

Modified collagen of beef paunch and its effect on the biological value of meat foods

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### INTRODUCTION

The most use of all without exception components of meat raw material is of a great importance. So the resolution of the issue about the rational and effective methods of processing the connective tissues, the content of which is about 16% in carcasses, can be achieved by the increase in the output of foods.

It should be noted that increase in the output of meat foods, in the formulae of which the higher content of ballast substances (subproducts of the 2nd grade: sinews, pig hide) are built into, is less warranted in comparison with the isolation of the ballast substances from this raw material when isolated protein preparations and their use at the manufacture of foods.

A minor use of the collagen-contained of beef subproducts of the 2nd grade can be explained by the specific properties of this raw material, such as rigidity, reduced shelf life, objectionable odour etc. It can be also explained by the lack of methods allowing for modifying these subproducts in a such manner that preparation obtained can substitute the beef in the foods.

Use for the modification of collagen protein subproducts the methods for dispersing the collagen allows for obtaining the protein products with fibrous structure. These products on their main qualitative, structural and mechanical properties are similar to the main raw material of meat industry - the beef of the 1st grade. In addition to the specific properties of collagen, such as increased waterholding and fat holding capacities, gel-forming capacity expand the use of modified collagen-contained products. Moreover the shelf life of such products can be increased.

### MATERIALS AND METHODS

In the present work the method of the modification of collagen-contained subproducts of the 2nd grade, in particular, the paunch, was developed.

To perform the method the inorganic compounds recommended by the statutory instruments of Russia for the application in the food industry were used. The use of sodium sulphate as dehydrating agent at the alkali-salt treatment and salt washing is no point as well as the use of sulphuric and acetic acids for the neutralization of the alkali. It is for the reason that the product at the neutralization stage can absorb the salt-like compounds formed that can be hazard for the health.

At the same time the neutralization of the sodium hydroxide with the hydrochloric acid leads to the occurrence of sodium chloride and water in the interstructural space. Finely dispersed salt is uniformly distributed in the paunch protein product (PPP) and thereby provides the bactericidal and preserving action. For similar reason sodium hydroxide rather than other alkali was used.

The paunch treatment was performed by stages: alkali-salt treatment, salt washing, neutralization, repeat salt washing, neutralization, repeat salt washing. The total duration of the process was 24 h.

Since the paunch protein product PPP is the new product, its biological properties were studied as well as the PPP effect on the biological value of meat foods with it.

The next procedures were used. Aminoacid composition was determined on the aminoacid analyser T 339 M [2]. The content of the aminoacids was evaluated after the hydrolysis for 24 and 72 h; tryptophan content - after alkali hydrolysis [2]. The protein digestability *in vitro* by enzymes of alimentary canal was evaluated by means of Pokrovskii and Ertanov method [1].

### RESULTS AND DISCUSSION

It was established that the paunch as well as the PPP has one limiting irreplaceable aminoacid, namely, tryptophan. Its aminoacid score in comparison with the WHO advice (1985) [3] is 85% and 74% for the paunch and the PPP respectively (Table).

The protein digestability of the PPP *in vitro* is 26% higher than in the raw paunch. These data suggest the loosening of the raw material structure and also show the possibility of the PPP introduction into meat foods as an ingredient.

Thus the PPP is superior to the starting raw material throughout all factors (excluding tryptophan). Since the investigations were continued. We proceed from the point, that the PPP must be used not as a food, but as "intermediate" source of raw material possessed the improved properties. At the production of meat foods the lack of tryptophan must be compensated by the increased content of this aminoacid in the other ingredients using in the meat foods.

At the next stages the properties of the model systems of beef containing the various content of the PPP (from 5 to 35% in place of the same amount of meat). It is appropriate to use the PPP in the technology of cooked meat foods, in the formulae of which there is the increased content of the beef. The rate of the introduction is 15% in place of the same amount of meat. Cooked sausages with the PPP in their functional, technological and organoleptic properties are superior to the standards produced by the conventional receipt.



Table

Factors	Paunch	PPP	WHO scale	Sausage	
				standard	15% of PPP
Irreplaceable amino-acids, g/100g of protein:					
threonin	5,22	4,50	3,4	5,40	5,33
valine	4,73	5,05	3,5	5,10	5,10
methionine+cystine	2,99	2,90	2,5	4,00	3,83
isoleucine	3,59	3,44	2,8	4,64	4,60
leucine	7,15	7,00	6,6	7,91	7,80
phenylalanine+tyrosine	6,50	6,64	6,3	6,80	6,80
lysine	6,56	5,91	5,8	8,70	8,41
tryptophan	0,93	0,81	1,1	1,20	1,15
Digestability, mg of tyrosine/g of protein					
by pepsin	2,7	5,2		5,97	6,45
by trypsin	6,2	6,9		10,03	13,40
total	8,9	12,1		16,00	19,85
Biological value				0,99	0,98

To determine the biological value of sausages with the PPP the aminoacid composition and protein digestability in vitro were determined. The biological value was also calculated on the aminoacid score corrected on the fixation.

The analysis of the results obtained suggest that the cooked sausage with the PPP is of full value. None of the irreplaceable aminoacids is limited. The increased attack of proteins by enzymes of alimentary canal is observed.

The biological value determined by the protein fixation, established in the natural experiments with man showed the practical equality of the standard and experimental (with 15 % of the PPP) sausages. Simultaneous calculation of the caloric value of the sausages showed its decrease from 104,7 to 93,7 kcal. This fact allows for considering the product obtained as dietic.

#### CONCLUSION

In conclusion one can maintain about the possibility of the use of the paunch protein product, the major portion of which is modified collagen, in the technology of the cooked meat foods. Apart from the fact, that the product is of a high food and biological value, the presence in it of collagen fibres can allow for removing toxic substances from the body.

That is the new possibility to design the technologies of the products of the special purpose.

#### REFERENCES

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