

**COMPARISON OF PHYSICAL ACTIVITY OF SOCIALLY UNSTABLE BULLS AND STEERS BEFORE SLAUGHTER AND ITS EFFECT ON MEAT QUALITY****Jozef Mojto<sup>1</sup>, Jozef Dubravický<sup>2</sup>, Oľga Palanská<sup>1</sup>, Rudolf Lahučký<sup>1</sup>, Kvetoslav Zaujec<sup>1</sup>**<sup>1</sup>Research Institute of Animal Production, 949 92 Nitra, Slovak Republic<sup>2</sup>Meat Processing Plant KABÁT, 835 11 Bratislava, Slovak Republic**INTRODUCTION**

The pressure to improve the beef quality rose again the interest of farmers in fattening of steers in the Slovak Republic. It was not realized because of economic reasons practically from the years after the war till now. Therefore a deeper research in the sphere of meat quality in steers is necessary. The occurrence of dark meat (DFD) is an undesirable concomitant trait of beef meat production. The frequency of its occurrence depends on the complex of pre-slaughter factors. The manipulation with animals, transport, physical activity and emotional stress are considered to be the decisive ones (Bartoš et al., 1988; Warris, 1990; Fostier, 1992). The decrease of glycogen reserves in muscle ante mortem and the effect on the final pH value and meat quality can differ in individual categories of cattle. In general the highest occurrence of DFD meat is reported in young bulls and lower in cows, steers and heifers (Brown et al., 1990). The bulls and steers are marked by different temperament and susceptibility to the stress situations. This can be one of the decisive causes of different occurrence of DFD meat. The aim of this experiment was to study the physical activity of slaughter bulls and steers in the slaughter house before killing, to determine the content of muscle glycogen and compare the meat quality.

**MATERIAL AND METHODS**

There were used 8 slaughter bulls and 8 slaughter steers in a comparative experiment. They were Holstein (75 %) x Blond d'Aquitaine crosses kept in tying stalls. The animals were housed together during the whole night after the transport to the slaughter house (approx. 35 km). They were the so called socially non stabilized animals. Immediately before slaughter a sample from m.semitendinosus was taken by spring biopsy (Biotech, Nitra) to determine the muscle glycogen content (Dreiling et al., 1987). We measured the pH value and colour of meat (% of remission), and we determined the water holding capacity (WHC) 48 hrs post mortem. The weight losses in meat samples after cooking, as well as the shear force value (Warner-Bratzler) of m.long.dorsi were studied on the seventh day.

The ethological observations were performed in the period from 14.00 to 7.00 o'clock. The number of mounting other animals as expression of physical activity within the social struggle was noticed in individual animals.

Basic variation statistic parameters and testing of differences between groups (t-test) were calculated by personal computer with the STATGRAPHICS programme.

**RESULTS AND DISCUSSION**

Detailed results of the experiment are given in table 1. Physical activity of animals before killing as a part of social struggle for hierarchic position in the group has various forms. The most typical manifestation is mounting the other animals, which exhausts the animals markedly more than other activities (teasing, pushing, butting). There were quite great individual differences in activity between animals which were housed in common pen before killing. We noticed on average 60 mountings with bulls during the observation period and only 7 with steers. The greatest activity was noticed in animals during the first four hours then it decreased to minimum about the midnight. Slight activity (3 mountings on average) was noticed during the morning hours again. Physical activity and emotional stress cause degradation of muscle glycogen. Individual differences are often great and not always have the physically less active animals sufficient content of muscle glycogen at the moment of killing. It gives evidence of the importance of the emotional aspect of the pre-slaughter stress during which the splitting of glycogen takes place in muscle (Fischer, 1988) as a result of increased secretion of adrenalin. In our experiment played the physical activity which manifested itself in the number of mountings obviously a greater role as the bulls had significantly lower content of glycogen ante mortem compared with the steers (34.75 and 70.71  $\mu\text{mol.g}^{-1}$ ).

The final pH value was a consequence of it, and it was on average 6.73 in bulls and 6.11 in steers. Total occurrence of DFD meat in bulls was 87 % and in steers 37 % and these results confirm unambiguously that the bulls are more predisposed to the creation of DFD meat. The effect of different pH value showed itself also in further qualitative parameters. The meat of bulls was darker, more tender and it contained less loose water. These are typical attendant traits of DFD meat. Mohan Raj et al. (1992) mixed together steers, bulls and vasectomised bulls before killing. The number of mountings correlated with pH, content of glycolytic metabolites and meat colour very well during the first 4 hours. The vasectomised bulls showed the greatest activity, and the authors considered it to be an expression of homosexuality. We found also a high correlation ( $r=0.76$ ) between the number of mountings and the final pH value in our experiment. The animals which were mounted had lower occurrence of DFD meat. Voisin et al. (1997) evaluated the temperament of animals before killing with a 4 degree scale. Heifers were little more active than the steers. Calmer animals had paler meat and higher values of shear force. However, high proportion of DFD meat occurs in bulls and steers only if the animals are mixed. If we kill socially stabilized groups of animals, which were reared together, we practically do not find the DFD meat. We did not find the occurrence of DFD meat in steers even after an extreme transport (Mojto et al., 1994).



## CONCLUSION

The effect of pre-mortal stress presents itself in bulls and steers differently. The bulls are physically more active in the loose housing at slaughterhouse during the night, and the glycogen resources in muscles are more drawn off. They have higher final values of pH in meat, and more frequent occurrence of DFD meat compared with steers.

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Table 1 Physical activity, occurrence of DFD meat and some qualitative parameters

Parameters	Bulls	Steers	t-test
	$\bar{x} \pm s\bar{x}$	$\bar{x} \pm s\bar{x}$	
Number of mountings	67	7	
Glycogen ante mortem $\mu\text{mol.g}^{-1}$	$34.75 \pm 3.21$	$70.71 \pm 2.10$	++
pH <sub>48</sub>	$6.73 \pm 0.13$	$6.11 \pm 0.12$	++
Colour (% rem.)	$7.13 \pm 0.20$	$8.42 \pm 0.40$	+
Water holding capacity $\text{g.100 g}^{-1}$	$31.11 \pm 0.87$	$34.06 \pm 1.34$	NS
Cooking losses $\text{g.100 g}^{-1}$	$37.32 \pm 1.21$	$43.40 \pm 0.28$	++
Shear force value kg	$2.11 \pm 0.25$	$3.82 \pm 0.24$	++
Occurrence of DFD meat %	87	37	

+P<0.05; ++P<0.01

## LITERATURE

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