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# Hygienic Basis for Contamination of Food Products and Production of Dairy Products until 2030

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***Abstract---****This article shows the results of a study of residual amounts of organochlorine pesticides, salts of heavy metals, nitrates, mycotoxins in milk and dairy products consumed by the population, the total amount of which is a potential threat to public health. Also, a forecast for the production of dairy products until 2030 has been developed. Taking into account that the annual increase in production is on average 100-200 tons, it was found that the demand for it should increase by 61.5% (compared to 2009) in 15 years.*
***Keywords---****dairy products, forecast, heavy metal salts, milk, organochlorine pesticides, rational nutrition.*

## Introduction

The creation of a scientific and hygienic basis for preventive health measures through the creation of a mathematical model based on a multifactorial analysis of the complex impact of environmental factors on the health of the population and the application of a systematic approach remains an urgent issue. To accomplish this complex task have to use many methods and criteria The role of mathematical modeling in solving the problem of monitoring the external environment and public health is very important (Badalov, 2000; Baturin et al., 2005; Popkin, 2002). Solving the problems associates with the existing system closer to European standards in many ways. Although some mathematical models on the impact of environmental factors on the health of the population are multifaceted, their extreme complexity and value do not allow them to be put into practice. Diet and nutrition are important factors in improving and strengthening the health of the population throughout life, and its deficiency leads to chronic diseases (Bultacheev, 2006; Musaiger, 2002; Ashurova, 2014). The period of growth of chronic diseases is in full swing all over the world, there is a steady growth trend in its dynamics. The most serious and dangerous of the diseases are cardiovascular diseases. Cardiovascular disease accounts for 50% of fatalities. There are specific reasons for this situation to grow rapidly in less developed countries. Researchers predict that by 2020, the death rate will be 71% for heart disease, 75% for heart attacks, and 70% for diabetes. The incidence of diabetes could reach 2.5 times in developing countries or 228 million by 2025. The role of infectious diseases in Asia, Latin America, and some African legions remain important (Musaiger, 2002; Murray et al., 1996; Stampfer et al., 2000).

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The launch of new types of dairy products in the country leads to an increase in demand for their preparation, storage, and transportation. The problem of ensuring the quality and safety of these foods is becoming increasingly important around the world, including in Uzbekistan (Normatova, 2016). When surveyed, the Russian population was found to eat 78% - 3 times, 10% - 2 times, 12% - 4 times (Food quality and safety: 2003). A study of Central Asian countries in Tajikistan (2003) found that among school-age children, the daily diet was lower in protein, fat, and higher in carbohydrates. These include deficiencies of vitamins C, A, V1, V2, iron, calcium, and other minerals in the diet, low consumption of meat, eggs, milk, sugar, and other products, and excessive consumption of bread, as well as the same diet (Urbach, 1995; Grunert et al., 2000).

E.A. Khokhlova (2007) argues that as a result of the study of the actual nutrition of the population of the Chuvash Republic of the Russian Federation, it is disproportionate. In the diet, it is shown that there is a lot of bread. In the diet, protein from milk and dairy products - 0.07, fats - 0.01 g, and cottage cheese, sour cream, and cheese were recorded in very small amounts in the diet. Dairy products average 50 g per day (Khokhlova, 2007). Lapardin and co-authors (2003) made a hygienic assessment of the nutritional status of the population in the Primorye Territory of the Russian Federation and found that the deficit of dairy products in the daily ratio was 42%. These authors study the needs of urban and rural populations for milk and dairy products and note that in 2000 the demand for them among the urban population was 418.2 g per day, and in rural areas - 525.3 g (Lapardin et al., 2003).

Serotypes of pathogens such as hysteria, botulism, Listeria mono cytogenesis, and Escherichia coli are changing in the manifestation of food quality and safety, and atypical manifestations of the disease are observed. For example, Listeria mono cytogenesis, which enters the body through food, causes 20-30% of deaths, and Escherichia coli causes hemorrhagic colitis in 10% of patients, a disease that is life-threatening with hemolytic-uremic syndrome due to the release of verotoxin from the microbe (Popkin, 2002; Sapp, 1991; Alcivar et al., 2017). Scientific sources report an increasing number of factual data and evidence of food-related diseases, most of which include eating-related kidney disease, reactive arthritis, cerebrovascular disorders, and long-term diseases of the nervous system (Musaiger, 2002).

