

Studies On Development of Technologies for Production of Meat Items with Radioprotective Properties

E. TSVETKOVA, V. VLADOV and S. CHAMOVA

Institute of Meat Industry, Bul.Cherni Vrah 65, Sofia 1407, Bulgaria

SUMMARY: The problem of ecological balance disturbance as a result of environmental radioactive pollution proves the necessity for development of specialized foods, which can be used for a long time without having any lateral effect on human organism. Therefore, the possibility for development of food products with radioprotective properties is examined. Six types sausages with addition of definite quantities of wheat germ, pectin, potassium chloride, fluorine water and microbial starter culture - Biostart - are developed. Bioassays on rats and mice are carried out with these types sausages in order to prove their decorporative and radioprotective action.

INTRODUCTION: Rapid development of nuclear energetics and the wholesale use of the same and covered sources of ionizing radiation in science and technics increase the number of radiation-induced diseases among great parts of the population. This problem is of special significance in cases of emergency. The ensurance of radiation safety of the threatened people is hard and unsolved problem till now. There are not developed sufficiently effective means for a really good prophylaxis and therapy to prevent the damaging effect of the radioactive strontium and other radionuclides, incorporated in human organism once or on chronic receipt. The studies on the possibility of physical, chemical or combined physical and chemical ray-protection show limited application of these means.

Therefore, it is necessary to investigate this possibility by purposefully enrichment of food products with natural ingredients with antiradioactive action, to increase their resistance to higher radiation. The aminoacids cysteine, essential aminoacids, antioxidative substances, vitamins E, B, B1, B12, betacarotines, natural fats, pectin substances, wheat germ and fluorine water have ray-protective properties.

MATERIALS and METHODS: Two types meat items are produced in order experiments to be conducted:

A/ Raw-dried sausage "Borovets" from beef, lean pork and fat according BSS (Bulgarian State Standard). The sausage is produced in three variants:

Variant 1 - without "Biostart" (liophilized preparation from microbial starter cultures);

Variant 2 - with "Biostart", according technological instructions;

Variant 3 - with "Biostart", as 50% of the sodium chloride are replaced by 50% potassium chloride.

B/ Perishable cooked and smoked sausages, wieners "Sofia" from beef, semi-lean pork and fat according BSS. The wieners are also in three variants:

Variant 4 - according the existing BSS;

Variant 5 - with fluorine water, 5% wheat germ;

Variant 6 - with fluorine water, 5% wheat germ and 3% pectin.

The raw materials which are used in the experiments are tested for radioactivity by "Cambera" - USA.

Biological experiment

The experiments were conducted on 280 male rats "Vistar" and 110 mice. The animal number was determined regarding the experimental setting.

Methods for internal and external radiation

The external radiation was carried out by X-ray therapeutical apparatus "Muler", according to the following parameters: 190 kV, 20 mA, focal distance 50 cm, filter-aluminium 3, power of exposure - 0,00061 K1/kg/sec.

The internal radiation was carried out with cesium 134. The isotope was used in activity 0,2 or 0,6 k/Bk/g, through the mouth by stomach-tube, 0,2 ml for a mouse and 0,5 ml for a rat.

The decorporative effect was estimated according to data from the measurement of the wholebody activity and radioactivity of the critical organ /femur/ or spleen and liver.

Some of the radiometric investigations were carried out by a complex of gamma-metrical apparatus - Livius - Italy.

The decorporative activity of the nonperishable sausages, perishable sausages and "Biostart" with the respect of the cesium was determined by a method, applied at the Institute of Nuclear Medicine, Radiology and Radiation Higyene, Academy of Medicine, Sofia.

RESULTS and DISCUSSION: Regarding physico-chemical and microbiological parameters, the raw-dried sausage "Borovets" and perishable cooked-smoked sausages wieners "Sofia" have no modifications, when compared to the normative requirements. Variant 3 has more non-specific flavour and is a little bitter due to the potassium chloride. The consistency of variant 5 is not so flexible as in the control sample due to the wheat germ.

Decorporative effect of the nonperishable raw-dried sausages regarding cesium 134 on rats was tested by the biological method. Therefore, the spleen and liver activity was measured. The conducted investigations of the radioprotective properties of the new types meat products show positive effect for variant 3 and moderate positive effect for variant 2. The radiometry of the liver show lack of decorporative effect on radiocesium in variant 1 - nonperishable sausages "Borovets". It is established even additional retaining of the radioactive elements in the rat tissues, which is due eventually to the high radiosensitivity of the spleen in tested animals. The tests with the three variants wieners show slightly expressed decorporative effect regarding radiocesium 134.

Together with these experiments the action of "Biostart" alone was tested, as it was applied in 0,02 mg/g body weight every day and the cesium was applied in activity - 0,6 k/Bk/g. Except the "Biostart", the animals received also standard food from yeasts. It was established definitely expressed decorporative effect of "Biostart" - 47% decrease in

cesium quantity in animal spleen. These results together with the data for the chemical composition of the meat products show that the ray-protective effect of variant 3 is due to the microbial starter culture "Biostart". For the variant 5 the application of wheat germ and potassium chloride is significant.

CONCLUSIONS: The conducted experiments are not sufficient and concrete conclusions can not be drawn. We can state that:

- The preparation "Biostart" has radioprotective characteristics and is perspective natural product when the special meat items with decorporative properties should be developed;

- It is necessary to continue the searching of new technological desicions for the application of other biological substances with proved protective and decorporative efficiency;

- It is necessary tests to be enriched, as the investigations should be conducted on different experimental conditions.

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