THE EFFECT OF CATTLE PRE-SLAUGHTER MAINTENANCE ON THE BIOCHEMICAL INDICES OF MUSCULAR TISSUE

Preslaughter maintenance of cattle affects significantly meat quality. The positive influence of cattle peroral administration of sodium chloride before slaughter on meat hydratability was reported to the XVIIIth Meeting. In this report the data on some biochemical changes in the liver and in the muscle tissue are presented, depending on watering and cattle tied and untied maintenance.

At present, there is no single opinion on preslaughter maintenance conditions influence on meat biochemical indices, so the study of this influence was of interest.

The experiments were carried out in the North Caucasus with the average daily air temperature was 23.4°C and the R.H. 70.4%. 30-monthold castrated steers-analogs of the Red Steppe breed in groups of 5 animals each were used in the experiment. Fresh-warm livers and longissimus dorsi of freshly-killed carcasses and of carcasses after 48 hours chilling at 0-4°C were the objects of the investigation.

Two series of experiments were carried out according to the following scheme:

Group I - no watering; untied maintenance;

Group II - watering ad libitum; untied maintenance;

Group III - watering ad libitum; tied maintenance.

Glycogen content was measured spectrophotometrically by the colour reaction with anthrone /7/; lactic acid content - spectrophotometrically by the colour reaction with para-hydroxy-diphenyl /8/; potassium and natrium contents - by flame photometry /9/ in pre-dried samples at 105°C; the total moisture - by sample drying at 150°C for one hour; bound moisture content - by the press-method /10/ and pH- potentiometrically.

Changes in some biochemical indices of livers and muscle tissue as related to animals watering are shown in Table 1.

Table 1

Group number	Glycogen content in fresh-warm tissue, mg%		Glycogen content in the muscle tissue 48 hours after slaughter, mg%	Lactic acid content in the muscle tissue 48 hours after slaughter, mg%	pH
	liver	muscle			
	M±m	M±m	M±m	M±m	M±m
I	4,500±158	660±13.04	96±7.10	783±22.3	5.69±0.03
II	5,250±36.4	728±16.60	160±13.03	740±10.5	5.76±0.01

The regime of watering influences significantly the glycogen content in the tissue. No watering prior to slaughter increases glycogen decomposition: in liver - by 14.5% ($P < 0.01$), in fresh-warm muscle tissue - by 17.6% ($P \leq 0.01$). It especially affected the total glycogen in the liver. It was noted that the liver of the animals of Group I, which were left without water for 24 hours before slaughter, was found to weigh by 10% less (3.78 kg)as compared to the animals of Group II(4.20 kg). The total glycogen in the liver of the animals of Group I was 150.1 kg; in case of Group II it was 220.5 g, i.e. by 46.9% more.

It was noted that glycogen content in the muscle tissue of the animals of Group I after aging for 48 hours at 0-4°C was 40% as small($P < 0.01$) and lactic acid content was 5.8% as high as compared to those of the animals of Group II; pH was reduced from 5.76 to 5.69 ($P < 0.1$).

However, the analysis of glycogenolysis rate showed that under these experimental conditions the quantity of decomposed glycogen was similar in both cases (564 mg% in group I and 568 mg% in group II, or 11.7 and 11.8 mg% per hour, respectively).

Changes of water and salt composition of the muscle tissue depending on animals watering are shown in Table 2.

The disturbance of watering regime for 24 hours before slaughter results in significant alterations of potassium and sodium contents and ratio in the muscle tissue. Potassium level for the animals of Group I increased by 20.4% ($P < 0.05$) and sodium level by 66.5%($P < 0.001$); potassium/sodium ratio in the muscle tissue

was 4.71 in case of Group I and 6.52 in case of Group II. Pre-slaughter watering elimination resulted in changing water-and-salt metabolism, which increases potassium and sodium contents in the muscle tissue and reduces bound moisture by 8.12%($P < 0.05$)

Table 2

Group number	Content, mg/g		Total moisture, %	Bound to total moisture, %
	potassium	sodium		
	M±m	M±m	M±m	M±m
I	1.65±0.23	0.353±0.016	76.60±0.33	65.11±1.73
II	1.37±0.03	0.212±0.090	76.74±0.17	70.86±1.08

The data obtained show a close relation between carbohydrate and water-and-salt metabolisms and their importance for the subsequent changes of meat quality. A reverse correlation was found between glycogen and sodium concentrations which was most pronounced in case of Group I (without watering), $r=-0.80$($P \leq 0.05$). A direct correlation between glycogen and bound water contents was also observed, the highest correlation coefficients being also for Group I, $r=-0.94$($P \leq 0.01$).

Tied maintenance of animals influences markedly meat quality.

Changes of some biochemical indices of livers and muscle tissue as related to the tied maintenance of animals are shown in Table 3.

Table 3

Group number	Glycogen content in fresh-warm tissue, mg%		Glycogen content in the muscle tissue 48 hours after slaughter, mg%	Lactic acid content in the muscle tissue 48 hours after slaughter, mg%	pH
	liver	muscle			
	M±m	M±m	M±m	M±m	M±m
I	5,250±36.4	728±16.6	160±13.03	740±10.5	5.76±0.01
II	5,900±1033	780±22.1	216±9.41	638±45.7	5.80±0.03

Tied maintenance of animals before slaughter causes a glycogen concentration increase in fresh liver by 12.4% ($P < 0.01$) and in the fresh-warm muscle tissue by 8.2% ($P \leq 0.05$); a still grea-

ter growth of glycogen concentration in meat post 48-hour aging (by 35%) ($P < 0.001$). However, in this case also, the rate of glycogenolysis for 48 hours was similar in both groups (11.7 and 11.8 mg%/hr). The total glycogen in livers for tie-maintained animals turned out to be higher also (256.1 g vs. 220.5 for Group II). Lactic acid accumulation in the tissue of the animals of Group III was 13.8% less than of Group II ($P < 0.1$).

Changes in water-and-salt composition of the muscle tissue as related to the tied maintainance are shown in Table 4.

Table 4

Group number	Matter Content, mg/g, of		Total moisture content, %	Bound water content to total moisture, %
	potassium $M \pm m$	sodium $M \pm m$	$M \pm m$	$M \pm m$
I	1.37 ± 0.03	0.212 ± 0.090	76.74 ± 0.17	70.86 ± 1.08
II	1.39 ± 0.02	0.281 ± 0.002	75.89 ± 2.24	71.64 ± 1.61

Sodium content in the muscle tissue of the animals, tie-maintained before slaughter, rose by 32.5% ($P \leq 0.001$).

At the same time, some changes of the muscle tissue hydratability were observed. However, no significant difference in the total moisture and in bound water among the groups was determined.

Table 5 presents data on glycogen level in the tissues of the animals, tie-maintained before slaughter, as related to maintainance conditions during the fattening period.

Table 5

Glycogen content, %[x]	Maintainance conditions during the fattening period	
	tied	untied
Fresh liver	176.7	112.4
Fresh-warm long.dorsi	141.4	108.2
Long.dorsi after aging for 48 hours	129.8	135.0

x) Glycogen level in the tissues of the animals maintained untied for 24 hours before slaughter was considered to be 100%

It is clear from the Table that tied maintainance of animals pr
or to slaughter increases glycogen concentration in the muscle
tissue, the highest increase being in case of maintainance of t
untied
animals during the period of fattening.

The investigations carried out showed a certain relation among preslaughter maintainance conditions of animals, carbohyd
te and water and salt metabolism and meat quality.

This allows oriented changes in some qualities of beef mea
by using simple methods of preslaughter maintainance of animals.

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