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## DETERMINATION OF ECOLOGICAL SAFETY AND MEAT MICROBIOLOGICAL INDICATORS

### ҚАЛЫПТАҒЫ ЕТ ӨНІМІНІҢ ҚАУІПСІЗДІГІН ЖӘНЕ МИКРОБИОЛОГИЯЛЫҚ КӨРСЕТКІШІН АНЫҚТАУ

### ОПРЕДЕЛЕНИЕ БЕЗОПАСНОСТИ И МИКРОБИОЛОГИЧЕСКИХ ПОКАЗАТЕЛЕЙ ФОРМОВАННЫХ МЯСНЫХ ПРОДУКТОВ

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*This article shows the increase of the role of preventive nutrition in ecological situation, which is aimed at strengthening the protective powers of organism as well as at the reduce of the risk of the influence of hazardous meat substances.*

*The aim of the work is determination of ecological safety and microbiological indicators of molded meat products. Upon the results of conducted research it has been established that the use of raw materials of vegetable origin influences positively on a nutrition status, which is proved by a dynamics of indicators, characterizing ecological and microbiological status of researches in molded meat products.*

*The results of the ecological safety researches showed the absence of toxic elements and radionuclides in a molded product, what guarantees toxic safety of the product and its further production at the enterprises of the Republic of Kazakhstan.*

*Осы мақалада ағзаның қорғаныс жүйесін нығайтуға, қалыптағы өнімдерінің зиянды заттарының әсер етуін төмендетуге бағытталған профилактикалық тамақтанудың ролінің артқандығы көрсетілген.*

*Жұмыстың мақсаты қалыпталған ет өнімдерінің қауіпсіздігі мен микробиологиялық көрсеткіштерін анықтау. Жүргізілген зерттеулердің нәтижесінде өсімдік шикізаттарын қолдану, тамақтану деңгейіне жағымды әсер ететіндігі анықталған, мұны қалыпталған ет өнімдеріндегі зерттеудің микробиологиялық деңгейін сипаттайтын көрсеткіштер динамикасы растайды.*

*Зерттеу нәтижелері қалыпталған өнімдерде улы заттар мен радионуклеидтердің жоқ екендігін көрсетті, бұл өз тарапынан өнімнің токсикологиялық қауіпсіздігіне және оны ары қарай Қазақстандық кәсіпорындарда өндіруге кепілдік береді.*

*В статье рассматривается роль профилактического питания, направленная на укрепление защитных систем организма, на снижение риска воздействия вредных веществ формованных мясных продуктов.*

*Целью работы является определение безопасности и микробиологических показателей формованных мясных продуктов. В результате проведенных исследований установлено, что использование растительного сырья оказывает положительное влияние на питание, о чем свидетельствует динамика показателей микробиологических исследований в формованных мясных продуктах.*

*Результаты исследований безопасности показали отсутствие токсичных элементов и радионуклидов в формованном продукте, что гарантирует токсикологическую безопасность продукта и его дальнейшее производство на предприятиях Казахстана.*

**Keywords:** molded product, microbiological indicators, toxic elements, digestibility of protein.

**Негізгі сөздер:** қалыптағы өнім, микробиологиялық көрсеткіштері, улы элементтер, ақуыз сіңімділігі.

**Ключевые слова:** формованный продукт, микробиологические показатели, токсичные элементы, переваримость белка.

**Introduction.** The modern food production, both in our country and abroad, is characterized by the creation of a new range of products of high nutritional value.

Their technology is based on fundamentally new processes, including biotechnological modifications at complex processing of raw materials of animal and plant origin. Traditional technologies of food production are being improved in order to preserve biologically active substances at industrial processing. Requirements of a food hygiene, treatment and prevention of a number of diseases are thus considered. A lot of attention is paid to the development of products of mass appointment taking into account age and demographic features.

Solving the problem of creating new technology products of directional action is complicated by the fact that raw materials containing potentially hazardous substances to the human health can be used at their manufacturing. Therefore, a considerable importance is a right choice of ways of processing of the food raw materials, providing both harmlessness of the final product, and preservation of its initial positive biological active properties.

The foodstuff safety is a lack of toxic, cancerogenic, mutagen or other adverse action of products on a human body at their use in the standard quantities, is guaranteed by establishment and observance of regulated level of the contents (absence or restriction of levels of maximum-permissible concentration) pollutants of the chemical and biological nature, and also natural toxic substances, specific to this product and representing health hazard.

Broad penetration of chemistry into various branches of economy creates in some cases threat of infection of environment, including food products. In this regard at the determination of meat quality we investigated the presence of impurity of harmful chemicals in addition to the usually accepted criteria characterizing their nutrition value.

The aim of our study was the definition of ecological safety and microbiological indicators of molded meat products.

**Materials and methods.** Determination of cesium-137. In the finished product is determined by the beta-gamma spectrometry on the device RUT-

91M N 3000264 according to the standard procedure.

We used the standard methods of microbiological analysis in accordance to the State standard 9225-84.

Microbiological evaluation of finished products was accomplished in conjunction with members of the laboratory of the Institute of Nutrition of the Republic of Kazakhstan (Almaty). GOST 9958, GOST 50454. Determination of microbial indicators.

The indicator of relative biological value was counted as a percentage of quantity of the infusorians which have grown on a studied sample to that on a control product.

