probiotic, as well as the premix "MilkMiks". Supplements were included in the concentrated feed in the following quantities: probiotic 5 kg and premix 1 kg per 200 kg of concentrate mixture. At the same time, the titer of probiotic activity was no less than $1,0 \times 10^7$ CFU, and the content of macro- and microelements was normal according to the needs of cows. The results of the study to determine the number of somatic cells were carried out in the laboratory "Food Technology" at the Department of "Technology of Production, Storage and Processing of Products" of Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnology. There are direct (arbitration) and indirect methods for determining somatic cells in milk. The direct method involves counting somatic cells using a microscope. We used the optofluoroelectric method on the Lactoscan SCC analyzer (Expert SSK), which involves the use of an automatic system for microscopic counting of somatic cells, whose nuclei are stained

with a special reagent. This method is the fastest and provides the most accurate result, which cannot be affected by either chemical or temperature falsification. The digital image analysis algorithm includes determining the number of fluorescent cells and calculating their concentration and size. The result is displayed automatically. This analyzer allows you to:

- determine the number of somatic cells. And do this differentiated: by cell size, by type. And this, in turn, makes it possible to separate subclinical mastitis from yeast mastitis, which will subsequently relieve the animal from unnecessary drug treatment with antibiotics and will have a positive effect on the grade of milk, and therefore its price;
- carry out veterinary analysis of samples;
- configure the software to detect high-quality/non-high-quality milk, exceeding the level of somatic cells;
- carry out visual control based on the received images on the analyzer screen and determine the type of mastitis.

Results and Discussions

The presence of a large number of somatic cells in milk leads to a serious decrease in its quality indicators: biological usefulness is lost, technological properties deteriorate during processing. In addition, as can be seen from Table 1, the acidity of milk decreases, and losses of fat, casein, and lactose are noted. Milk becomes less heat-resistant, curdles worse with rennet, and the development of beneficial lactic acid bacteria slows down. It is impossible to make high-quality products from such milk (cheese, cottage cheese, butter, kefir, etc.).

Table 1. Changes in the composition and properties of abnormal milk
(according to K. Butkus, Z. Vagonis, V. Butkene, 1977)

Number of somatic cells, million/cm ³	Percentage reduction in milk			
	titratable acidity	fat	lactose	casein
0,6-1,0	9,0	0,38	0,33	0,13
2,3-3,8	16,5	0,35	0,40	0,24
4,0-13,0	21,0	0,51	0,50	0,27

In comparison with the existing restrictions on the permissible level of somatic cells in the world (Table 2), Uzbekistan is at the level of countries with high potential for the development of dairy cattle breeding.

Table 2. Requirements for milk quality in different countries (according to T.I. Krikun, 2008)

A country	Level of somatic cells, thousand/ml	A country	Level of somatic cells, thousand/ml
Australia	140-170	Netherlands	150
Austria	80	Poland	450-500
Argentina	400	USA	225
Brazil	600-1000	Finland	150-180
Hungary	245-300	France	150
Germany	180-220	Czech	200
Denmark	300	Switzerland	110
Israel	222	Estonia	400
Ireland	150-250	Russia	200-1000
Spain	200-500	Belarus	300-1000

Note: the content of somatic cells according to regulatory documents STB 1598-2006 for milk of the "extra" grade is no more than 300, the highest grade is no more than 500, the first grade is 750 and the second grade is 1000 thousand/cm³.

The results of the study to determine the number of somatic cells are given in table. 3.

Table 3. Content of samotic cells depending on the season of the year

Season of the yea	Livestock (counter) PC.	Number of somatic cells, thousand/cm ³	Livestock (experienced), PC.	Number of somatic cells, thousand/cm ³
зима	14	200	12	180
весна	15	250	14	230
лето	16	300	16	280
осень	15	250	14	230
среднее	15	250	14	230

Conclusions

An analysis of milk for the content of somatic cells was carried out, produced in the conditions of the "Suyunov Jura Bobo" farm, Ishtykhan district of Samarkand region. It can be concluded that the milk produced fully complies with regulatory requirements for the quality and safety of manufactured products, and ranges from 180-300 thousand/cm³. To reduce the content of somatic cells in milk, it is necessary to strictly monitor the living conditions of animals, the completeness of feeding, and the quality of milking.

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