In Uzbekistan, the elimination of diseases related to food quality and harmful substances, ensuring the safety and quality of products from primary production to the consumer are identified as important tasks (Normatova & Botirov, 2020; Anvarovna & Kabilovna, 2020). Several laws, regulations, and guidelines are being developed to implement the recommendations of the UN WHO, to train and educate personnel on membership in the World Trade Organization, and to implement the strategy of food quality and safety. At the same time, the lack of well-developed infrastructure, poor inter-farm relations, the existence of artisanal production, the existence of an old system of control and inspection cause problems with the quality and safety of food products. One such product in the diet of the population is milk and dairy products.

*The purpose of the study*. Study of food quality and safety problems in the Republic of Uzbekistan and development of a forecast of dairy production until 2030.

## Material and Methods

In determining the indicators of quality and safety of milk from the following normative documents: State standard 26932-86 in determining the amount of lead in "Raw and finished products"; State standard 26935-86 in determining the amount of tin in "Raw and finished products"; State Standard 26927-86 for determining the amount of mercury in "Raw and finished products"; State Standard 26931-86 for determining the amount of copper in "Raw and finished products"; State Standard 26934-86 was used to determine the amount of zinc in "Raw and finished products".

Detection of pesticides was carried out on chromatographs "TsVET". State Standard for hygienic assessment of pesticide residues 23452-93 "Dairy products". Methods for the determination of residues of organochlorine pesticides, Sanitaria rules and norms 42-123-4540-87 "Maximum permissible levels of pesticides in food and methods for their detection" were used (Pandit et al., 2006; Soeters et al., 2008). In the determination of nitrates. P. Recommendations from Sayapin and co-authors were used (1988). Bacteriological indicators of dairy products were studied using laboratory data of the regional sanitary-epidemiological surveillance and public health service. Three different methodological approaches were used in forecasting: the method of determining the "maximum stability", the regression equalization, the formula for predicting Spearman (Wouters et al., 2002; Hyndman & Koehler, 2006).

The analysis and algorithm of parametric forecasting consist of the following: here parametric forecasting is understood as a discrete quantity variable with a constant discrete step. In the forecast, changes in milk production over time were expressed in values. In this case, the distance between the dynamic changes in the analysis was chosen as 1 year. A dynamic range was constructed based on the values of changes in milk production over the years. Its characteristic feature is that in place of x was the time factor, and in its place was expressed milk

production (thousand tons). The graphical representation of the dynamic series is represented by broken lines. To determine the main trend of the characters, it was necessary to align the dynamic rows, that is, to grind the broken lines. Correlation and regression analyzes were performed in the development of risk formulation prediction formulas (Mamatkulov B.M, 2014). The inspections were carried out in the laboratories of the regional sanitary-epidemiological peace and public health service.

**Result and Discussion**

Residual amounts of heavy metal salts, pesticides, mycotoxins, microbes, and nitrates from persistent determinants in dairy products were assessed by applicable sanitary norms and regulations. Analysis of milk and dairy products consumed by the population of the Fergana Valley shows that they contain chemical and biological xenobiotics that pose a potential threat to public health (Fanelli & Piazza, 2020; Clement, 1999). In the Fergana Valley, the indicators of heavy metal salt residues in dairy products were given, and the quantitative indicators of lead, copper, and zinc in dairy products consumed by the population did not differ sharply across regions.

Lead as heavy metal is dangerous with the call of chronic poisoning. The average detected amount of lead at the Fergana Valley observation points we conducted was 0.195 ± 0.04 mg/kg. The daily intake was 0.0065 mg. The content of lead in milk in Andijan region is 0.15 ± 0.02 mg / kg, in Namangan region 0.22 ± 0.03 mg / kg, in Fergana region 0.16 ± 0.009 mg / kg, and in Fergana 0.23 ± 0.02 mg / kg. The calculated daily dose was 0.005 mg in the Andijan region, 0.007 mg in the Namangan region, 0.006 mg in the Fergana region, and 0.008 mg at observation points in Fergana. It is known that nitrates are converted into nitrites, which are dangerous for the body as a result of the reduction reaction, converting hemoglobin in the blood as methemoglobin as a toxic substance. The average nitrate content of the dairy products we tested was 10.5 ± 0.7 mg/kg. Of course, these figures are very low compared to nitrates in melons (50 mg/kg in water, 90 in melons, 90 in watermelons, 1600 mg/kg in beets), but given the constant consumption of milk, it is clear that this amount is a potential risk. The number of nitrates in milk was 8.4 ± 0.7 mg/kg in the observation points of the Andijan region, 10.3 ± 2.1 mg/kg in Namangan region, 9.8 ± 0.7 mg/kg in Fergana region, 13.4 ± in Fergana city. 1.04 mg / kg. The maximum detected concentration of nitrates was 26.4 mg/kg.

