

BIOLOGICAL POLLUTION OF NUTRITION PRODUCTS OF ANIMAL ORIGIN IN TURNOVER OF THE TOWN OF BISHKEK

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We have undertaken microbiological monitoring of nutrition products of animal origin (meat products) in turnover on the territory of the town of Bishkek and defined dynamics in revealing the products that does not meet requirements of normative documents. The objects of research were traditional and alternative methods of microbiological study of meat products. The research was made on the following microbiological indications: number of mesophile aerobic and facultative-anaerobic microorganisms, (bacteria of coliform bacillus group), Salmonella, Staphylococcus aureus, Escherichia coli, yeasts, and moulds. Normative values of definition of the above-mentioned indicators was set in accordance with the Universal sanitary-epidemiologic supervision, authorized by decision of commission of customs union. The received results and novelty: – for the first time laboratory examination took place upon generalized report data in regard to contents of micro-organisms in nutrition products of animal origin in turnover at the territory of the town of Bishkek during the period 2017-2019; nutrition products of animal origin were evaluated according to content of certain groups of microorganisms: – for the first time yearly dynamics (2017-2019) of revealing products that do not meet requirements of normative documentation.

Keywords: microbiology, safety, sanitary-indicational microorganisms, number of mesophile aerobic and facultative-anaerobic microorganisms, bacteria of coliform bacillus group, conditionally-pathogenic microorganisms, E. coli, S. aureus, sulphite-reducing clostridium, pathogenic microorganisms-Salmonella, organisms of spoiling: yeasts, moulds

Nutrition is one of the most important factors that define ecological-physiologic condition of human health and provide a complete function, adaptation abilities of an organism, and life expectancy.

According to the data of many scientists (M.P. Butko, 1994; N.R. Anosov, 2001, A.V. Aganin, 2002, L.V. Dracheva, 2007; V.A. Dolgov, 2005, and others), practically health of a person depends on nutrition, its structure, safety, and quality of the consumed nutrition products, majority of which is formed of products of animal origin. They serve as basic source of the most deficit complete proteins and other necessary nutrients for human organism. However, with products of human origin human organism can be penetrated by activators of infection diseases as well as products of their activity (toxins, ferments) that can often lead to local and general pathological processes on molecular, cellular, and organ level.

According to statistics, number of diseases, related to low-quality products grows every year, and, according to the data of State inspection of sanitary, veterinary, and phytosanitary safety by the Government of Kyrgyz Republic, the part of positive results of bacteriologic examinations of products of animal origin remains high still. The level of microorganisms' content nutritional cheese and dietary products in Bishkek has a great influence upon ecologic and microbiological safety of products of animal origin, however, this question remain insufficiently-studied.

Materials and research methods

The object of this research is nutritional products of animal origin in turnover of the

town of Bisheke. The research took place according to the following microbiological indicators: number of mesophile aerobic and facultative-anaerobic microorganisms, bacteria of coliform bacillus group, conditionally-pathogenic microorganisms, E.coli, S.aureus, sulphite-reducing clostridium, pathogenic microorganisms-Salmonella, organisms of spoiling: yeasts, moulds. The work implements a complex of methods: bacteriological methods, and also methods of analysis, comparison, and statistics. The research took place over the period of 2017 to 2019 at the department of General biology and technology of its mastering at faculty of Biology and Chemistry of Kyrgyz state university of I. Arayev in collaboration with laboratories of the branch office of State inspection of sanitary, veterinary, and phytosanitary safety by the Government of KR.

Normative values of defining the above-mentioned indicators was set according to the Universal sanitary-epidemiologic and hygienic requirements towards goods subjective to sanitary-epidemiologic supervision, authorized by commission of the customs union.

Research results and discussion

Quality of meat and meat products is defined by a complex of microbiological, organoleptic, and physical-chemical indicators in accordance with requirements of current normative documents.

In microbiological evaluation of quality of meat and meat products quantitative and qualitative indicators are used. Quantitative indicators reflect an overall number of certain organisms in 1 g or 1 cm³ of meat products.

Qualitative indicators reflect presence or lack of microorganisms of certain types or groups in a given mass of volume of a product.

Sanitary norms on meat imply revelation in meat products number of mesophile aerobic and facultative-anaerobic microorganisms (NMAFAnM), bacterias of coliform bacillus group (BCBG). During the research presence of microorganisms of all groups was defined in meat (diagram 1, diagram 2, diagram 3).

