Dairy products quality assurance at the consumer market in compliance with EEC requirements

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Abstract. The article deals with the problems of the Russian consumer market in the field of milk and dairy products, which are the reasons for reducing the average annual consumption of these products per person. The main types of falsification of milk and dairy products are analyzed. Recommendations to improve the efficiency of quality control and safety at dairy processing enterprises of the Russian Federation are presented.

1. Introduction

Human health is one of the fundamental values of the modern society. However, the number of factors negatively influencing and posing a potential threat to human health is increasing each year [1]. Because of that, each country government sets the standards, norms and rules to ensure the population wellbeing and health protection, and the same is applied to food products manufacturing. According to Rosstat, consumption of milk and dairies in the Russian Federation has been gradually declining since 2014 [11]. Consumption diagram is shown in Figure 1. One of the reasons for consumption decline may be lack of trust of the consumers to the quality of domestically produced goods.

![Consumption of milk and dairy products](image)

Figure 1. Consumption of milk and dairy products

Adulterated goods are discovered quite frequently in Russia. Thus, according to Rospotrebnadzor,
which collects information on violation of technical regulation requirements, 730 cases of milk and
dairies adulteration were registered in different regions of the country within 2014-2018 [9]. These
data highlight the real problems of the country’s milk and dairy industry. This paper presents an
investigation of the influence of different content of additives of the pre-treated aluminium oxide
powder on the structure of lead-tin-base bronze under formation.

The purpose of our research is to discover the problems in the quality management and safety
assurance system for the food products, to analyze the methods, which manufacturers may use to
deceive the consumers, to develop recommendations for enhancement of the product quality and
safety assurance systems.

Table 1. Food products in part of its marking.

| Scope of requirements                                      | The name of the normative document                                                                 |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Statutory acts regulating entrepreneurial activity procedures in the area of manufacturing and circulation of food products | 1. Federal Law of the Russian Federation No. 129-FZ dated August 8, 2001 “On state registration of legal entities”
|                                                             | 2. Federal Law No. 381-FZ dated December 28, 2009 (version of July 3, 2016) “On fundamentals of state regulation of trading activity in the Russian Federation” (with amends and additions entered into effect from July 15, 2016) |
| Requirements to facilities of organizations related to manufacturing | 1. “Norms of technological design of milk and dairy industry enterprises. Departmental Norms of Process Design 645/1618-92” (approved by the letter of Ministry of Agriculture of the Russian Federation No. DN-60 dated April 7, 1992) |
| Requirements to the manufacturing process of food products   | 1. “Sanitary Rules and Norms SanPiN 2.3.4.551-96 2.3.4. Food and food processing enterprises (Technological processes. Raw materials). Manufacture of milk and dairy products” (approved by the Decree of Goskomsanepidnadzor of the Russian Federation No. 23 dated October 4, 1996) |
| Requirements to the working conditions                      | 2. GOST 26809-86 “Milk and dairy products. Rules of acceptance, sampling and preparing samples for analysis” |
| Requirements to personal hygiene of personnel                | 1. Sanitary Rules and Norms SanPiN 2.2.4.548-96. 2.2.4. Physical factors of manufacturing environment. Hygienic requirements to microclimate of manufacturing facilities. Sanitary rules and norms” (approved by Decree of Goskomsanepidnadzor of the Russian Federation No. 21 dated October 1, 1996) |
| Requirements to manufacturing control organization           | 1. “Sanitary Rules and Norms SanPiN 2.3.4.551-96 2.3.4. Food and food processing enterprises (Technological processes. Raw materials). Manufacture of milk and dairy products” (approved by the Decree of Goskomsanepidnadzor of the Russian Federation No. 23 dated October 4, 1996) |
| Requirements to manufacturing control organization           | 1. Sanitary Rules “SP 1.1.1058-01. 1.1. General matters. Organization and carrying out production control over compliance with the Sanitary rules and conducting sanitary and epidemic prevention (preventive) measures. Sanitary rules” approved by the Chief State Sanitary Doctor of the Russian Federation on July 10, 2000) |
| Main requirements to product quality and safety              | 2. RP 2.3.2.2327-08 Recommended practice for organization of manufacturing microbiological control at the milk and dairy industry enterprises |
|                                                             | 1. Federal Law of the Russian Federation No. 29-FZ dated January 2, 2000 (version dated July 13, 2015) “On quality and safety of food products” |
|                                                             | 2. Federal Law No. 52-FZ dated March 30, 1999 (version of July 29, 2017) “On sanitary and epidemiological wellbeing of the population” (with amends and additions entered into effect from September 30, 2017) |
|                                                             | 3. GOST 31455-2012. Regional standard. Ryazhenka (fermented baked milk). Technical specifications (entered into effect by Order of Rosstandard No. 1595-st dated November 29, 2012) |
|                                                             | 4. Technical Regulation of the Customs Union “On milk and dairy products safety” (CU TR 033/2013) adopted by Resolution of Council of the Eurasian Economic Commission No. 67 dated October 9, 2013 |

