

Development of Functional Food Products with National Content based on Local Traditional and Non-traditional Raw Materials of the Republic of Kazakhstan

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Abstract—Based on the main characteristics of the nutritional and biological value of milk from various farm animals, as well as local fruit and berry raw materials, including additives of herbal concentrates, new functional products with targeted biomedical properties have been developed. Experimental evaluation in animals and clinical studies in humans have confirmed the targeted antioxidant, detoxifying and immunostimulating properties of the products, which makes it possible to use these products as specialized nutrition, as well as for mass use for prophylactic purposes.

Keywords— Functional Food Products, Local Traditional and Non-traditional Raw Materials.

I. INTRODUCTION

Evaluation of the nutritional status of various age groups in the Republic of Kazakhstan indicates insufficient consumption of vegetable fats, protein, vitamins A, E, C, folic acid, iron, zinc and iodine. There is a deficiency in the consumption of polyunsaturated fatty acids, in particular omega-3 and omega-6, antioxidant vitamins, and dietary fiber. Due to the basic diet, in particular, organized groups of people, it is very difficult to achieve a complete balance of the diet in terms of basic food ingredients. [1,2].

In this regard, the development and implementation of specialized food products and biologically active food supplements with targeted biomedical properties is of particular importance. Taking into account the national ethnic characteristics of the population of the Republic of Kazakhstan, preferences are given along with products of animal origin, certain types of milk, vegetables and fruits, the use of fermentation products, especially mare's, camel's and goat's milk, plays an equally important role. Products such as kumis, shubat, ayran, kurt, etc. created on the basis of mare's, goat's and camel's milk are widely represented in the diet of the population of various regions of the country. [3]. Noting certain therapeutic

and prophylactic properties of the above products, proven by numerous clinical studies, as well as taking into account their uniqueness of chemical composition, in order to expand the range and give the products targeted preventive properties, products have been created that combine a combination of dairy and plant raw materials. [4].

Considering the high nutritional and biological importance of fruit and vegetable and berry raw materials, producers and research teams are faced with the task of deeper processing of these raw materials in order not only to expand the range of products, but also to create new products of targeted preventive action that reduce the risk of toxic poisoning by foreign compounds that increase immunity. and the antioxidant properties of the body, i.e. development of products for healthy, functional, specialized, dietary and therapeutic-prophylactic nutrition [5].

The development of liquid, pasty and curd products using combined raw materials makes it possible to impart targeted physiological and biochemical characteristics to the final product, which makes it possible to use them in addition to the basic diet or independently, as well as in combination with drug therapy [6].

Based on the foregoing, the purpose of this study was to develop functional food products with national content based on local traditional and non-traditional raw materials of the Republic of Kazakhstan. To achieve this goal, the following specific tasks were solved:

1. Justification of the choice of raw materials and basic biologically active additives used for the design of products on a dairy-plant basis; Разработка рецептур и технологий продуктов;
2. Assessment of the chemical composition;
3. Evaluation of the properties of products in experiment and in clinical observations;
4. Organization of industrial production;

Research novelty. For the first time, new specialized products have been developed based on mare's, camel's and goat's milk with the addition of fruit and grain additives, with targeted biomedical properties.

II. EXPERIMENTAL PART

Taking into account the high nutritional biological value of

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local traditional and non-traditional raw materials (dry mare, camel, goat milk, concentrates and extracts of medicinal herbs, fruit and vegetable raw materials), new specialized products, unique in chemical composition and medico-biological properties, have been developed based on fermented milk, food concentrate and canned food bases.

The product recipe is shown in table 1 below.

TABLE I. FORMULATION FOR A DRY MIXTURE TO INCREASE THE BODY'S RESISTANCE TO THE ACTION OF FOREIGN COMPOUNDS, BASED ON 10 KG OF THE FINISHED PRODUCT

№	Name of ingredients	Quantity, kg
1	Applesauce	1,0
2	Dried apricots	0,5
3	Blackcurrant puree	1,0
4	Dried cranberries	0,5
5	Dried figs	0,5
6	Melon puree	1,0
7	Dried mare's milk	3,0
8	Activated porous oats, minced	2,0
9	Citrus Pectin Powder	0,5

The culture of *Streptococcus thermophilus* in combination with *Lactobacillus rhamnosus* was used as a starter culture

TABLE II. FORMULATION FOR A DRY MIXTURE TO INCREASE THE PROTECTIVE FUNCTIONS OF THE BODY, BASED ON 10 GK OF THE FINISHED PRODUCT

№	Name of ingredients	Quantity, kg
1	Sweet pumpkin puree	2,0
2	Sea buckthorn puree	1,0
3	Dried camel milk	2,0
4	Maltodextrin powder	1,5
5	Activated porous oats, minced	1,8
6	Chopped almonds	0,5
7	Bulgarian pepper puree	0,5
8	Vitamin premix (powder)	0,1
9	Dry cultures of <i>lacto</i> and <i>bifidobacteria</i>	0,5
10	Fucoidan powder	0,1

The culture of *Streptococcus thermophilus* in combination with *Lactobacillus rhamnosus* was used as a starter culture.