Uzbekistan is one of the world's leading cotton producers. Intensive protection against pests and diseases is required to grow cotton. In this case, the use of stable and oil-soluble pesticides is especially dangerous. These include dichlorodiphenyltrichloroethane (DDT) and hexachlorocyclohexane GXTsG (a, g). The use of DDT is banned in our country, but in some Central Asian republics, this pesticide is still used. The mean total DDT and its metabolites in the study areas were 0.077 ± 0.0045 mg / kg, the daily intake was 0.0027 mg, 0.04 mg / kg in yogurt, 0.05 mg / kg in sour cream, and 0.02 mg / kg in sour cream. kg, in sour milk 0.001 mg / kg, in cream 0.06 mg / kg.
The maximum amount of GXTsG at the identified observation points was detected in samples taken from Fergana - 0.019 mg / kg (daily dose 0.00067 mg). The mean value of the total data obtained was 0.0008 ± 0.00004 mg / kg, the daily intake was 0.000031 mg. GXTsG in non-dairy cream 0.0035 ± 0.0006 mg / kg, daily dose 0.0001 mg, sour cream 0.0046 ± 0.008 mg / kg, daily intake 0.00016 mg, yogurt 0.0018 ± 0.0007 mg / kg, the daily dose is 0.000064 mg, the daily dose is 0.0028 ± 0.00008 mg / kg, the daily dose is 0.0001 mg, the daily dose is 0.0041 ± 0.0008 mg / kg, the daily dose is 0.00014 mg, in cheese 0.0038 ± 0.0004 mg / kg, and the daily dose was 0.00013 mg.

Bacteriological parameters in the diet were analyzed based on data obtained from DSENMs. Of the 1933 samples taken in 2013, 167, or 8.6%, were positive, in 2014, 147 or 1,07% of 1,073 samples were positive, and in 2015, 127 or 6,6% of 1,915 samples were positive.Contamination of milk and dairy products is caused by contact with contaminated water, mosquitoes, parasites, rodents, pets, contaminated dishes, a sick person, or carriers of bacteria. In particular, the study revealed that the total number of microbes in the air of dairy farms, the number of hemolytic staphylococci, streptococci exceeded the sanitary and hygienic standards by 1.5-2 times. In recent years, there have been reports in scientific sources that breast and cattle milk is contaminated with aflatoxins. These data were obtained as a result of inspections conducted in the territory of the Republic of Kazakhstan. The study of the dynamics of mycotoxins in 2013-2015 showed that in 2013 their average value was 0.0009 ± 0.0002 mg / kg, in 2014 it was 0.0007 ± 0.00003 mg / kg, in 2015 the average was 0.0004 ± 0, 00003 mg / kg was detected. The total amount of mycotoxins in the diet is declining. Although surveys at observation points in the Fergana Valley show that aflatoxin residues are below hygienic standards, the accumulation of mycotoxins in the general diet in other products and their synergistic nature acknowledge the potential risk to public health.

Nowadays, like all food products, the demand for milk and dairy products is growing. New dairy farms and dairy plants are being created and the range of products is expanding (Kim & Smith, 2001; Lee et al., 2001). To ensure the quality and safety of this product, it is of course advisable to calculate the scale of production according to the need for it. To calculate the forecast of dairy production, data from the State Statistics Office on the quantitative indicators

of dairy products for the last 10 years are given in Table 1. The small squares method of dynamic series alignment was used to determine the quantitative indicators of the forecast.

The dynamic series was aligned as follows using the dots expressed in arithmetic mean natural series. In the next step of the calculation, we subtracted the deviation at the series levels from this magnitude. We performed the calculations using formulas 1 and 2 below and determined the linear equation dimensions. We placed the result of this equation in the last column of the table. As a result of continuing the line formed by the dynamic image of milk production and the balanced image, it became possible to give a forecast of milk production for 2009-2030 (Table 2). Table 2 shows the forecast of milk production in the country in 2009-2030.

