

INFLUENCE OF SUBLIMATION DRYING ON AMINOACID COMPOSITION OF
READY-TO-EAT MEAT PRODUCTS

ELLY TSVETKOVA¹, BLAGOY YORDANOV¹ and FANY RIBAROVA²

¹Institute of Meat Industry, Blvd. Cherni Vrah 65, Sofia 1407,
Bulgaria

²Research Institute of Gastroenterology and Nutrition,
Academy of Medicine, Sofia, Bulgaria

ABSTRACT: The present study examines the influence of sublimation drying on aminoacid composition of three types ready-to-eat meat products for dietetic nutrition of children, suffering from iron insufficiency. The essential aminoacids in the products have weakly expressed decrease than in the initial raw materials, with the exception of valine, which not changes considerably. The limiting aminoacids are sulphur containing aminoacids. The non-essential aminoacids of cooked freeze-dried veal have high values, with the exception of glutamic acid. In cooked freeze-dried liver considerable differences are received in glycine. The investigations show, that there are not significant differences in the aminoacid contents before and after the sublimation drying. The essential total aminoacid ratio remains the same and the variations are observed in the sulphur containing aminoacids, especially in cystine.

INTRODUCTION: The high protein content of meat and meat products determines their significance for human nutrition as the main source of complete protein. Meat has high biological value because of its rich content of essential aminoacids. The proportion between the meat aminoacids is characterized by very good balance between them /2,7/. Considerable significance for nutritional substances digestion, as well as protein digestion, the products' treatment has. At continuous and high temperature cooked processing, the aminoacids can react with carbohydrates and with other substances, containing in food product, and as a result of this are formed undigestible for the organism melanoidines /1, 6/. Not all of the protein aminoacids are equal sensitive toward the thermal changes. The most sensitive toward the similar change is lysine. Relative unstable at heat and other impacts are sulphur containing methionine and cystine. This must be taken into consideration in the process of cooking, because these aminoacids become partially undigestible for the digestive tract/3, 5/. Besides to process of cooking of food raw materials, they can be subjected to the sublimation drying, during which received concentrates /4/. Characteristic features of sublimation dried food products are the high quality and the preserved nutrition value of the products after their restoration, as well as the possibility to be permissingly stored for durative period at normal atmospheric conditions. The objective of the present study is to evaluate the meat components' quality according to their aminoacid composition, in three types ready-to-eat meat products, before and after their sublimation drying.

MATERIALS AND METHODS: Three types of meat raw materials are analyzed: veal, veal liver and poultry meat. The raw

materials were cooked and after that were sublimation dried with the use of relatively "mild" regimes, characterizing with low temperature of drying. The products were freeze-dried to -30° - 45°C . The sublimation drying was carried out according to the following parameters of the technological process:

- maximum temperature of the heated plates - 70°C ;
- residual pressure in the sublimation camera - 0,8 mbar;
- maximum temperature of products' drying - from 30°C to 40°C .

All products were dried in sublimation pilot installation RAYIA of the firm "Atlas" /Denmark/. After preliminary protein acid hydrolysis with 6 n HCL during 22 h, the aminoacid analysis was carried out with automatic aminoanalyzer of the firm Hitachi, model KLA-5. The determination of the essential aminoacid tryptophan was carried out after alkaline hydrolysis with 5 n NaOH during 20 h, with liquid chromatograph under high pressure of the firm PERKIN - ELMER. The calculation of aminoacid score was carried out regarding the essential aminoacids in the standard FAO protein /7/. The analysis data were framed by use of microcomputer Sigma-10 of the same firm.

RESULTS AND DISCUSSION: Our investigations show, that the protein content in veal is 20,70%, in poultry meat - 19,29% and in veal liver - 19,11%. The main criterion for the protein evaluation from the chemical point of view is the quantity spectrum of aminoacids, including in the protein. In table 1 are presented the results from the analysis of aminoacid composition of raw materials. The limiting aminoacids are sulphur containing aminoacids. In the liver the essential/total aminoacid quantity ratio is high - 47,65%. Especially valuable are ready-to-eat freeze-dried products from animal origin, that can be characterized as protein concentrates. We established on the base of our investigations, that the total protein in veal is 85,63%, in poultry meat - 84,13%, in veal liver - 68,97%. In table 2 are presented the results from the aminoacid analysis of cooked freeze-dried veal and poultry meat as well as from the aminoacid analysis of cooked veal liver. The calculated aminoacid numbers according to the chemical score method are also presented in table 2. The essential aminoacids, with the exception of valine, calculated per 100 g protein in cooked freeze-dried meat, have although weakly expressed, lower values in comparison with the initial raw materials. These differences are confirmed also from the aminoacid numbers. The limiting aminoacids are s-containing. In veal this value is comparatively high - 98. In cooked freeze-dried veal the aminoacid number is 85, which determines s-containing aminoacids as first limiting /2,98%. The decline of methionine is weakly expressed, and cystine is approximately 2 times lower, that determines the total decline of s-containing aminoacids. The rest of aminoacid numbers are high, as the greatest reserve has lysine and the three types meat raw materials. The non-essential aminoacids of cooked freeze-dried products have high values, with the exception of glutamic acid in cooked freeze-dried veal. The essential aminoacids/total aminoacid quantity ratio is lower with 2% in the freeze-dried product, regarding the initial raw material.