As presented in diagrams, study of 237 samples of meat in 2017 revealed 24 positive to the indicator NMAFAnM that equaled 10,1% of the selection. In 2018 3 samples of 31 were positive (6,7%). In 2019 of 73 studied samples 1 did not meet requirements of microbiological safety and sanitary norms according to NMAFAnM indicator (8,3%).

Thus, the percentage of revealing increased number of mesophile aerobic and facultative-anaerobic microorganisms equaled from 6,7% to 10,1%. 237 samples of animal meat was studied in 2017 to presence of bacterias of coliform bacillus group (BCBG), of which 53

or 22% contained an increased number of microorganisms of the named group. In 2018 they were located in 6 samples of 31 that formed 16,6%. In 2019 of 73 studied samples 1 did not meet requirements of normative documents according to indicator of BCBG, revelation percentage equaled 1,38%.

Annually percentage of samples that do not meet requirements of microbiological safety and sanitary norms by indicator bacterias of coliform bacillus group (BCBG) equaled 1,38% to 22%.

Over the period of 2017 to 2019 251 samples of meat semi-products were researched to the presence of the following microorganisms: NMAFAnM, BCBG, moulds and yeasts. 969 examinations were conducted. 26 positive samples were revealed (31 examination, of which NMAFAnM – 13, BCBG – 15, moulds and yeasts – 4). The percentage of revealing samples of meat semi-products that correspond to requirements of microbiological safety and sanitary norms equaled 4,8%, 9,9%, and 3,4% respectively.

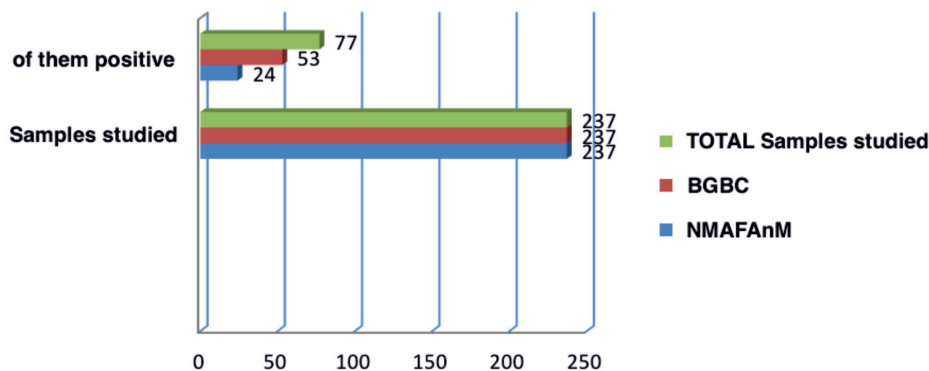


Diagram 1. Dynamics of revealing samples of meat that do not meet requirements of microbiological safety and sanitary norms in the town of Bishkek in 2017

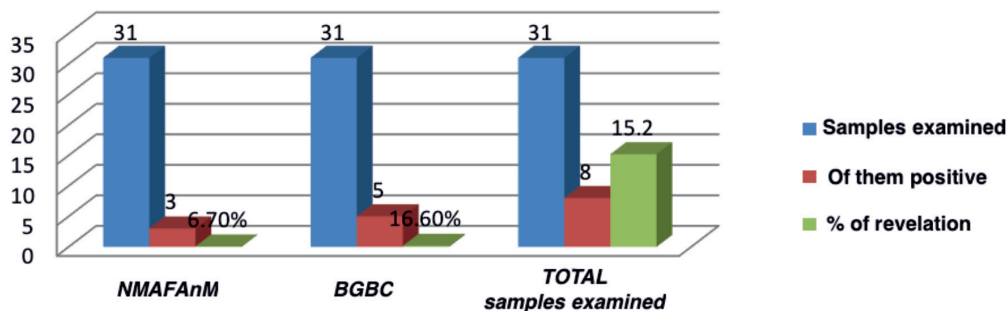


Diagram 2. Dynamics of revealing samples of meat that do not meet requirements of microbiological safety and sanitary norms in the town of Bishkek in 2018

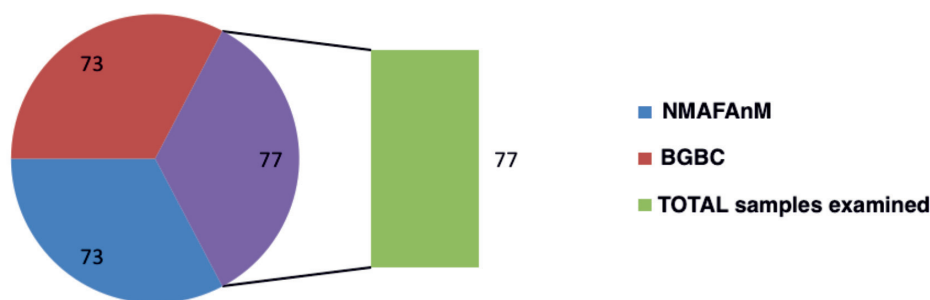


Diagram 3. Dynamics of revealing samples of meat that do not meet requirements of microbiological safety and sanitary norms in the town of Bishkek in 2019

