MEDICAL-BIOLOGICAL ASPECTS OF GROUND MEAT-BASED SEMI-PREPARED PRODUCTS FOR DIETETIC THERAPY OF CARDIOVASCULAR PATIENTS

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Keywords: ground semi-prepared foods, biological additives, medical-biological evaluation, blood count

Introduction

Based on formulated medical-biological requirements, with consideration of specific metabolic processes in organisms of people pre-disposed to and suffering from cardiovascular pathology, meat-plant ground semi-prepared foods for preventive nutrition were developed. The objective of the study was to develop recipe compositions based on meat raw materials added with plant components and biologically active ingredients and study of their influence on physiological state of laboratory animals, pathological morphology, general clinical blood indices and biochemical indices of blood serum of animals.

Materials and Methods

The formulations were developed using the methods of mathematical modelling (Lipatov, 1988) according to formalized medical and biological requirements. Medical and biological evaluation was carried out on the growing white male rats of Vistar line during 28 days in the vivarium of VNIIMP, using traditional experimental methods. Four groups of animals, 10 to each, were formed. The base of recipes of the studied products was ground pork and beef, oatmeal, soy protein (isolate and concentrate). The control group №1 received the ground meat as a basis, bread and rendered lard; group №2 received ground meat added with the complex of BADNo1 (wheat fibre, ascorbic and succinic acid, natural red palm oil, linseed oil, phospholipids, mineral calcium fortifier); group 3 received ground meat added with the complex of BADNo2 (iodocasein, wheat fibre, rendered lard, dihidroquercetin, ascorbic and succinic acid) and group №4 received complex of BAD №1 in addition to the diets of vivarium. The integral index of chronic intoxication (IPHI) (Snitsar *et al.,* 2000) was calculated as the ratio of the organ mass to the total mass of the body in %. General clinical blood examination and determination of glucose, cholesterol and triglycerides in the blood were carried out in veterinary clinic of MGUPB.

Results and Discussion

No clinical evidences of deviations in health were marked in animals of control and experimental groups during the whole experiment. Viability of animals in the experimental and control groups during the whole period was full (100%). The lowest gain weight (222%) and final weight were observed in group №4; use of BAD №1 in the recipe of the meat product (group №2) has led to the largest gain weight (279%) of the animals.

Pathological and anatomical examination of animals after slaughter did not reveal any external signs of pathological or inflammatory processes in internal organs. IPHI of internal organs characterizing possible negative effects of the investigated complexes of BAD are presented in Table 1.

Table1. Integral indices of state of rats having control and tested diets.

Indices	Group №1 (control)	Group №2	Group №3	Group №4
IPHI of spleen	0.36±0,03	0,34±0.03	0.30±0.08	0,29±0,05
IPHI of kidney	0.47± 0.02	0,39±0.11	0.46±0,01	0,37±0,04
IPHI of liver	3.76± 0.22	3.53±0,83	4,10 ± 0.52	4,05 ±1,17
IPHI of heart	0,51±0,19	0,54±0.28	0.30±0.18	0,46±0.07

The calculated integral index did not reveal any significant differences in the relationships between the body mass of the experimental and control animals as compared to the mass of their main important internal organs, which showed the absence of cumulative toxic effect of all the tested mixtures.

The data on hematological indices show a positive effect on hemopoietic function for rats having in their diets dihidroquercetin, which is a strong antioxidant and helps better assimilate the nutritive iron (Pilat and Ivanov, 2002). The value of hematocrit (plasma volume and blood formed elements ratio) in all the groups exceeds the control suggesting the absence of iron-deficient anemia. The colour index (hemoglobin content in one erythrocyte) reflecting the degree of saturation of erythrocytes with hemoglobin and important in diagnostics for differentiation of kinds of anemia, in test groups doesn't differ from the control.

SOE (the velocity of erythrocytes sedimentation) is the least in group №4 (BAD complex), that corresponds to the increase of blood viscosity, and is extremely undesirable for cardio-vascular patients. When BAD are used together with meat products (group 2) this index reaches the level of the control group. Dihidroquercetin allows to increase SOE 1.5 times as compared to the control. The analysis of leucotytic formula of animals' blood has shown insignificant

increase of the total number of leucocytes in groups 3 and 4 as compared to the control, that can be a concomitant symptom of immunological resistance increase of the organism.

