

ASSESSMENT OF HARMLESSNESS OF MEAT PROCESSING INDUSTRY SECONDARY PRODUCTS AND BY-PRODUCTS IN THE DEVELOPMENT OF RESOURCE SAVING TECHNOLOGIES

Dr. L.V.Antipova, I.A.Glotova, S.V.Polyanski, V.K.Kurchaeva, Dr. L.Bastic, Dr. A. Spiric

Voronezh State Academy of Technology, pr. Revolutsii, 19, Voronezh, Russia, 394000 Institute of meat hygiene and technology, Kacanskog 13, 11000 Beograd, Post. fah 33-49, Yugoslavia

Keywords: secondary collagencontaining resources, heavy metals, nitrate-ions, chlororganic pesticides, harmless.

Resume:

In the development of rational usage of meat and poultry processing industry non-traditional raw materials special importance has the assessment of harmless level according to the content of ions of heavy metals, nitrate and nitrite ions, chlororganic pesticides. It has been established that the content of heavy metals ions not exceed the maximum limited concentration for meat. Salt of cadmium, cobalt, lead, arsenic, mercury of all kinds are absent. Nitrate-ions do not exceed the maximum limited concentration for poultry meat, nitrite-ions are not revealed. Total content of chlororganic pesticides (pp'DDE and pp'DDT) is 0,015-0,111 mkg/g of fat, that is in accordance with the standards of European MLC for meat and fish products (0,3 mkg/g). Thus, the evaluation of harmlessness of secondary collagencontaining resources allows to recommend them for the production of food and special products; ingredients, including dease-preventive and medical biopreparations.

Background:

Among the questions connected with the human ecology and environment the obtaining of ecologically pure products is the most actual one. In this connection the problem of control of contamination of the raw material by toxicants of various types for the production of complete products from it. It is known, that products obtained in the result of intensive and resource-saving technologies may do not correspond to physiology of people and some components are not characteristic to their nature and even may cause undesired mutational action on the human organism. Due to the development of scientific and technical progress the technogenic influence upon the environment becomes larger and leads to the accumulation of various toxicants in tissues and organs of the slaughter animals. At the present time, it is accepted to consider plant and animal raw material pure if it is produced in the conditions which guarantee full exclusion of penetrating of harm or undesired substances at storage and processing [1]. At the evaluation of harmlessness in meat industry the practical importance has the determination of nitrates, nitrites, ions of heavy metals, pesticides, microbial toxins.

Determination of indices has a special importance for non-traditional raw material and semi-products of meat and poultry processing industries in the assessment of perspectives of their rational use in food and special products. Priority belongs to the raw material rich in connective tissue components due to the well-known medico-biological qualities of the collagen and its functional role as the food fibers in the diet.

The aim of this work is the assessment of harmlessness of secondary collagen containing products and by-products of meat and poultry processing productions in relation to the development of new technologies, methods of useful products output increase from 1 t of the raw material.

Materials and methods

The object of study were secondary collagen containing resources of meat (beef veins) and poultryprocessing (combs, skin, stomachs of hens and broiler chickens) industries obtained at the industry processing of cattle and poultry at the meat plant Voronezhsky and at the egg processing plant Voronezhsky. Qualitative determination of toxicants was carried out with the application of gas chromatograph Varian-3000, atom-absorptional spectrophotometer C-115 M, ionometer I-130.

The content of chlororganic pesticides in the raw material – by the method of the gas-liquid chromatography on the chromatograph Varian-3000 by the method of CHCl_3 [2]. Samples were prepared in accordance with the method [3]. Column Megabore DB-17, length – 30 m, inner diameter 0,53 mm. Gas-carrier – nitrogen, stream rate – 16 cm^3/min .

Detector ESD for chlororganic pesticides, lower boundary of detection – 0,01-0,04 mg/g of fat. Detector temperature – 300 °C, injector temperature – 250 °C. Regime of the column thermostating: 2 min at 160 °C, from 160 °C to 180 °C the rate of temperature increase – 2 °C/min; 2 min at 180 °C; from 180 °C to 230 °C the rate of temperature increase 5 °C/min; 7 min at 230 °C. Spectrum integrator – Phesics Systems 1. The laboratory of the Yugoslavia Institute of Meat technology hygiene and and research laboratory of the meat and meat products department of the Voronezh State Technological Academy.

Results and discussion:

The possibility of meat contamination by toxicants of various types is the limiting factor in the application of the raw material of the animal origin including food and dease-preventive directions. Due to the absence of systematic information about the places of localization and accumulation of toxicants in the animal bodies coming with fodder, we determine (for the evaluation of harmlessness) the level of ions of heavy metal, arsenic, nitrate- and nitrite-ions and chlororganic pesticides (table).

