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Specific Products Influential Aspects of the Animals Resistance to Irradiation

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Abstract: The majority of doctors and biology scientists in the whole world are sure that biological active additives for food are ideal, safe and reliable way of health strengthening, preservation of longevity and for facilitating of disease treatment. In this study, the results of research of the histological study of the rat's lungs affected by gamma irradiation in 6 grey dose while feeding the detoxicant special product and immunomodulatory products.

Key words: Food, specialty products, dietary supplements, aerospace medicine, basic diet, immunity, radio protective, immunomodulatory properties, raw fruits, vegetables, radiation safety, histology, necrosis, acinus, bronchus, lung epithelium

INTRODUCTION

New special foodstuffs and biological active additives with pluripotent effect and medico biological characteristics may be used for enhancing sustainability and the adaptation possibilities of organism to bad environmental factors including the space flight (Rabin *et al*., 2005; Pecaut *et al*., 2003; Casarett, 1980; Reschke *et al*., 1998; Burr, 1992). In the last century there were some scientific changes in the structure of the feeding research and using of special biological additives. In view of these the main purpose of our research is to study possibility of using biological active additives and special products with directed medical-biological properties to rise the adaptation possibilities of organism in order to lower the damaging effects of radiation on white rat's lungs (Fitts *et al*., 2001; Manzey and Lorenz, 1998; Brenner, 1992; Lean and Han, 1998; Frentsos and Baer, 1997).

MATERIALS AND METHODS

The experiment tested physiological-biochemical properties of new specialized products in conditions simulating the space flight factors (irradiation).

The experimental part of the work was carried out on male rats of Wistar line. The animals were kept on a standard diet and were divided into 4 groups. Control rats were the first group contained within 1 month of the standard diet (Fig. 1). Animals 2 experimental group were exposed to a single dose of 6 grey radiation through an X-ray machine "RUM 17". Rats in groups 3 and 4 received specialized products with detoxifying and Immunomodulatory effects over 30 days, respectively. About 1day before the slaughter they were subject to a single total irradiation dose of 6 gray. Change of body weight during the experiment are presented in Table 1.

Fig. 1: Dividing experimental rats into groups

Table 1: The dynamics of the experimental animals body weight during the influence of X-rays and specialized food products

	Indicators (1-3 Group)		
Experiment conditions	Control plus X-ray irradiation	Detoxifying product plus X-ray irradiation	Immunomodulatory product plus X-ray irradiation
Before the experiment	291.7+24.3	283.3+27.6	285.3+31.4
in 15 days	295.6+26.9	291.7+30.1	315.0+29.8
Before slaughtering in 30 days	298.3+21.6	312.7+27.6	325.0+30.8

It can be seen from Table 1 that the data presented in the table specialized products led to an increase in

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Table 2: The recipes for special products (the ingredients for 100 g of product)

Dry nutrients used	Detoxifying product	Immunomodulatory product
Beet	25	20
Carrot	25	30
Pepper	-	-
Pumpkin	20	10
Apple	20	10
Dry mare milk	-	20
Sugar	8	7
Vitamin and mineral premixes	2	3

body weight on 30 days of observation by an average of 29-40 whereas, animals treated with standard diet (control group) had gained on average, about 7 g of body weight amounted in 30 days. The changes of body weight indicate a beneficial effect of specialized products in the metabolic processes of the body of animals.

Based on the chemical composition of plant and animal nutrients the local traditional fruit, vegetables and milk products containing high levels of vitamin antioxidants, bioflavonoids, phenolic compounds as well as trace elements were selected. The special recipes targeting certain medical and biological properties were developed (Table 2).

Apart from fruit and vegetable powders the mixtures contained vitamin and mineral premixes with A, E, C vitamins, folic acid, selenium, zinc, iron, calcium, magnesium.

In the course of experiment all animals were in same standard conditions of vivarium, their behavior was active, noses moist, hair dry, smooth. All rats one day before the slaughter time with the exception of control group were exposed to one-time gamma irradiation in 6 grey dose. Decapitation of animals ran over next day with using of narcosis in strictly fixed time between 9 and 11 h of morning. Like object of histological study were basic populations of lungs cells.

The experimental animals became water indefinitely. For histological research were used standard methods of thin section preparation. The central areas of under study organs were fixed in 10% neutral formalin. The impregnation and filling in paraffin made after dehydration in spirits of rising concentration. The histological cuts with 7 μm of thickness were made on microtome. The cuts were painted by universal hematoxylin-eosin. The morphological description and pictures were prepared by microscope MBI-15.

RESULTS AND DISCUSSION

The histological research of respiratory section of the rat's lungs from control group on semi thin cut's showed that, there was no special changes, the acinus's are

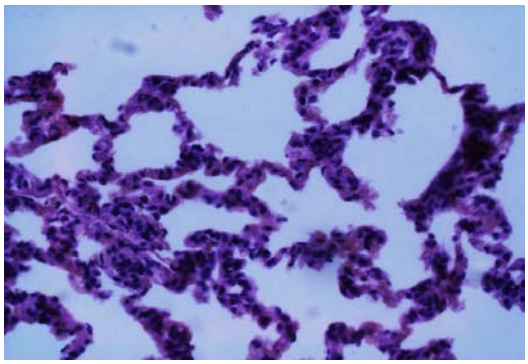

Fig. 2: The histological structure of respiratory part of lung is in normal condition. Coloration by Hematoxylin-eosin. X 210

