

AN APPROACH TO THE STANDARDIZATION OF
CONNECTIVE TISSUE CONTENT IN COMMINUTED MEAT
PRODUCTS IN BULGARIA

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SUMMARY

This report describes the approach to the development and standardization of the connective tissue content limits for the comminuted meat products in Bulgaria. Connective tissue is defined for this purpose as eight times the hydroxyprolin content.

As a first step, it was decided that the effort should be directed towards determination of the upper limits for the collagen content in the principal groups of meat products. The approved values based on the analysis of a large number of samples (which formulas include collagen-rich raw materials) are as follows: (as a percentage of total protein) less than 13 % for shelf-stable and semi-stable, raw-dried and cooked and dried meat products; less than 16 % for the perishable cooked sausages, and less than 22 % for only few types of collagen-rich, cooked sausages.

The second step of the standardization procedure was aimed at getting the best estimate of the collagen content in meats of the typical manufacturing sorts. The required data was collected by chemical analysis and the corresponding average values are as follows: (as a percentage of total protein) lean pork - 4,5 %; semi-lean pork - 12 %; fatty pork - 25 %; lard - 35 %; all-sort beef - 11 %; beef trimmings - 18 %; all-sort veal - 15 %, etc. After that, the upper limits for the connective tissue content in the individual meat product types were calculated on the basis of analytical data and product formula.

At the third step, which is still underway, the calculated values for the individual types of products are to be checked against the corresponding values obtained by chemical analyses. In this report we present a set of data on the group of raw-dried salami-type products. In general, the calculated values agree well with the values obtained in the laboratory with the actual products. Further work is underway in order to introduce limits for the remaining meat product types.

INTRODUCTION

Currently, a new opinion is emerging that the connective tissue which is an integral part of both lean meat and adipose tissue may play an important role in the diet of human beings (Shrimpton, 1984). Some nutrition experts and consumer groups, however, consider the collagen as having a low biological value and omit any consideration of the physical properties of this otherwise poorly digestible nutrient. For that reason, they think that the connective tissue content of comminuted meat products should be limited and insist on introducing such limits in the meat regulations.

In Britain, for example, current regulations prescribe no limits for the connective tissue content of meat products but the Food Standards Committee recommended in 1980 that new regulations should be based on the content of trimmed lean meat containing no more than 10 % fat and 10 % connective tissue. This recommendation has not yet been embodied in British regulations but EEC regulations which govern the payment of export refunds, limit the dry connective tissue content of British pork sausages, intended for export, to 45 % of the dry protein content (Hannan, 1984).

In Bulgaria, a decision was taken to introduce limits for connective tissue content of comminuted meat products in the current meat regulations. This report describes our approach to the development and standardization of such limits.

METHODS

Total nitrogen was determined by the Kjeldahl method and the results were multiplied by 6,25 to give total protein. Hydroxyproline, the indicator substance for collagen, was determined by the Stegemann-Stalder method described by ISO. Connective tissue is defined as eight times the hydroxyprolin content.

RESULTS AND DISCUSSION

Since a basic regulation exists for each principal group of comminuted meat products it was decided that, as a first step of the standardization procedure, our efforts should be directed towards setting upper limits for connective tissue content in each group. Generally, perishable, cooked sausages are manufactured from raw materials of a lower quality (i.e. having high collagen content) than those intended for the manufacture of shelf-stable or semi stable, raw-dried or cooked and dried meat products. In each group however, composition formulas include a wide variety of raw-materials and combinations of them. Therefore, if a group limit is to be set, it should be based on those brands of meat products of that particular group that contain the largest amounts of collagen-rich raw materials.

Bearing that in mind, three to four brands of each principal meat product group were selected according to their expected connective tissue content, and samples of them were subjected to chemical analysis for total protein and collagen content determination. The number of samples of each type of product varied slightly but was never less than 15. A typical histogram of the data obtained for one brand of product is shown in Fig.1. As can be seen, the distribution was close to normal, and the set of data was treated accordingly. Similar distribution patterns were obtained for the other brands of meat products under investigation.