Results show, that the level of metal ions in the raw-material and at the collagen containing semi-products, obtained according to our new technology do not exceed MLC for meat and meat products (0,05 mg/kg), except ions of cadmium for experimentally mass on the base of by-products of cattle gut raw material, on the base of end parts of cattle hides (0,07 mg/g) and is in the allowable limits of MLC for inner organs. Such ions of heavy metals as cadmium, cobalt, lead, arsenic are absent in the raw material tested. Nitrate-ions do not exceed MLC for poultry-meat, nitrite-ions are not revealed.

Considerable use of mineral and organic substances promotes their accumulation in the food products such dangerous substances as pesticides. The overwhelming majority of pesticides and products of their decay is characterized by a high stability in natural condition. Many pesticides are chronoconcentrated cumulative poisons, i.d. their toxic influence depends upon not only concentration, but the period of action. The presence and level of pesticides in agricultural raw material and food products

considerably decrease their food value and ability to storage. At the same time, pesticides control in the food products goes the behind the spectrum of their application.

Results of chromatographic investigations [1] showed the presence of chlororganic pesticides: HCH, pp'DDE, pp'DDT. Iron the know isomers (α , β , γ , δ) α -HCH is present only in two samples: by-products of beef trimmings and by-products of cattle gut raw material. The limits of revealing of isomer HCH – 0,01 mkg/gr, DDT and its metabolites – 0,04 mkg/g of fat. The total content of chlororganic pesticides is 0,015-0,111 mkg/g of fat and this corresponds to the European standards of MLS for meat and fish products (0,3 mkg/g).

Assessment of harmlessness of the secondary collagen containing raw material of the meat and poultry processing industry showed the absence of accumulation of chemical toxicants in the connective tissues in compassion with the muscle tissue and parenchimotoze tissue of the inner organs and answered positively to the question of about wide possibilities of application of the secondary resources for the production of useful products. Results of this study allow to recommend it for the obtaining of food and special products including disease-preventive and medicine biopreparations.

New notions about the functional role of the collagen as the food fiber open new perspectives of this protein in the production of traditional and original productions in order to give preventive qualities. Medico-biological qualities, possibility to save molecular structure at the extraction from tissues and separation from other components make it perspective biopolymer in the development of non-traditional and improvement of the known technologies of the collagen substances of different functionality. The most perspective are applied aspects with the obtaining of food products, special ingredients, mainly polymers. The latter are closely connected with the production of non-traditional products for medical use on the base of deep processing of tissues.

The assortment of the products produced may be rather wide: substitutes of the main raw material in the production of minced meat items (protein-fat additives), pastes, protein hydrolyses, medial and special preparations, enriched fodder concentrates, mixture of amino acids and products of their separation.

Conclusion:

The assessment of harmlessness of the secondary collagen containing resources allow to recommend them as the perspective row material for obtaining the ecologically pure food and special products, ingredients including decease-preventive and medical biopreparations.

Realisation of their deep processing is rather useful for solving the problem of the production potential stabilisation of the processing branches of the agroindustrial complexes, maximum obtaining of processed raw material.

References:

1. Report of a WHO Consultation on Research on New Slaughter Technologies to Reduce Cross - contamination, 1990.
2. USA Analytical Chemistry Laboratory Guidebook, 1991.
3. Folch J.M., Lees M.A., Stanley G.H.// J. Biol. Chem. - 1971. - 226. - P. 497.

Level of heavy metals

Table

Name of the raw material	Content, mkg/g of fat											
	Ions of heavy metals								Nitrate-ions NO ³⁻	Clororganic pesticides		
	Zn ²⁺	Cd ²⁺	Pb ²⁺	Cu ²⁺	Fe ³⁺	Mn ²⁺ +	Cr ³⁺	Hg ²⁺		pp'DD E	pp'DD T	HCH
Comb	1,4	-	-	1,05	7,50	-	0,10	-	18,00	0,017	0,035	-
Stomach	2,7	-	-	0,85	9,89	0,10	-	-	12,40	0,023	0,036	-
Skin	1,2	-	-	0,35	4,50	0,05	-	-	10,60	0,044	0,067	-
Legs	2,0	-	-	0,50	7,00	-	0,06	-	49,60	0,058	0,064	-
Guts	1,6	0,03	-	0,20	6,00	-	0,10	-	-	0,089	0,078	-
Collagen masses on the base of:												
back spilk cattle (control)	0,5	0,01	0,01	1,18	0,01	0,05	0,25	0,03	-	-	-	0,015
by-products of beef trimming	2,0	0,01	0,02	0,57	5,00	0,03	0,08	0,01	-	-	-	0,018
by-products of cattle guts	11,2	0,19	0,05	0,97	8,30	0,01	1,25	0,01	-	-	-	-
pig skin	1,6	0,04	0,01	0,60	3,00	0,01	0,25	0,01	-	-	-	-
mixture of end parts of cattle hides	3,7	0,07	0,05	1,40	35,00	0,10	0,38	0,01	-	-	-	-
MLC for products: meat and products from it	70,0	0,05	0,50	5,00	-	5,00	-	0,03	150,00	0,300	0,300	-
inner organs	100,0	0,30	0,60	20,00	-	-	-	-	150,00	0,300	0,300	-