TABLE III. FORMULATION FOR FERMENTED MILK COMBINED YOGURT BASED ON MARE'S AND CAMEL'S MILK, PER 1 LITER OF FINISHED PRODUCT

№	Name of ingredients	Quantity, ml (mg)
1	Mare's milk, 2.0% fat	389
2	Camel milk, 2.0% fat	500
3	Peach puree	50
4	Cranberry puree	50
5	Citrus pectin	10
6	Dry cultures of <i>lacto</i> and <i>bifidobacteria</i>	1

The culture of *Streptococcus thermophilus* in combination with *Lactobacillus rhamnosus* was used as a starter culture.

TABLE IV. FORMULATION FOR FERMENTED MILK COMBINED YOGURT BASED ON GOAT AND MARE'S MILK, PER 1 LITER OF FINISHED PRODUCT

№	Name of ingredients	Quantity, ml (mg)
1	Mare's milk, 2.0% fat	389
2	Goat milk, 3.0 fat	500
3	Apple puree	50
4	Strawberry puree	50
5	Citrus pectin	10
6	Dry cultures of <i>lacto</i> and <i>bifidobacteria</i>	1

The culture of *Streptococcus thermophilus* in combination with *Lactobacillus rhamnosus* was used as a starter culture.

To confirm the antioxidant properties of specialized products, we carried out experimental studies, assessed the antioxidant properties of the product on the model of toxic poisoning of the body with lead salts. The experiments were carried out on white nonlinear rats weighing 300-350 g in vivo.

The model animals were divided into 3 groups of 10 individuals: 1 - control (group on a standard diet), 2 and 3 groups of animals were soldered Pb (NO₃)₂ solution with drinking water at a concentration of 10 mg / kg body weight (0.6% solution), 2 the group was on a general-cooked diet and received a Pb (NO₃)₂: 3 seed; the group, against the background of chronic intoxication with lead nitrate, received a combined product with a standard diet (Dry mixture to increase the body's resistance to the action of foreign compounds).

The experiments were carried out on liver microsomes. To obtain a homogenate, a weighed portion (0.5-1.0 g) of rat liver tissue after washing in a cooled saline solution was placed in 10 ml of a medium containing 0.85% NaCl and 50 mM KH₂PO₄ (pH 7.4 at 4 °C) and homogenized with a Polytron homogenizer for 90 sec. The homogenate was centrifuged at 10000g for 20 min. The microsomal fraction was obtained by centrifuging the supernatant at 30,000 g for 60 min. The supernatant was carefully decanted, and the precipitate, which was a fraction of heavy microsomes, was suspended in a medium containing 25%

glycerol, 0.1 mM EDTA, 0.2 mM CaCl₂, 10 mM histidine (pH 7.2 at 4 ° C) and stored at minus 4 ° C.

The results of the researches of indicators of prooxidant and antioxidant status in liver homogenates are presented in Table 5.

TABLE V. STUDY OF INDICATORS OF PROOXIDANT AND ANTIOXIDANT STATUS IN LIVER HOMOGENATES

Groups	MDA _{origin} , nmol/mg proteins	MDA, nmol/mg proteins	Diene conjugant, nmol/mg proteins	Antioxidant protection, %	Catalase, ng/ml	Superoxide dismutase, E/mg
Group 1	1,5	12,5	2,8	76,5	32,5	54,2
Group 2	2,8	28,4	3,8	43,2	18,2	27,2
Group 3	2,4	14,2	3,0	68,2	29,3	48,2

As can be seen from Table 5, with chronic exposure to lead salts in the liver tissue, there is an increase in LPO processes. The study of the initial values of MDA showed that the level of this compound is almost 2 times higher than the control. The study of the concentration of such intermediate products of FRO as diene conjugates showed that the level of DC in homogenates of hepatocytes of rats with a model of chronic intoxication exceeds the control values by 27%. When LPO processes are induced by the Fe²⁺ + / ascorbate system, all intermediate products are completely oxidized to the final compound. The final MDA values were 28.4 nmol/ mg protein in O1, which is 2.3 times higher than the control values. Along with the intensive accumulation of TBA-active products, there is a decrease in total AOA compared to intact animals by 43.6%, in particular SOD by 50% and catalase by 44%.

Assessment of the antioxidant status of hepatocytes in rats that received specialized products against the background of a toxic load also had a positive trend. The total antioxidant activity in hepatocytes increased by 13%, 38% and 58%, respectively, relative to the group with the intoxication model. However, this indicator was below the control by 36%, 22% and 11%, respectively.

In addition, under conditions of increased physical activity on highly qualified athletes, the effect of products on the biochemical and immunological parameters of blood was assessed. The use of products for 60 days against the background of physical activity contributed to an increase in the blood levels of hemoglobin, erythrocytes, serum iron, increased indices of nonspecific and specific links of immunity, along with an increase in the endurance and performance of triathlon athletes.

Заклучение. Thus, on the basis of local traditional and non-traditional raw materials, various combined milk-fruit-grain-based products have been developed, as well as fermented milk products with targeted medico-biological properties. Experimental and clinical results obtained make it possible to use these products for the prevention of negative effects on the body of unfavorable factors, increase endurance, and also make it possible to use them in the complex therapy of

gastroenterological, cardiovascular diseases, as well as to increase the body's resistance to the action of foreign compounds.

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