NEW APPROACH TO THE CREATION OF SPECIFIC MEDICO-PREVENTIVE PRODUCTS REDUCING GENOTOXIC AND STRESS INFLUENCE OF HARMFUL FACTORS ON THE HUMAN HEALTH

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Nowadays the problems are urgent concerning the creation of specific medico-preventive products, which would promote the decrease of genotoxic disturbances caused by under the influence of ionizing irradiation and chemical contaminants of the environment or living in contaminated locations - on one hand, as well as the creation of preparations reducing the harmful influence of chronic stress, which occured to follow constantly human beings - on the other hand.
Earlier the control of such factors was based on usage of antioxidants, some vitamins, and microelements in the form of medicines and food additives. However such an approach to solving the mentioned problems had a substantial shortcoming: each of these substances did not usually provide the sufficient preventive or medicinal effect. And the development of various compositions was frequently based on the intuition of the authors, but not on the detailed information about the complex influence of various preparations and laws of manifestation of useful effect.
In last years some other of approaches were tested to solve the mentioned problems. Researchers in the field of biology and medicine have actively analyzed the effects rendered by small molecules of low concentration of type NO and CO which play the key role in the most physiological processes and in the development of pathological states. Thus it is known that nitrogen oxide is the basic regulator of the vascular tonus and hence the microcirculation of the blood and tissue liquids as well as the regulator of the immunologic activity and specific neurotransmitter. Nitrogen oxide (NO) plays an important role in the development of inflammation, shock, cell destruction, regeneration, and others. NO is produced by means of specific fermentative system - NO synthase from only one aminoacid - l-arginine. That's why the content of l-arginine sources in foods would play an important role in the body resistance to various destructive agents, and in particular to genotoxic factors of physical and chemical origin as well as to the influence of acute and chronic stress.

PURPOSES

The purpose of the study was to analyze the ability of some antioxidants and arginine aminoacid as a food additive to render positive influence on special canned meat products.

MATERIALS AND METHODS

Comparative analyses were carried out to estimate effects of some known antioxidants (vetaron and sodium selenate) and two sources of arginine (pure aminoacid and protamin with addition of nucleic acids hydrolyzates) used as food additives to canned meat. In this connection models of radiation (genotoxic) and stress influence on linear mice were studied. Mice were kept as usual and received feed rations in the laboratory vivarium (7-8 animals in each plastic cage). Animals of all test groups received perorally through the probe 0,5 g of homogenized product two times a day. Then all mice were tested on radio-protective and hemostimulating influence, and antistress effect. First of all, mice were subjected to sublethal irradiation with gamma-rays of cobalt-60. Hemostimulating effect of preparations was analyzed as the index of anti-irradiation efficiency. This effect was estimated by the rate of the recovery after the irradiation of spleen cells with subsequent formation of endogenic colonies under the action of blood-forming cells survived after the irradiation. Statistical treatment of the results was carried out using the parameters of normal (spleen weight) and log normal (number of endocolonies) distribution. Assurance of differences between test and control groups was estimated according to the significance level $P < 0,05$.
To evaluate the antistress effects of feeding the mice canned meat rations with various food additives, a widely spread methods of quantitative determination of stress level were used. The stress level was estimated by the decrease of thymus weight after the immobilization stress by of animals. Mice were immobilized in special narrow cases made of organic glass, where they were tightly pressed to case walls and could not move. Then mice were slaughtered, thymus was removed and weighed.
Statistical analysis was carried out similar to the method for analyzing the data about the spleen.

RESULTS AND DISCUSSION

Analysis of the data (Tables 1 and 2) obtained showed that feed rations containing only meat products without biological additives had no radio-preventive, hemostimulating (Table 1), and antistress effect (Table 2). It was proved that such antioxidants as vetaron and combinations of vetaron with sodium selenate rendered the preventive effect on animals. The combination of fat- and water-soluble antioxidants provided a higher effect than single vetaron. At the same time, when applying only arginine, its effect occurred not to be inferior to that of mentioned combination. Application of special food additives met the requirements of animals not only in arginine,but in products of DNA hydrolysis rendering even better effect. It was evident that the application of arginine would appear to be rather perspective for the production of canned meat with specific effect.

CONCLUSION

Arginine added to meat products is bioaccessible assimilated, and can be readily activating the blood-forming system intensifying the radio-resistance of animals and their ability to tolerate any acute stress.
Probably, the correlation of these two effects is connected with the phenomenon, that both the stress and ionizing irradiation increase so-called "oxidative stress" in human organism, and antioxidants or nitrogen oxide inhibit its development . Data obtained in this study allow to recommend arginine sources (only aminoacid or protamin with various additives, nucleic acid hydolyzate in particular) as food additives in the development of meat products decreasing the genotoxic and stress effects of different environmental factors and results of professional human activity. The above-mentioned approach to solving these problems is original, not expensive, and based on the application of such natural compounds as aminoacids and nucleic acids.

Table 1. Data of radio-preventive and hemostimulating effect of canned meat with biologically active additives

Tested canned meat	Spleen weight, mg	Number of spleen endocolonies
Control samples	39.1 ± 2.9	1.6 ± 0.2
Canned meat with vetaron - version I	39.9 ± 4.0	1.8 ± 0.2
Canned meat with vetaron and sodium selenate - version 2	44.7 ± 3.9	3.6 ± 0.3
Canned meat with arginine - version 3	45.3 ± 3.9	4.1 ± 0.4
Canned meat with arginine and DNA hydrolyzate - version 4	48.8 ± 4.3	4.9 ± 0.5

Table 2. Antistress effect of canned meat containing biologically active additives

Tested canned meat	Thymus weight, mg
Control I (feed without canned meat)	62.3 ± 2.4
Control 2 (immobilization; feed without canned meat)	26.3 ± 1.1
Control 3 (immobilization after feeding canned meat)	28.8 ± 1.3
Immobilization after feeding canned meat:	
- with vetaron	34.4 ± 1.8
- with vetaron and sodium selenate	38.7 ± 2.1
- with arginine	39.9 ± 2.0
- with arginine and DNA hydrolyzate	42.7 ± 2.4