Examination of 5 samples in 2017 to presence of moulds and yeasts did not reveal positive results. In 2018 14 samples of meat semi-products were examined, increased concentration of yeasts and moulds was registered for one of them (7,8%). Two positive samples of semi-products of 71, examined to this indicator, were revealed in 2019 (2,9%).

Thus, percentage of revealing samples that do not meet requirements of normative documents according to indicator yeasts and moulds equaled from 0 to 7,8 during the latest 3 years.

Samples were not examined to indicator *Esherihia coli* in 2017. In 2018 44 samples were examined, 9 of them were positive (18,6%). In 2019 23 samples were examined, no revelation cases were registered.

In 2018 23 samples were examined to presence of yeasts and moulds, of them 4 positive (13,6%). In 2019 three of six examined samples resulted unsatisfactory (50,0%).

According to sanitary norms and rules of researching meat of slaughter animals and poultry, as well as products of its procession (meat semi-products, prepared meat products, by-products) the following indicators are studied: number of mesophile aerobic and facultative-anaerobic microorganisms (NMAFAnM), bacterias of coliform bacillus group (BCBG), *Esherihia coli*, and also yeasts and moulds. During the research presence of microorganisms of all named groups was studied. As presented in table 2, examination of 1553 samples of meat and meat products in 2017 revealed positive samples according to NMAFAnM – 33 (7,6%), in 2018 291 samples were examined, 28 were positive (10,0%). In 2019 22 of 481 examined samples did not meet requirements of veterinary-sanitary rules and norms according to indicator NMAFAnM, and it equaled 4,5%. Thus, percentage of revealing increased number of mesophile aerobic and

facultative-anaerobic microorganisms annually equaled from 4,5% to 10,0%. To presence of bacterias of coliform bacillus group (BCBG) in 2017 322 samples of meat and meat products were examined, of them 57 (17,5%) contained an increased number of microorganisms of the named group. In 2018 of 346 they were found in 31, that equaled 9,2%. In 2019 of 467 examined samples 12 did not meet requirements of veterinary-sanitary rules and norms according to indicator bacterias of coliform bacillus group (BCBG), revelation percentage equaled 2,45%.

Annually percentage of samples that did not meet requirements of microbiological safety and sanitary norms according to indicator bacterias of coliform bacillus group (BCBG) equaled from 2,45% to 17,5%.

Of 44 samples of meat and meat products, examined in 2018 to presence of bacteria *Esherihia coli* 8 were positive it equaled 18,7%. In 2019 23 samples were examined. Samples that did not meet requirements of normative documents, were not registered.

According to indicator yeasts and moulds in 2017 5 samples were examined. Unsatisfactory products were not revealed. In 2018 of 36 studied samples 4 (11,6%) did not meet requirements of normative documents. In 2019 75 samples were examined, 6 of them – positive (6,7%).

To presence of yeasts and moulds in 2017 87 samples were examined, one of them – positive (1,12%). In 2018 of 109 samples 17 were positive (15,8%). In 2019 129 samples were examined, of them 7 did not meet requirements of normative documentation according to this indicator, and it equaled 4,8%. In total, over the period of three years intolerable amount of yeasts and moulds was revealed in 24 samples of nutritional products of 325 examined (6,8%).

During our research we made a retrospective analysis of the level of seeding of nutritional products of animal origin that was received for examination over the period from 2017 to 2019. The revealed microorganisms were divided into 3 groups (table):

- Sanitary-indicative (number of mesophile aerobic and facultative-anaerobic microorganisms (NMAFAnM);
- Conditionally-pathogenic: bacteria of coliform bacillus group (BCBG);
- microorganisms of spoiling (yeasts and moulds).

Proportion of each separate group in comparative aspect and dynamics to number of all revealed microorganisms was studied.

Thus, analyzing data of seeding nutritional products of animal origin with microorganisms showed us that the greatest number of the revealed microorganisms referred to sanitary-indicative group (89,5%). Conditionally-pathogenic microorganisms formed 5,1%. Microorganisms of spoiling – 5,81%.