2. Specific features of dairy products quality assurance at the consumer market in compliance with EEC requirements
To assess the government regulations in the area of dairy products quality assurance at the consumer
market in compliance with EEC requirements, we conducted the content analysis of published research materials, statistical data of the Federal Services of the Russian Federation, such as Rospotrebnadzor, Rosstat, and Rosselkhoznadzor, as well as requirements of EEC legal and regulatory framework for the milk and dairy industry.

First of all, we studied a number of legal documents regulating the manufacture of milk and cultured milk products. Such documents are Sanitary Rules and Norms SanPiN 2.3.4.551-96 “Manufacture of milk and dairy products” covering all milk and dairy enterprises currently in operation, under design or under construction, including integrated manufacturing facilities, factories, plants producing dry infant milk products and dairy products for young children regardless of their departmental subordination and form of ownership; CU TR 033/2013. Technical Regulation of the Customs Union.

The content analysis enabled us to single out the problem, which is a big concern for the manufacturers of the industry under research, namely, adulteration, Figure 2.

![Figure 2. Adulteration types [2, 3].](image)

The problem of dairy products adulteration has become of special importance due to renewal of dairies assortment by way of adding vegetable raw material components (vegetable fats, soy proteins etc.), extending of dairy types and varieties [13]. The solution to this problem may become approval of dairy products compliance with the legal and regulatory requirements, i.e. conducting an expert evaluation.

Nowadays the problems of conducting various expert evaluations to verify genuineness of dairy products sold in our country gained special importance. In recent years, the variety of milk and dairies manufactured in our country increased significantly. Very often, to cheat on the consumers the following methods are applied: adulteration as to quantity, assortment, information and quality [2].

Thus, according to Rospotrebnadzor report, within 9 months of 2017, over 236 thousand samples of milk and dairies were examined. Out of all tests, 6.6% of samples did not meet the quality and
safety requirements under the regulatory documents as regards physical and chemical parameters, and 3.9% under adulteration parameters. More detailed information on non-compliance of parameters is shown in Figure 3 [12]. This problem is controlled by the federal authorities, which take the appropriate measures aimed at prevention of illegal actions aimed at milk and dairies adulteration.

Figure 3. Parameters of non-compliance of dairies under physical and chemical parameters in percent

For instance, some manufacturers add soda to milk, which destroys vitamin C (acidity decreases), but prolongs the product shelf life, which tells about high quality adulteration. This is a sign of manufacturing technology violation [2, 3, 4].

In case of milk powder, the most popular adulteration is adding cheese whey, food raw containing all milk components. About 50% of milk dry matter, including 88-94% of milk sugar, 20-25% of proteins, 6-12% of milk fat, 59-65% of minerals, are transferred to cheese whey from milk raw. The additive value ranges between 10 and 60%, the most widely spread is substitution of 1/3 milk content.

To manufacture whole milk powder, butter and curd with high fat content, vegetable fats are quite often used instead of milk fat: coconut fats, fractionated palm oils, hydrosol fats. In case of condensed milk, the following adulterations are typical: adding whey, vegetable fats, soy protein and thickening agents, mainly starch. Over half of condensed milk sold at the Russian market is adulterated products [5-13].

Quality assurance for manufacture of dairy products and preventing adulterated products from entering the market is one of the industry’s vital problems. A solution to this problem may become establishment of efficient quality management system, which should be developed not only within the milk and dairy industry enterprises, but also at the regional and federal levels. The quality problems in milk and dairy industry are discussed nowadays at the scientific and practical conferences and agroindustrial forums, including international events, where the necessity of international integration of quality and safety assurance system at the milk farms and factories was emphasized many times [13].

The currently existing quality control system according to the Technical Regulation of the Customs Union “On milk and dairy products safety”, which contains manufacturing requirements, and “Milk and dairy products manufacturing”, includes several stages of control at various production areas. However, the main disadvantage of this quality system is its system nature itself: many milk and dairy industry enterprises effectively implement some elements of quality and safety control system without any complex approach. The control system implies a set of rules and principles, which cannot be avoided, and which require mandatory strict compliance for all the participants of production chain from the supplier to the consumer.