For the purpose of standardization, we proposed that the sum of the mean plus one standard deviation should be calculated and the resulting value be set as an upper limit for the relative connective tissue content. This approach was accepted as a reasonable one by the regulation authorities. The approved limits for the connective tissue content of

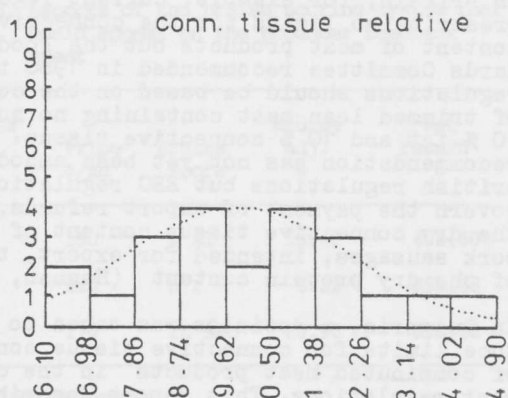


Fig.1. Distribution of the values for the relative connective tissue content (as percentage of total protein) of one brand of raw-dried salami-type product.

each principal group of comminuted meat products are as follows: (as a percentage of total protein)

- shelf-stable, raw-dried - less than 13 %;
- shelf-stable, cooked and dried - less than 13 %;
- semi-stable, raw-dried or cooked and dried - less than 13 %;
- perishable, cooked sausages - less than 16%;
- perishable, cooked sausages manufactured from collagen-rich raw materials (a few brands only) - less than 22 %.

The second step of the standardization procedure involved the setting of numerical values for the maximum acceptable collagen content of each particular brand of meat product. This reflects a specific feature of the state-owned meat industry in this country - the requirement that all manufacturing plants perform cutting and sorting of meat in the same way as well as that they are expected to follow the same approved composition formulas of the individual brands of meat products. Although limited in number, the variety of existing brands of comminuted meat products is still so large that at least two years of costly laboratory work is needed to analyze the required number of samples and draw conclusions that will satisfy the regulation authorities. The only reasonable approach was to get a realistic estimate of the collagen content in meats of all typical manufacturing sorts; then use the obtained data to calculate the maximum expected collagen content of each individual brand of comminuted meat products.

To characterize the raw materials in current use, representative samples of them were analyzed for total protein (N x 6,25) and connective tissue (HOPro x 8) content. The resulting data as well as the values for the relative collagen content to be used for further calculations are presented in Table 1.

On the third step, which is still underway, the calculated values for the individual brands of products are being checked by comparison with the corresponding values obtained by chemical analyses of samples taken from the manufacturing plants or purchased

at the retail market. For illustration only, some data on the group of shelf-stable, raw-dried salami-type products is presented in Table 2. As can be seen, the calculated values of the upper limits agree well with the values obtained by chemical analyses. Final approval of these group limits is due soon. Further work is underway to check the proposed values for the remaining brands of comminuted meat products and get a final approval for their introduction into meat regulations.

REFERENCES

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Table 1. Total protein (N x 6,25) and connective tissue (HOPro x 8) content of the raw materials in current use for the manufacture of comminuted meat products

Raw material type	Total protein content			Connective tissue content			Relative connective tissue content
	N	Mean	Stdev	N	Mean	Stdev	
Lean pork	15	19,9	1,8	15	0,88	0,22	4,5
Semi-lean pork	15	12,1	3,2	15	1,45	0,29	12,0
Fatty pork (trimmings)	15	5,3	1,1	15	1,29	0,86	25,0
Lard	15	3,4	0,7	15	1,11	0,15	35,0
Beef (low collagen)	15	20,6	0,8	15	1,14	0,29	5,5
Beef (high collagen)	15	19,4	0,9	15	3,46	0,75	18,0
All-sort beef	15	19,3	1,0	15	2,14	0,64	11,0
Veal trimmings	15	18,5	0,8	15	3,04	0,80	16,0
All-sort veal	15	18,1	1,4	15	2,60	0,50	15,0

Table 2. Expected and found values for the relative connective tissue content of some brands of salami-type meat products

Brand of product	Expected	N	Found	
			Mean	Stdev
Sugjuk Tarnovo	11,0	7	13,15	1,46
Diavena	11,8	7	11,25	1,02
Lucanka I	10,7	7	10,09	1,00
Lukanka II	10,7	6	11,55	0,62
Dobrich	11,6	5	11,38	1,07