Analyzing cases of registering cases of nutritional products of animal origin that did not

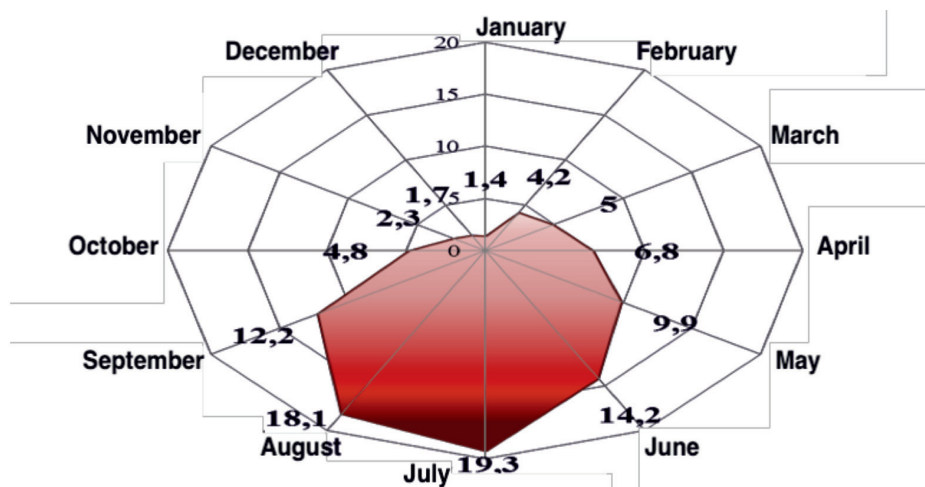
meet the requirements of normative documentation at selling points of the town of Bishkek over the period from 2017 to 2019 established that the highest rate of revealing unsatisfactory products to be located at Skotskiy market (12,5%). The second place is occupied by Oshskiy market (7,9%), Amedin-markets (7,5%). Following are market Bayat (6,2%), Orto-Sayskiy market (5,7%), market Kok-Zhar (5,0%), Dinar, market Alamedin-1 (5,0%), etc.

Based upon the results of our research as well as annual reports of laboratory of branch office of State inspection of sanitary, veterinary, and phytosanitary safety, we have analyzed yearly dynamics of revealing nutritional products of animal origin that does not meet requirements of normative documentation of the course of three years (picture).

From the material, presented in diagram, we can see that the majority of cases of revealing unsatisfactory products took place during the period from May to September (73,7%), peaking in July (19,3%) of all cases of revealing nutritional products that does not meet requirements of normative documentation.

Revelation of products of animal origin that does not meet requirements of microbiological safety and sanitary norms according to groups of microorganisms

Group of microorganisms	Years			Total	
	2017	2018	2019	Saples	%
Sanitary-indicative	199	87	65	351	89,54
Conditionally-pathogenic	2	16	2	20	5,1
Microorganisms of spoiling	1	17	5	23	5,81
TOTAL	200	120	72	392	100



Yearly dynamics of revealing samples of nutritional products that does not meet requirements of normative documentation

In our opinion, it is related most of all to the fact that climatic conditions of this period are the most favourable for reproduction of microorganisms. Therefore, inappropriate conditions of transportation, storage, and realization of nutritional products of animal origin lead to its rapid deterioration. Over the remaining 9 months (September to May) 26,3% of the registered cases of revealing samples of nutritional products that do not meet requirements of normative documentation, took place.

Nutrition is one of the most important factors that define one's health condition and provide for reproductive function, adaptation abilities of an organism, workability, and life expectancy. According to many scientists, practically health of a person in 60-70% depends on nutrition, its structure, safety, and quality of the consumed nutritional products, of which more than half is formed by products of animal origin. They are the basic source of the most deficit complete amino-acids and other nutrients, necessary for a man.

The main factor in transition of infection diseases are products of animal origin that often contain microorganisms that are activators of certain diseases. Emergence of these diseases is related to consumption of nutritional products (meat and meat products, milk and diary, fish, non-finish, eggs, and egg-products) that were exposed to insufficient thermal procession, or their seeding by microorganisms

during the process of production and storage. Providing quality and safety of nutritional products is one of the most urgent problems in Kyrgyzstan. According to statistics, number of diseases, related to low-quality products grows every year.

In this regard provision of high quality and safety of meat products is one of the basic factors in complex of measures aimed to establish microbiological safety and sanitary norms, directed towards prevention of nutritional diseases (infections and intoxications), preservation and improvement in health of population. This work is devoted to studying questions quality and safety of local products in turnover at the territory of the town of Bishkek, from the result of this initial research follows a general monitoring and a number of measures on establishing safety of meat products in turnover at the territory of the city of Bishkek.

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