

Nutritive value of mechanically deboned meat

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Devices for mechanical deboning of meat permit to recover its considerable amount. This is a disintegrated muscle bulk, which, according to the data from the literature, is characterized by a different composition and changed properties, as compared with normal meat. The nutritive value of mechanically deboned meat as a food is of special importance.

The purpose of the present studies was to determine the basic composition as well as the biological value of proteins of mechanically deboned meat, compared with normal meat, in relation to the kind of bones.

Material and Methods

Studies were carried out on bones of pigs 100-110 kg of weight, which were deemeated mechanically in a Seffelaar-Looyen separator /Holland/ 24 hrs after slaughter. The variation factor were two kinds of bones: shoulder-blade /scapula/ and humerus bone separately deemeated mechanically, as well as m. longissimus dorsi /the segment from the 4th thoracic vertebra to the 5th lumbar vertebra/ of the same pigs.

In the material mentioned the following determinations were made:

a/ basic composition:

- total protein content according to Kjeldahl
- collagen content according to Stegemann and Stalder /2/
- fat content according to Soxhlet
- moisture content by drying at 105°C to constant weight

b/ biological value of proteins determined by two methods:

- PER /protein efficiency ratio/ consisting in determining growth efficiency of the protein studied in rats of Wistar strain according to the method given by the Association of Official Agricultural Chemists, USA /1/.
- analysis of aminoacids composition of the protein studied; the level of aminoacids was expressed in per cent of protein.

Results and Discussion

The results of studies are presented in Tables 1, 2 and 3.

The basic composition of mechanically deboned meat /Table 1/ shows, in contrast to normal meat, significant differences demonstrated by:

- a/ decisively higher level of protein and fat but,
- b/ distinctly higher moisture content.

Tab.1. Basic composition of mechanically deboned meat - MDM in %; n=6

kind of meat	protein				fat				moisture			
	\bar{x}	\pm	s	V	\bar{x}	\pm	s	V	\bar{x}	\pm	s	V
MDM - scapula	12.35a	1.06		10	27.63a	2.30		9	58.63a	2.65		5
MDM - humerus	8.74b	0.81		10	46.11b	2.17		5	42.90b	2.11		5
m. longis. dorsi	21.62c	0.72		3	5.57c	1.67		25	70.17c	0.78		1

a,b,c - means with superscript different letters differ significantly at ≤ 0.01

The basic composition of mechanically deboned meat significantly depends on the kind of bones. In the meat studied comparatively and coming from two bones, i.e. shoulder blade and humerus significant differences in the level of protein, fat and moisture were found.

Tab.2. Content of protein /%/ , collagen /%/ and PER of MDM; n=6

kind of meat	protein				collagen				PER			
	\bar{x}	\pm	s	V	\bar{x}	\pm	s	V	\bar{x}	\pm	s	V
MDM - scapula	12.35a	1.06		1	5.12a	0.69		15	2.50a	0.08		4
MDM - humerus	8.74b	0.81		10	7.19a	1.11		16	2.50a	0.08		3
m. longis. dorsi	21.62c	0.72		3,9	5.17a	1.43		31	2.80a	0.09		3

The results in Table 2 show that the protein of mechanically deboned meat, compared with that of normal meat, does not show any significant differences in the biological value expressed by PER. No significant influence of the kind of deemeated bone on PER value was found, either. The main and decisive reason of this is probably the absence of significant differences in collagen level in all kinds of meat studied.

The analysis of amino acids of two kinds of mechanically deboned meat and normal meat presented in Table 3 showed some differences in the level of some amino acids. However,

the total level of essential amino acids determining the biological value of protein not show significant differences depending on the kind of meat studied. Only individual essential amino acids showed significant differences in their levels, demonstrated other things by:

- lower level of methionine and tyrosine in mechanically deboned meat,
- higher leucine level.

Tab.3. Amino acids composition of proteins in NDM %/; n=6

amino acids	NDM-scapula	NDM-humerus	m.longissimus dorsalis
Arginine	6.68 a	9.23 b	6.54 a
Aspartic acid	11.04 a	7.79 b	8.14 b
Serine	3.20 a	3.07 a	3.10 a
Glutamic acid	15.92 a	13.72 b	15.53 ab
Proline	4.32 a	5.97 b	4.63 a
Glycine	4.70 a	4.32 a	3.39 b
Alanine	5.45 a	4.72 b	4.66 b
+ Lysine	9.26 a	11.94 b	10.60 ab
+ Histidine	3.82 a	5.20 b	4.51 ab
+ Cystine	1.42 a	1.70 a	1.26 a
+ Methionine	1.72 a	2.18 a	2.71 b
+ Threonine	6.49 a	5.76 b	6.31 ab
+ Valine	5.87 a	4.51 b	4.28 b
+ Isoleucine	3.89 a	3.34 b	4.04 a
+ Leucine	7.83 a	7.32 a	7.08 b
+ Tyrosine	2.86 a	2.57 a	3.42 b
+ Phenylalanine	4.05 a	3.29 b	3.09 b
total essential amino acids	47.21 a	47.81 a	47.31 a

Significant differences were also found in the level of some essential amino acids relation to the kind of deameated bones, which concerned histidine, treonine, valine, leucine and phenyloalanine.

Conclusions

From the studies carried out the following conclusions can be drawn:

1. The basic composition of mechanically deboned meat differs distinctly from that of normal meat, but it also shows significant differences in relation to deameated bones.
2. The biological value of mechanically deboned meat expressed by PER does not show significant differences either in relation to the kind of bones or with regard to protein of normal meat.
3. In the composition of some amino acids certain differences occur in relation to the kind of deameated bones and normal meat compared; the total content of essential amino acids does not show any significant differences, by which PER results are confirmed.

Literature

1. Ass.Official Agric.Chem.: Official Methods of Analysis. Washington, D.C. 1970.
2. Stegemann H., Stalder K.: Clin.chim.Acta 18, 267, 1967.