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SECTION C 4

R. Rahelič and R. Rede

Faculty for Food Technology, Novi Sad, Yugoslavia

Relation Between Connective Tissue Content and WHC in Some Pig and Beef Muscles.

In the literature dealing with meat technology problems there are enough data about structure and composition of connective tissue (CT) (1,4), particularly about its influence on tenderness of meat (2, 3, 4, 5, 6, 8, 9).

The interest in investigation of this problem is arising as the market is asking more and more for tender meat.

But in spite of the existing interest in this problem, as far as we know there are no published data about the influence of CT on WHC of muscle. On the other hand, it is known from practice that meat from fore quaters is preferably used for meat paste production, believing that muscles from this part of the body have better WHC, because contain more CT.

For this reason, investigating the influence of CT on meat quality we paid attention to the relation between the content of this tissue and WHC in some pig and beef muscles.

Materials and methods

Materials. For the examination five muscles from pig and four from beef carcasses were used. In pigs six mm biceps brachii (Bb), triceps brachii (Tb) - caput longus and

extensor carpi radialis (Excr) were examined always from the same shoulder, and seven mm longissimus dorsi (Ld) and ileopsoas (Il), always from the same carcass.

All muscles were taken from the carcass as a whole, except Ld, which was cut out from lumbal region in the lenght of about 15 cm. In beef were examined four mm longissimus dorsi (Ld) 7. to 10. thoracal vertebra, triceps brachii (Tb) (distal third), biceps brachii (Bb) and extensor carpi radialis (Excr). Two last muscles were taken as a whole.

Muscles were taken from carcasses of commercial white type pigs, 7 to 10 months old, live weight ranging from 100 to 120 kgs, and from carcasses of domestic coloured beef breed, 14 to 18 months old, and of live weight from 400 to 450 kgs.

Methods. In all samples the content of CT, WHC and pH 24 hours post mortem were determined. CT was determined by Neuman and Logan method (6) for hydroxyproline detection. Extinction of hydrolyzate was measured by Bausch and Lomb, Spectronic 20 spectrophotometre. WHC was measured by Grau and Hamm press method (6), using Schleicher-Schüll, blau band 589[1] filter paper. pH was measured in aqueous extract 1 : 5, using Philips pH-metre, Model 9400. Besides, 0,5 g of the samples was compressed by Höppler consistometre with the weight of 20 kgs/5 min. between two plexiglas plates. The surface of compressed samples as well as the wet surface on filter paper were measured by planimetre, and the results were expressed in cm^2.

The measured samples were removed from the same part of the muscle, so that the fusiform muscles (Bb, Il and Excr) were cut across the middle and from there the muscle tissue without detectable amount of CT was removed.

Results and discussion

Results of examinations are presented in Table 1 and 2.

From data in these tables one can see that the content of CT, expressed as hydroxyproline, was augmented in examined pig muscles as follows - Il, Ld, Tb, Bb and Excr. In examined beef muscles the results were similar, i.e. the lowest content of CT was detected in Tb, but in Ld, Excr and Bb it was continually higher.

These results were confirmed, in some way, by examination of plasticity of muscles compressed with 20 kgs weight. It was found that the smallest surface was covered by the film of compressed sample of Excr of pig and the largest one by the sample of Il (Table 1). Other muscles, excluding Ld, showed, in general, the similar relations. The results obtained with beef muscles (Table 2) were similar. Tb and Ld, containing the least amount of CT were more tender than other two muscles (Bb and Excr) containing more CT. That indicates that muscles containing less CT are more tender and when compressed cover larger surface than the muscles containing more CT.

However, the obtained results did not express regularity in relation between the content of CT and WHC. So, pig muscles (Table 1), containing higher amount of CT (Excr and Bb) showed quite different WHC (the larger wet surface, the lower WHC). The remaining three muscles, containing smaller amount of CT showed WHC ranging between the values of previously two mentioned muscles. In these samples, WHC measured by Grau and Hamm method as well as by compression method with 20 kgs were analogous.

The results obtained by examining beef muscles (Table 2) were different from those obtained by parallel examination of pig muscles. Muscle with the highest CT content (Bb) showed the lowest WHC (method by Grau and Hamm), and muscle containing the least amount of CT (Tb) showed very similar WHC. In the other hand, Ld containing almost the same amount of CT (as Tb) showed the highest WHC. The congruity in results, obtained by two used methods, of WHC determined

in these muscles, was not expressed.

The variations of pH values of examined muscles 24 hours post mortem were very small, in pig - 5,62 to 5,76 as well as in beef - 5,40 to 5,57 (Tables 1 and 2). However, the relation between pH and CT content, as well as between pH and WHC was not found.

According to the obtained results it could not be said that content of CT influences neither pig nor beef muscles WHC. Therefore, the opinion that the muscles from fore quaters of beef carcass, containing more CT, bind more water and are more suitable for meat paste production, couldn't be confirmed.

It is reported that the function of muscle influences the arrangement of CT fibers (8). With aging of animals collagen change its colloidal properties, too. These changes are the result of increased cross linking in collagen and provoke reduction of solubility and hydrolysation of this protein (1, 2. 7). According to these data, one can suppose that the differences in function of various muscles, in some way, change the WHC of this protein. Tightening the network of protein the structure becomes more dense which lowers WHC. Estimating the results obtained in this work one should also keep in mind this postulation.

Literature

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Content of hydroxyproline as well as WHC and pH in some pig muscles 24 hours post mortem

Table 1

	Muscles				
	Ileopsoas /Il/	Long.dorsi /Ld/	Triceps br. /Tb/	Biceps br. /Bb/	Extensor c.r. /Excr/
Hydroxyproline +	0,151±0,016	0,204±0,019	0,247±0,018	0,285±0,039	0,512±0,055
Surface of compressed muscle	5,89±0,65	4,95±0,36	5,71±0,70	5,06±0,56	3,42±0,62
Wet surface ++	8,43±1,82	8,88±0,84	8,08±1,51	7,76±0,75	9,26±1,98
Wet surface +++	8,25±1,14	9,49±1,72	8,47±0,99	7,31±1,03	10,20±2,50
pH	5,62±0,16	5,62±0,19	5,74±0,09	5,75±0,08	5,76±0,11

+ Expressed as E_{560}

++ Wet surface of filter paper - by compression with 20 kg, in cm^2

+++ Wet surface of filter paper - by Grau and Hamm method, in cm^2

Content of hydroxyproline as well as WHC and pH in some beef muscles 24 hours post mortem

Table 2

	Muscles			
	Long. dorsi /Ld/	Triceps br. /Tb/	Biceps br. /Bb/	Extensor c.r. /Excr/
Hydroxyproline +	0,245±0,051	0,241±0,081	0,432±0,160	0,336±0,109
Surface of compressed muscle	5,34±0,40	5,07±0,47	4,68±0,70	3,64±0,18
Wet surface ++	6,61±0,81	8,01±2,56	6,77±1,33	7,77±1,85
Wet surface +++	6,87±0,39	9,32±2,48	9,92±0,62	8,74±1,10
pH	5,56±0,20	5,57±0,16	5,40±0,25	5,45±0,17

\+ Expressed as E_{560}

++ Wet surface of filter paper - by compression with 20 kg, in cm^2

+++ Wet surface of filter paper - by Grau and Hamm method, in cm^2