Table 1.-Aminoacid composition of the raw materials

Parameters	Veal		Poultry meat		Liver	
	g/100 g protein	score, %	g/100 g protein	score, %	g/100 g protein	score, %
Essential aminoacids:						
Isoleucine	5.25	131	5.23	131	4.59	115
Leucine	8.61	123	8.49	121	9.63	138
Lysine	9.55	174	9.85	179	8.37	152
Methionine	2.95	98	2.34	91	2.37	104
Cystine	0.47		0.86		1.26	
Threonine	4.36	109	4.37	109	4.44	111
Tryptophan	1.28	128	1.11	111	1.61	161
Tyrosine	3.95	138	3.69	136	3.78	156
Phenylalanine	4.30		4.49		5.56	
Valine	5.19	104	5.50	101	6.15	123
Non-essential aminoacids:						
Hydroxyproline	0.60		0.89			
Alanine	5.42		5.29		5.40	
Arginine	6.78		7.08		6.40	
Aspartic acid	9.14		9.48		9.78	
Histidine	4.60		3.51		3.33	
Glycine	3.89		3.82		4.81	
Glutamic acid	16.39		16.55		13.55	
Proline	3.95		4.31		4.67	
Serine	3.36		3.63		4.30	
Total quantity aminoacids	21.32		18.70		19.39	
Total quantity essential aminoacids	45.87		45.51		47.65	

Table 2.-Aminoacid composition of cooked freeze-dried products

Aminoacids	Cooked freeze-dried veal		Cooked freeze-dried poultry meat		Cooked freeze-dried liver	
	g/100 g protein	score, %	g/100 g protein	score, %	g/100 g protein	score, %
Essential aminoacids:						
Isoleucine	4.98	128	4.97	124	4.03	100
Leucine	8.26	118	8.16	117	9.19	131
Lysine	9.33	170	9.23	168	7.63	139
Methionine	2.73	85	2.77	89	2.23	82
Cystine	0.25		0.36		0.65	
Threonine	4.23	106	4.20	105	4.38	109
Tryptophan	1.25	125	1.37	137	1.80	180
Tyrosine	3.54	129	3.53	128	3.66	149
Phenylalanine	4.19		4.12		5.30	
Valine	5.19	104	5.50	101	6.15	123
Non-essential aminoacids:						
Hydroxyproline	1.09		1.56		1.27	
Alanine	5.62		5.82		5.96	
Arginine	7.14		7.15		5.93	
Aspartic acid	9.21		9.17		9.45	
Histidine	4.76		3.55		3.54	
Glycine	4.74		5.26		5.91	
Glutamic acid	15.63		15.97		14.12	
Proline	4.24		4.51		4.44	
Serine	3.36		3.63		4.30	
Total quantity aminoacids	87.50		85.62		69.30	
Total quantity essential aminoacids	44.10		43.79		45.31	

CONCLUSIONS: From the made comparisons between the initial raw materials and their cooked freeze-dried forms, the following conclusions can be drawn: there are not significant differences in the quantities of the particular aminoacids after the sublimation drying of the cooked products; after the sublimation drying the essential aminoacids/total aminoacid quantity ratio remains the same; there are variations in s-containing aminoacids and more exactly in cystine, after the above mentioned technological treatment.

REFERENCES:

1. Nesterin, M.F. (1979) Food Industry, p. 7 (Moscow)
2. Ribarova, F., Shishkov, S. and Baklova, I. (1987) Aminoacid composition of bulgarian food products. Ed. Zemizdat, Sofia, p. 118.
3. Skurihin, I.M. and Volgarev, M.N. (1987) Chemical composition of food products. Ed. VO "Agropromizdat", Moscow, p. 9.
4. Tsvetkov, Ts., Ralchovska, E., Meranzov, N. et al. (1985) Sublimation drying of food products. Ed. Zemizdat, Sofia, p. 87.
5. Shaternikov, V.A. (1980) Medico-biological aspects of problems for enrichment of food proteins, in: Theoretical and slaughtering aspects of food science. IP, AMN, Soviet Union, vol.1, Moscow, p. 134.
6. Bodwell, C.I., Adkins, D. et al. (1981) Protein Quality in Humans. AVI Publishing Company INC, Westport, Connecticut, p. 20-53.
7. FAO/WHO (1973) Ad Hoc Expert, Energy and Protein Requirements, WHO Technical Report Series N° 522, FAO Nutrition Meetings Report Series 52.