The content of monocytes in the blood of rats consuming BAD and half-prepared products with additives is to some extent higher than in the control, but doesn't exceed the limits of the norm (0 –4%) (Batuyev, *et al.*,), which shows the absence of immune conflict in the animal's organism. Full absence of basophil lymphocytes in peripheral blood indicates a low level of food sensibilization in all the samples.

Table 2: Blood count of rats.

Indices	Group №1 (control)	Group №2	Group №3	Group№4
Erythrocytes, x 10^6/μl	4,4 ± 0,07	4,45±0,06	4,85±0,07	4,6±0.1
Mean volume of erythrocytes, μm^3	85.65±2.8	99,7±3,7	98,1±3,3	97,8±3.5
Hematocrit,%	38,0±0,0	44,5±1,7	46.0±1.4	44,0±1,8
Hemoglobin, g/dl	11,2±0,9	10.9±0.8	13,0±0,7	11,6±0,7
Colour index	0,7±0,0	0.7±0,07	0,8±0,07	0,75±0,07
Velocity of sedimentation of Erythrocytes, mm/hour	1,0±0.0	1,05±1,3	1,5±0,7	0.55±0.6
Leucocytes, x 10^3/μl	4,95±0,3	3,7±0,7	5.3±0.6	5,25±0,4
Neutrophils				
- juvenil, %	0,0±0,0	0,0±0,0	0,0±0,0	0,0±0,0
- stab, %	2,01±0,1	2.5±0.09	1,0±0,2	0,0±0,0
- segmented, %	26,01±0.1	49,0±1,4	63,0±2,3	34,0±2,6
Eosinophils, %	0,0±0,0	2,0±0,08	4,0±0,0	6,0±0.5
Monocytes, %	0,0±0,0	2,0±0,08	1,0±1,4	2.0±0,1
Basophils. %	0,0±0,0	0,0±0,0	0,0±0,0	0,0±0,0
Lymphocytes,%	72,0±2,3	34±1,4	31,0±1,2	58,0±2,1

The results of biochemical investigations of animals' blood (Table 3) have shown that use of a complex of BAD (group 2) in a meat product leads to a more rapid reduction of the level of cholesterol and triglycerides compared to other samples, and in case of use the complex of BAD only (group №4) the antiatherogenic effect was the least, which confirms the usefulness of incorporation of BAD into the recipe of a meat product with the purpose of enhancing the theraupetic effect for cardiovascular patients.

The incorporation of dihidroquercetin (group №3) to the ground meat led to less reduction of cholesterol (as compared to the control) than addition of the complex BAD №1 (group №2).

Table 3: Biochemical indices of animals' blood serum.

Indices	Group№1(control)	Group №2	Group №3	Group №4
Glucose, μmol	4.1±0.4	4,7±0.3	4.65±0.3	3,15±0.3
Cholesterol, Mmol/l	6.02 ±0.1	4,85±0.2	5.1±0.7	6.2±0.01
Triglycerides, mol/l	0,58 ±0.1	0,44±0.1	0,75±0.13	1.02 ±0.2

Conclusions

A chronic biological test of feeding meat and plant half-finished products to laboratory rats gave the following results:

- absence of cumulative toxic effect of the tested diets and, correspondingly, of the food additives in the diets;
- use of the complex BAD №1 (wheat fibre, ascorbic and succinic acids, natural red palm oil, linseed oil, phospholipids, mineral calcium enricher) in meat-plant half-finished products gives the largest antiatherogenic effect. The incorporation of dihidroquercetin (complex BAD №2) led to decrease of blood viscosity and increase of hemoglobin level, which indicates a positive effect of both versions;
- Theraupetic effect of BAD complex increases when used in combination with the meat product;
- As a result of the tests, 6 recipe compositions of meat-plant half-finished products for dietary therapy of cardio-vascular diseases have been developed.

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