Table 1
Calculation of forecast parameters of milk production in the Republic of Uzbekistan (thousand / ton)

| years<br>ПЗ<br>Ч | $X_i$ | milk production, $Y_i$ | $(X_i - X)$ | $Y(X_i - X)$ | $(X_i - X)^2$ | $Y_x$ |
|---|---|---|---|---|---|---|
| 1994 | 1 | 3494,9 | -7 | -24464,3 | 49 | 3196,13 |
| 1995 | 2 | 3665,4 | -6 | -21992,4 | 36 | 3320,69 |
| 1996 | 3 | 3556,2 | -5 | -17781,0 | 25 | 3445,25 |
| 1997 | 4 | 3667,3 | -4 | -14669,2 | 16 | 3569,81 |
| 1998 | 5 | 3569,4 | -3 | -10708,2 | 9 | 3694,37 |
| 1999 | 6 | 3765,3 | -2 | -7530,6 | 4 | 3818,93 |
| 2000 | 7 | 3669,9 | -1 | -3669,9 | 1 | 3943,49 |
| 2001 | 8 | 3665,2 | 0 | 0,0 | 0 | 4068,05 |
| 2002 | 9 | 3721,3 | 1 | 3721,3 | 1 | 4192,61 |
| 2003 | 10 | 4031,1 | 2 | 8062,2 | 4 | 4317,17 |
| 2004 | 11 | 4280,5 | 3 | 12841,5 | 9 | 4441,73 |
| 2005 | 12 | 4554,9 | 4 | 18219,6 | 16 | 4566,29 |
| 2006 | 13 | 4855,6 | 5 | 24278,0 | 25 | 4690,85 |
| 2007 | 14 | 5097,5 | 6 | 30585,0 | 36 | 4815,41 |
| 2008 | 15 | 5426,3 | 7 | 37984,1 | 49 | 4939,97 |
| S | 120 | 61020.8 | - | 34876,1 | 280,0 | |

Analysis of the data showed that from 2009 to 2015 there was an upward trend in milk production in the country. The dynamics of dairy products have increased due to population growth, but the amount of dairy products does not comply with the rules of adequate and rational nutrition. It is advisable to have an optimal daily intake of 500-1000 ml of milk. Mathematical calculations show that the volume of milk production in 2016 amounted to 5064.53, in 2017 - 5189.09, in 2018 - 5313.65, in 2019 - 5438.21, in 2020 - 5562.77, in 2025 - 6185.57, in 2030 - 6808.37 thousand. / ton delivery is forecasted. According to the Main Department of Statistics, the total number of cattle in the country in 2008 was 7438. According to the data provided by reputable organizations in our country, given that the population is growing by 1.2-1.5% per year, it is necessary to increase the number of dairy products per capita by 61% compared to 2009.

Table 2
Forecast of milk production in Uzbekistan until 2030

| Years | Milk production forecast (thousand tons) | Years | Milk production forecast (thousand tons) |
|---|---|---|---|
| 2009 | 4192.61 | 2020 | 5562.77 |
| 2010 | 4317.17 | 2021 | 5687.33 |
| 2011 | 4441.73 | 2022 | 5811.89 |
| 2012 | 4566.29 | 2023 | 5936.45 |
| 2013 | 4690.85 | 2024 | 6061.01 |
| 2014 | 4815.41 | 2025 | 6185.57 |

| | | | |
|---|---|---|---|
| 2015 | 4939.97 | 2026 | 6310.13 |
| 2016 | 5064.53 | 2027 | 6434.69 |
| 2017 | 5189.09 | 2028 | 6559.25 |
| 2018 | 5313.65 | 2029 | 6683.81 |
| 2019 | 5438.21 | 2030 | 6808.37 |

**Conclusion**

- The daily ratio of organochlorine stable pesticides (DDT, DDD, DDE), hexachloride (α and γ), nitrates, lead, copper, arsenic, mercury, tin, gland (a) pyrene, nitrosamine, polychlorinated biphenyls, cadmium, radionuclides, radionuclides the total amount of bacteria was found to pose a potential risk to public health.
- The forecast of dairy products until 2030 showed that its volume will be 6808.37 tons, the average annual increase in production will be 100-200 tons, and the need for it will increase by 61.5% (compared to 2009) after 15 years. Milk production in the country will increase from 3.6 million tons (156.3 liters per capita per year) to 4.9 million tons (181.5 liters per capita per year), and by 2030 the per capita demand for dairy products is expected to increase by 250 ml per day.

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