

METHOD OF OBTAINING OF SAFE FOOD PRODUCT FROM BLOOD OF SLAUGHTER ANIMALS

M.L. FAIVISHAVSKY

All-Russian Meat Research Institute, Talalikhina 26, 109316 Moscow, Russia

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An extrusion technology of production of foodstuffs with blood of slaughter animals in combination with other kinds of animal and vegetable materials was developed at VNIIMP. The utilization of blood makes it possible to enrich the final product with proteins, vitamins, macro- and microelements, especially with the ions of highly assimilable iron in hem form, which pre-determines the possibility of its utilization in diets for prevention and treatment of anemic diseases, associated with deficiency of iron. Taking into account that in processing by this method the mixture of raw materials is subjected to high temperature (higher than 150°C) and pressure higher than 2.0 MPa for a short period of time, a necessity arose to study the indices based on which one can conclude about safety of the product. Four samples of products differing in blood and other components content were selected (Table 1).

The increased content of protein in sample 3 resulted from introduction of protein component into the formulation, at the expense of decrease of starch containing component. The content of calcium and phosphorus was determined, special attention being given to the presence of iron in manufactured extruded forms (Table 2). Low ratio of Ca:Ph in extruded forms points out to the necessity of introduction into the diet, in which their usage is considered, of the products rich in calcium salts, which will make it possible to change the existing level and reach adequate ratio of these components in the total diet. The indices in Table 2 indicate that the extruded forms can serve as a source of iron in the diet.

Chemical composition of extruded forms of products

Table 1

Content, %	Sample number			
	1	2	3	4
Moisture	4.2	4.2	4.8	4.7
Fat	0.9	0.8	0.4	0.5
Protein	19.8	18.3	28.7	17.0
Ash	1.6	2.4	0.7	1.3
Starch	64.7	66.1	57.5	70.4
Fiber	1.6	1.6	0.6	1.6

Content of calcium, phosphorus and iron in extruded forms

Table 2

Content	Sample number			
	1	2	3	4
Calcium, mg%	19.6	16.4	18.4	20.4
Phosphorus, mg%	342	328	205	358
Iron, mg/kg	22.5	31.8	11.0	22.5

Data in Table 3 show the amounts of heavy metals and arsenic in extruded forms.

Comparison of the above values with established critical concentrations of these elements in foodstuffs allows to make a conclusion that the extruded forms as foodstuffs fully meet medical and biological requirements.

The studies also indicated that the developed extruded forms have no pesticides and organic chlorine compounds (β -heptachlorcyclohexane, γ -heptachlorcyclohexane, DDT, their metabolites, heptachlorine and aldrine).

Table 3.
Content of heavy metals and arsenic in extruded forms (mg/kg)

Elements	1	2	3	4
Lead	0.05	0.05	0.06	0.04
Cadmium	0.01	>0.01	0.01	0.01
Copper	1.83	2.0	1.9	2.0
Zinc	6.5	5.75	4.83	5.0
Mercury	>0.01	>0.01	>0.01	>0.01
Arsenic	>0.1	>0.1	>0.1	>0.1

With the view of determining the influence of developed conditions on bacteriological indices of the obtained extruded forms, microbiological investigations were carried out. Resistance of mesophilic aerobic and facult.-anaerobic microorganisms, coliform bacteria, fungus and salmonella bacteria were studied.

Non-pathogenic strain E. coli-1257 was used as a test culture. This culture was grown on meat-peptone agar at 37°C during 18 hours, and a suspension of cells was prepared on physiological solution, containing 1×10^9 cells/cm³. A suspension of test-culture was being introduced before extrusion in the original mix of components with the rate 500 cm³/h.

The results of bacteriological investigations for different kinds of raw materials and extruded forms obtained are given in Table 4.

The investigations confirmed a possibility of inactivation of pathogenic microflora by extrusion processing of mixture of animal and vegetable materials.

Wholesomeness of the product is in the absence of toxicity. To reveal the toxicity of new products the investigations were carried out on white mice (n = 20). In the trials, 1 cm³ of 10% solution of extruded products with different content of blood was administered in the stomach of the animals. No changes in health was registered during 48 hours of observation. All the mice were alive and healthy. The results confirm that the developed technology provides products without toxicity.

The studied amino acid composition of the extruded forms has shown that the products possess the whole complex of indispensable amino acids, what confirms their food value.

Table 4
Bacteriological indices of some kinds of raw materials and manufactured extruded forms

Object of investigations	Total count of mesophilic aerobic and facultative-anaerobic microorganisms in 1 g of product	Coliforms in 1 g of product	Fungus in 1 g of product	Salmonella in 25 g of product
Blood, dry	17.7×10^3	No	6.3×10^2	No
Wheat	1.7×10^2	No	5.8×10^2	No
Extruded form	No	No	3.0	No
Extruded form as manufactured with test-culture in raw materials	No	No	No	No

The investigations carried out enable to conclude that the extrusion processing of the mixture of vegetable and animal raw materials, including blood of slaughter animals, provides a safe foodstuff.