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UTILIZATION OF NATURAL PROTEIN-ORGANOMINERAL COMPONENTS FOR CORRECTION OF CONSUMER FEATURES OF MEAT PRODUCTS FOR CHILD NUTRITION

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Background
At present, due to unfavourable ecological situation, adults and children suffer from different illnesses, and decrease of their vital activity takes place. The developed problems can be solved not only by medical treatment , but also by application of new kinds of meat products capable of providing the growing child's organism with metabolically valuable nutrients, energy, and improving stimulation of immune systems and non-specific resistance [2].

Objective
Development of biologically valuable meat products for child and dietetic nutrition enriched with natural protein-organomineral components, protective factors and studying of their influence on the nutritive value and qualitative characteristics of finished products.

Object and Methods
Canned foods and paste enriched with mineral components served as an object of investigations. Microstructural investigations were carried out by the histological method with the system of image analysis on the "Madzhiskan 2A"computer system. Biological evaluation was made on model animals according to the internationally adopted procedures.

Results and their Discussion
A range of meat products for curative and preventive nutrition of children (canned foods "Karapuz" and "Gulliver") and for dietetic nutrition (paste "Krepysh") was developed by VNIIMP.
Meat raw materials (beef, pork), providing the necessary level of protein and fat mass fraction content in the finished product, form the basis of the above products. Additives of animal origin (by-products, collagen-containing raw material, organomineral components, blood, vitamins, etc.) enrich them with mineral substances, such as calcium, iron, vitamins and proteins at the same time, contributing thereby to the manufacture of products for curative-and-preventive and dietetic purposes. Palatability and consistency of the product are ensured by spice extracts, water, salt, and onion.
Development of formulations of products for child and dietetic nutrition is realized with utilization of system analysis methods, on the basis of which medical and biological requirements (MBR) to meat products, considering the specificity of metabolic processes of the child's organism, were formulated and experimentally grounded.
In conformity with scientifically grounded requirements, the content of protein and fat in curative-and-preventive canned foods must be at the level of 30-40 % from the daily need of a (6-12)-month child for these nutrients and amount to 10-12 and 8-12 %, respectively, their ratio being 1:1±0.3. The aminoacid composition of canned foods must approach the composition of ideal protein under the FAO/WHO scale. The linoleic acid content must come to 12-15 % of the amount of fatty acids. Canned foods must be enriched with mineral substances, first of all, by calcium and iron salts. The calcium and iron content in the product must be 150-250 and 2.0-3.5 mg%, respectively. The Ca:P ratio must be approx. 1:1 or 1:1.5. To improve radioresistant properties of canned foods and increase resistance of the product to oxidation, such vitamins as ascorbic acid and β-carotene, the content of which must be at the level of 100 % from the daily need and amount to 40.0 and 3.0 mg%, respectively, should be introduced into the formulations of products.
Investigation of the total chemical composition permitted to note, that developed canned foods meet scientifically justified composition and quality requirements made on the above group of products.
In recent years, positive influence of some mineral substances, first of all, calcium, on protective and adaptive abilities of the organism was determined by a number of researchers [1, 3, 4, 5].
In this connection, for enrichment of products of the above range with alimentary calcium and for normalization of calcium-phosphoric exchange, mechanically-recovered meat and bone powder were included in formula compositions of canned foods and paste.
To obtain mechanically-recovered meat and bone powder, the most complying by their quality characteristics with the requirements of manufacture of products for child nutrition, the raw material from young animals of the 1st category of fatness, raised in specialized stock zones, according to the technology ensuring their ecological cleanliness, was used.
Normalization of Ca : P ratio in products was attained by introduction into recipes of 1.0 % of bone powder or 15 % of mechanically-recovered meat. Microstructural investigations revealed that introduction of the recommended dosages during the appropriate technological processing didn't significantly change structural composition of finished products, and dimensions of bone inclusions (from 170 to 500 μm) didn't exceed permissible levels of the particle size of products intended for infant nutrition.
A proper, biologically grounded approach to utilization of meat raw material together with additives of animal origin (by-products, blood, bone preparations, etc.) permits to obtain products balanced by the aminoacid composition. Balance and access of aminoacids from the developed products were confirmed by the results of biological evaluation achieved in experiments on model animals. When determining biological value, a test - coefficient of protein efficiency was used.