The biological value of the proteins of multicomponent meat products was calculated on adjusted on the digestibility of protein and amino-acid score on the coefficient of efficiency of protein in animals (rats).

The determination of digestibility of proteins in the invitro experiments by the enzymes of the gastrointestinal tract was performed by the method of A. Pokrovsky and I. Ertanova (1967).

The degree of digestion of the product proteins was judged by the difference between the quantity taken for digestion and the remaining sample after sequential treatment of the product by pepsin and trypsin. Accumulation of hydrolysis products was determined by Lowry color reaction and expressed in mg of tyrosine per 1 g of protein.

**Results and discussions.** Due to the deterioration of the ecological situation and increase of stressful impacts on the person the problem of improvement of quality, safety, treatment and prophylactic properties of meat products becomes actual.

According to the data stated above the indicators of safety of the molded meat products were investigated. Toxic elements and radionuclides (table 1,2) were defined.

Studies (Shumkova I.A. et al, 1974, Miittinen I.K. et.al. 1994, Meyer D., 1996) found that the tissues of animal origin, that accumulate potassium, have the ability to accumulate cesium. The distribution of cesium-137 depending on the final product is studied. The results are shown in Table 1, 2 (Table 1,2).

Table 1 - Contents of Cs - 137 in the molded meat product

Radionuclides, Bq/kg	Molded products «Nazik»		Molded products «Damdi»		Molded products «Arai»	
	Permissible levels according to ND	Obtained fact	Permissible levels according to ND	Obtained fact	Permissible levels according to ND	Obtained fact
Cs-137	160	15,48	160	12,34	160	9,2

Table 2 – Indicators of the molded products safety

Radionuclides, Bq/kg	Molded products «Nazik»		Molded products «Damdi»		Molded products «Arai»	
	Permissible levels according to ND	Obtained fact	Permissible levels according to ND	Obtained fact	Permissible levels according to ND	Obtained fact
Toxic elements, mg/kg, not more than:	0,5	0,004	0,5	0,002	0,5	0,001
Arsenic	0,1	Not found	0,1	Not found	0,1	0,003
Cadmium	0,05	0,009	0,05	0,007	0,05	Not found
Mercury	0,03	Not found	0,03	Not found	0,03	Not found

The Table 1 and Table 2 show that absence of toxic elements and radionuclides in the molded product ensures toxicological safety of the product.

Microbiological indicators testify that essential decrease in a total amount of microorganisms after electric processing is caused by a sharp decrease of meat pH becoming more acidic that for the majority of putrefactive microorganisms

worsens conditions of their activity, reduces the enzymatic activity and ability to reproduction.

The content of toxic elements, antibiotics, pesticides and radionuclides in the finished meat products must not exceed the permissible levels established by the requirements. The table 3 shows microbiological parameters of the finished products (Table 3,4).

Table 3 - Microbiological analysis of finished products (the number of cells, thousands in 1 g)

Name of indicators	Molded products «Nazik»	Molded products «Damdi»	Molded products «Arai»
Total amount of microbial cells	0,644	0,736	0,697
Lactic acid bacteria	0,097	0,073	0,078
E- coli	-	-	-

Table 4 – The content of toxic elements, antibiotics, pesticides and radionuclides

Indicator	Permissible levels	
Toxic elements, mg/kg, not more than:		
Lead	0,5	
Arsenic	0,1	
Cadmium	0,05	
Mercury	0,03	
Benzo (a) pyrene	0,001	
Antibiotics*		
Laevomycesin	Not permitted	<0,01
Tetracycline group	Not permitted	<0,01 unit/g
Grisinum	Not permitted	<0,5 unit/g
Bacitracin	Not permitted	<0,02 unit/g

1	2	3
Pesticides:		
hexachlorocyclohexane ( $\alpha, \beta, \gamma$ - isomers)	0,1	
CCC and its metabolites	0,1	
Radionuclides Bq/kg:		
Cesium-137	160	

The biological value of food products is defined by the quality of its total protein and is estimated by the relation of biological value of this protein to the reference high-quality "ideal" protein. The indicator of biological value allows judging the digestibility of protein and balance degree of its amino acids.

At the determination of digestibility of proteins it was established that introduction of a

vegetable protein brine in a compounding of the molded meat products of a functional purpose improves their digestibility in comparison with a control sample.

The results of the analysis of potential indicators of biological value of the experimental products protein are consistent with data on its digestibility at the experiment in vitro (Table 5).

Table 5 - The digestibility of proteins of molded meat products

Digestibility of proteins in vitro, mg tyrosine/ g of protein	Molded meat products			
	Control	Sample №1	Sample №2	Sample №3
Pepsin	4,52±0,04	5,68±0,21	6,18±0,10	6,20±0,11
Trypsin	10,23±0,09	10,91±0,08	12,06±0,47	12,05±0,48
Summary digestibility	14,75±0,13	16,59±0,29	18,24±0,57	18,30±0,58

**Discussion.** Analyzing data it should be noted that the control option of the molded meat products is characterized by a lower value of digestibility by Pepsin and Trypsin in comparison with a sample.

**Conclusion.** Thus, the quality of a product represents a complex of its properties that allow satisfying the needs of a human body for necessary nutrients safe for his health. It is established that developed molded products of a functional purpose providing improvements of the digestion showed an increased biological value, digestibility and full assimilation of the finished product.

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