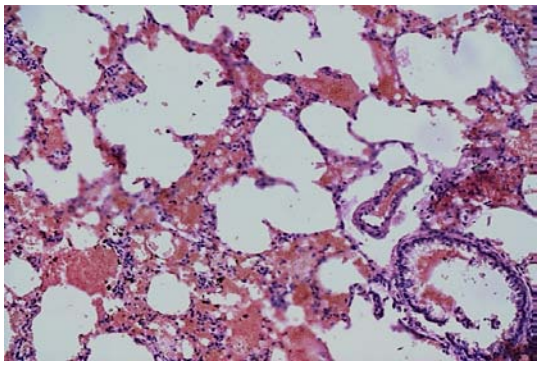

Fig. 3: Epithelium cover of bronchi is preserved, vessels are slightly plethoric. Semi thin cut; Coloration by Hematoxylin- eosin. X 210

visible which are located in walls of alveolus, air conducting section is short and presented by bronchus of 3-5 orders which are delimited on small bronchus and bronchiole. Mucous tunic of bronchus wall is covered by ciliated epithelium which changes his form with reduction of gauge, transforms from high prismatic epithelium to short cubic epithelium (Fig. 2).

The histostructure of the respiratory part of the rat's lung

Control group: The results of histological research of experimental animals, organs of second group which were irradiated by gamma irradiation without using of biological active additives, showed that the structure of lung had morphological changes. The irradiation of rats in lungs results to disturbance of blood circulation such like hyperemia, plasmorrhagia and inflammation on Fig. 3. Walls of big bronchus are thickened because of edema. On interfaced, areas between turgid acinuses, located the interstitial tissue with rich blood vessels. There were no

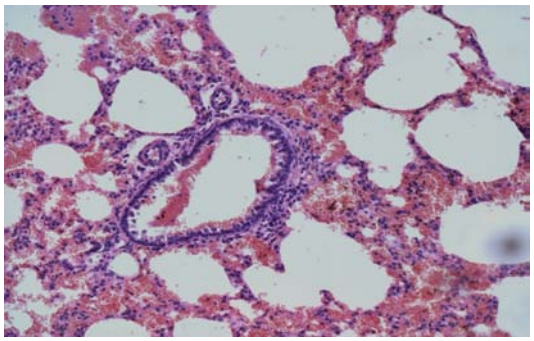

Fig. 4: The histology of lung in the rat experiments; slight thickening of the interalveolar septa. Semithin sections. Hematoxylin-eosin. Uv.h 210

physiological departures. The pronounced congestion with hemorrhages, vascular thickening and alveolar part finely predominantly of respiratory type were found. The erythrocytes and edematous fluid are seen in the lumen of the alveoli. Bronchial walls are thickened due to edema, infiltration. Along with this, the areas with narrow slit-like lumen of the alveoli and vice versa can be seen. Moreover, the wall of the alveoli in the last sections is slightly thinned. The histological structure of the lung of rats belonging to the second group (gamma-irradiated without the use of dietary supplements) is presented in explanations.

General condition of animals was satisfactory, hair coat even without areas of alopecia. Weight was normal; there was no reddening of pupils. The results of histological research of organs of experimental animals of third group which were irradiated and received detoxifying special product showed that, there were no morphological changes of alveolar epithelium of bronchioles. The structure of building in tissue of lung was normal. Epithelium without visible changes, vacuoles are visible in cytoplasm, nucleus indistinct, fuzzy and turgid. Lumen of alveoles is normal. Epithelium cover of bronchi remains, vessels are slightly plethoric. The histostructure of rat's lungs of third group which were irradiated and became detoxicant special product showed on Fig. 4. This histological research of inside organs of third group rat's which were irradiated and became detoxicant special product during the month shows that there is no especially changes in the lungs. In the lungs of alveolar epithelium is not big swelling of nuclei, lumen of the alveoles without changes.

In the lung tissue of the fourth group that was fed with the immunomodulatory specialized product and that received the single irradiation at a dose of 6 Gy the places of partial congestion is seen. Interstitial tissue rich in blood vessels is seen between acini, slight thickening of the interalveolar septa can also be found. Special pathological changes were not found. The histological structure of lung fourth group of rats (fed with the immunomodulatory specialized product and subjected to a single radiation dose of 6 Gy) is shown in Fig. 3.

CONCLUSION

The morphological research of white rat's lungs which were exposed radiation 6 grey has revealed expressed reactive changes in walls of bronchi like loosening of walls, partial desquamation of epithelium, heightened secretory activity of mucous cells. Also, there some not big changes were fixed in alveolar area such as edema and thickening interalveolar partitions, hyperemia of vessels, structural changes of cytoplasm and nucleus of epithelial cells of lungs parenchyma.

Histological research of rat's lungs which was irradiated in 6 grey dose against the background of preliminary feeding of the experimental animals with products with biological active additives during the month and in procession of detoxicant effect showed only not big structural changes in lungs parenchyma of rat's.

The general condition of animals, their motor activity, behavior and weight of body did not have profound changes. All this certificates about that the using of biological active additives in ration of irradiated rats has promoted the reinforcement of organism, rising of his adaptational possibilities, soften the heaviness of the destructive morph functional changes, especially it was expressed by using of detoxicant special product.

The experimental study on outbred rats that within a month were exposed to gamma irradiation at a dose of 6 Gy and that received immunomodulatory special products without the use of dietary supplements showed that gamma irradiation of rats leads to pathologic changes with subsequent degeneration and cell reaction. The use of a dietary supplement providing immunnomodulatory action improves compensatory adaptive responses and reduces degenerative processes, restores the general condition of the animals. General condition of the animals, their physical activity, behavior, body weight is only fractionally affected. The findings indicate that the use of dietary supplements is necessary.

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