The comparative analysis shows that biological value of new kinds of meat products enriched withnatural protein-organomineral components is, on an average, 9-12 % higher.

Positive influence of canned foods and homogenized product on the key indices of correction of anemic condition of model animals permitted to make a conclusion, that the above products had antianemic effect (see Table below).

Indices	Groups of animals receiving products				
	Control		Test		
	Canned food "Meat puree for children"	Paste	Canned food "Gulliver"	Canned food "Karapuz"	Paste"Krepysh"
Hematologic:					
blood hemoglobin, g/l	122.0±5.2	160.4±6.7	140.0±6.0	143.4±6.7	169.6±7.1
number of erythrocytes, 10^{12}/l	6.0±0.5	5.7±0.5	6.5±0.6	6.8±0.7	6.5±0.6
content of hemoglobin in 1 erythrocyte, %	27.5±2.6	24.8±2.4	32.1±3.1	33.8±2.3	28.9±2.7
content of hemoglobin in 1 erythrocyte, PG	25.8±1.9	19.2±1.3	32.4±3.1	30.0±2.2	22.0±1.6
number of reticulocytes, %	1.30±0.14	1.2±0.1	1.25±0.14	1.20±0.10	1.8±0.62
Iron change:					
concentration of serous iron, μmol/l	31.0±2.4	37.5±3.5	35.1±2.1	39.8±2.7	40.1±4.1
iron-binding capacity of blood serum, μmol/l	98.0±6.1	53.2±2.8	88.3±6.7	84.5±4.9	44.7±2.3
saturation of blood serum transferrine with iron, %	31.4±3.0	35.0±3.3	38.5±3.7	42.1±4.4	42.0±4.4

The results obtained showed that amount of hemoglobin in the blood of animals receiving paste "Krepysh", canned foods "Karapuz" and "Gulliver" was, respectively, 6.7, 17.5 and 14.7 % higher, as compared with the blood of animals receiving the control sample. Higher hemoglobin indices were also fixed in each separate erythrocyte. Regarding the number of reticulocytes in blood, practically there was no difference between the comparable groups of animals. However, such indices as concentration of serous iron, iron-binding capacity of blood serum, and degree of saturation of transferrine with iron point to the fact that test groups of animals are more furnished with this microelement, than the control rats.

According to the results of medical and biological evaluation, high assimilability (accessibility) of calcium from the products under development, which amounted to 34.2 and 81.8 % for canned foods "Karapuz"and "Gulliver", respectively, was determined.

The results obtained permit to speak about high bioaccessibility of calcium from bone powder in the composition of canned food "Gulliver"and paste "Krepysh". Moreover, it is necessary to mention that lower indices of calcium assimilability from canned food "Karapuz", probably, are modified by less quantity of this element in the ration and worse Ca : P ratio, but not by bad accessibility of calcium as such from meat mass. By hygienic parameters, the most optimal enrichment with calcium is attained during introduction into the formulation of such amount of natural-source calcium (or their combination) that ensures the content of calcium in 100 g of the product being not less than 200 mg.

Conclusion

The possibility and limits of utilization of natural protein-organomineral components in the composition of meat products for child and dietetic nutrition was grounded.

By way of microstructural investigations it was determined, that itroduction of the recommended dosages of organomineral components (mechanically-recovered meat, bone powder) into the canning meat, taking into consideration the maximum Ca : P balance in the product, didn't make significant changes in its structural composition.

Based on the complex evaluation, high bioaccessibility of calcium from mineral components in the composition of meat products for child and dietetic nutrition was established.

Utilization of meat raw material in combination with additives of animal origin (bone preparations, by-products, blood) permits to manufacture products of high biological value and promotes stimulation of the hemopoetic function of model animals.

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