It often happens that, while the technological processes are complied with, there is no elementary
sanitary norms in place, that is, while complying with the Technical Regulation requirements, the manufacturer may violate the sanitary norms. Another situation is that the result of testing the separate samples of the goods or raw material batch is applied to the whole batch, which is not always a sign of compliance of the whole batch to the control sample. It means that the control chain is sometimes interrupted, and it has a negative impact on the quality of the product supplied to the consumer.

3. Conclusion and proposals
Unfortunately, internal inspections at the enterprises are often a mere formality, and the main purpose of the business owners is to get the maximum profit to the prejudice of rules and standards compliance. Therefore, the quality and safety control of dairy products is not carried out on the ongoing basis and does not engage the independent inspections.

At this moment, the RF legislation does not have an exact definition of “product adulteration” term and does not separate between the violations which should be considered a minor offence, and those, which are a serious offense. On June 25, 2018, a meeting took place at the Ministry of Industry and Trade of Russia in regards to the draft federal law “On entering amends to the Criminal Code of the Russian Federation in part of strengthening measures to counter adulterated food products circulation”; however, these measures were not established [14]. At the same time, inspection carried out by Rospotrebnadzor in the Q1 2018 discovered 22 phantom enterprises, which were written on the goods packaging as manufacturers, but which were not present at the addresses they declared.

Proposals on improving the control system efficiency for quality and safety assurance, which can be practically, implemented at the milk processing industry enterprises:

1. First of all, careful compliance with the sanitary and hygienic regimes and personal hygiene rules by the enterprise personnel. Conducting briefings, systematic checking of knowledge of sanitary and hygienic rules and norms, introduction or tightening individual employee’s liability in case of his/her violation of sanitary and hygienic regimes or personal hygiene rules as one of the ways to enhance the quality control system efficiency.

2. Careful organization of manufacturing processes and complying with the technical regulations are also components of efficient manufacturing practice. To achieve positive results, it is necessary to carry out assessment of workplaces, upgrade of qualification of employed specialists and rigorous control over compliance with the regulations and record management, with assignment of personal liability on the employees. In case of systematic compliance with the said requirements, it is possible to improve the manufacturing processes in case if the analysis reveals the unfavorable influence on the quality of manufactured product.

3. Necessity of system control over all the manufacturing stages from incoming control to transportation of finished products. This provision implies necessity to carry out control over all the stages of production with elimination of chaotic data providing per each process separately and formal approach to data collection. The main purpose should be systematization, compilation, and analysis of data provided to the regulatory persons or authority. With this purpose the enterprise should establish a regulatory authority, which functions include collection of data on production processes and prompt response in case of violation of such processes or unreliability of data provided.

4. Each enterprise should independently develop its manufacturing activity. Therefore, it should have its own set of documents regulating manufacturing activity and aimed at assurance of quality and safety of manufactured products. For such purpose it is required to develop and implement a sufficient number of local regulatory documents, which contain detailed guidelines under each technological process and action plans for each theoretically possible situation.

5. Quality control for the raw materials and finished products should not only involve laboratory testing within the enterprise. To confirm the objectivity of tests and to extend the range of methods and opportunities, it is necessary to carry out systematic research of products at the independent accredited laboratory complexes. For the same purpose it is necessary to update, as often as it is required, laboratory facilities and equipment and to upgrade knowledge and skills of the employees responsible for the research process.
6. The essential element of control system efficiency is establishment of in-house control commissions over compliance of milk processing industry requirements. This form of control may be established in the form of department. Commissions should be preferably formed from independent persons to eliminate formal approach to performance of duties and raise the inspection objectivity. Such internal audit shall make it possible to detect shortcomings and take measures for their timely elimination.

7. In terms of legislation it is necessary to eliminate the gaps in penalties for adulteration of food products. As of now, these penalties are only of material nature, which in no way prevents from increase of adulterated food products at the market. Weakness and inadequacy of legal framework in the area of quality and safety regulation of food products can be partially eliminated by way of tightening liability and introduction of personal liability of the enterprise top management and divisions carrying out control over compliance with the effective regulations.

8. Introduction of mandatory certification of dairy products as a means of preventing violations in its production.

It is worth noting that enhancement of quality control efficiency and safety assurance is possible in case of implementing all the above proposals. Just a single measure shall not yield the expected result, since the quality control system covers not only specific production processes, but also everything that directly or indirectly relates to the manufactured product.

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