

THE OCCURENCE AND RAPID IDENTIFICATION OF DFD OF BULLS

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SUMMARY

The occurrence of DFD was studied on bulls on the basis of pH_{24} measuring in MLLT, regarding the way of their housing in pens at the farming production, length of their transport to the slaughterhouse, yearly seasons, and length of their keeping in boxes before slaughter. It was found that the length of their stay in the slaughterhouse is the most decisive factor for DFD occurrence. Cold weather partly increased the incidence of DFD.

DFD may be identified at the end of the slaughter line by measuring the pH_1 provided the carcass was electrically stimulated after stunning. pH_1 above 6.2 appeared to be suitable criterion which enables to detect all carcasses with DFD. However, 39% carcasses with normal meat are included in this group.

INTRODUCTION

The occurrence of DFD was formerly considered as consequence of the animal fatigue after transport. Nevertheless, it makes certain problems even in recent time, although the transport of the animals to slaughterhouses is realized by fast vehicles. The cause of DFD may be seen in mutual interactions of the animals, especially of bulls during their stalling in boxes before the slaughter. These interactions are proportional to the time of stalling and result in tired animals in which sources of the muscle energy in the instant of slaughter are exhausted. This opinion is supported by the fact that the occurrence of DFD of cows and heifers is less frequent due to less influence of stress factors, and of low intensity of mutual interactions during stalling these animals before slaughter.

DFD commonly detected 24 hours after slaughter does not satisfy the need of meat industry in Czechoslovakia. Therefore other ways were investigated which could enable DFD detection still at the end of the slaughter line. The purpose of this communication is: 1. to put a report about the occurrence of DFD in bulls from one of the observed areas in Czechoslovakia regarding the type of housing the bulls in original farming production, length of transport, climatic conditions, and length of stalling the animals in the slaughterhouse; 2. to point out the possibility of the DFD detection at the end of the slaughter line by measuring pH_1 when electrical low voltage stimulation of bull carcasses was used.

MATERIALS AND METHODS

610 bull carcasses of different breeds and cross-breeds from common reception at the slaughterhouse were evaluated without further differentiation (group A). In addition 1783 bulls (groups B) restraint housing or keeping loose at the original farming production, length of the transport, cold (November - February) or warm (April - May) seasons were registered. Further differentiation concerned the time which elapsed from reception the bulls to the slaughterhouse. Bulls were slaughtered either during one hour after their transport or were kept overnight in boxes for 12 animals.

DFD was detected by measuring pH_{24} with a portable transistor digital pH-meter DIGI 88/WTW and spear-tip glass electrode. Measurements were made in MLLT on the level between 8th and 9th rib, 5 cm from the backbone. Meat of bull carcasses with higher pH_{24} than 6.2 was considered as DFD.

For purposes of rapid identification of DFD at the end of the slaughter line bull carcasses were used which were stimulated electrically by the equipment MITAB (Sweden). Electrical stimulation was performed within 10 min. after stunning, for 32 s with current 0.65 A and voltage 85 V, with pulsation in the range 5 ms repeatedly every 72 ms. The el. current was applied by the clips in nostrils. The hook for carcasses served as negative electrode. In 90 bull carcasses stimulated pH was measured at the end of the slaughter line (pH_1), and after 24 hours (pH_{24}). Values pH_{24} greater than 6.2 as criterion for DFD, and were compared with competent values of pH_1 .

RESULTS AND DISCUSSION

The average occurrence of DFD in bulls is given in Table 1. It is evident that DFD occurs in 58.8 - 74.1% bull carcasses when slaughtered next day after transport. The length of transport does not appear to be important. Nevertheless, evidently occurrence of DFD can be seen in cold weather than in the warmer (groups B 8 and B 10). Bulls slaughtered in the day of their reception had DFD in the range 0 to 3.7%, with higher incidence in colder weather (group B 11) in comparison with warmer seasons (group B 9), 3.7% and 1.1%, resp. The average occurrence of DFD in bull carcasses differentiated into groups B 1 to B 11 was comparable with DFD occurrence in those of the differentiated group A.

The results indicate that for the occurrence of DFD neither the type of housing the bulls in the original farming production nor the length of transport are decisive but first of all the length of stalling bulls in the slaughterhouse before slaughter. These results confirm the opinion that exhaustion of energy sources in skeletal muscles is caused by mutual interactions of bulls in boxes, manifesting the fight of animals for social position in mixed groups of bulls, especially in those which were restraint in the farming production.

Prevention of DFD occurrence may be seen therefore in the stabilization of the groups of bulls, and first of all in the immediate slaughter after transport. Another possibility

Table 1. The average occurrence of DFD in bull carcasses

	n	DFD	%
A Common reception, without specification	610	269	44.09
B 1 Slaughter immediately after transport	229	6	2.62
B 2 Slaughter next day after transport	381	263	69.03
B 3 = B 2 but bulls were at farming production restraint	47	31	65.96
B 4 = B 1 but bulls transported no more than 30 km	201	6	2.98
B 5 = B 1 but bulls transported 31 - 100 km	28	0	0.00
B 6 = B 2 but bulls transported no more than 30 km	85	62	72.94
B 7 = B 2 but bulls transported 31 - 100 km	249	170	68.27
B 8 = B 2 but transport in warmer season	102	60	58.82
B 9 = B 1 but transport in warmer season	93	1	1.08
B 10 = B 2 but transport in colder season	232	172	74.14
B 11 = B 1 but transport in colder season	136	5	3.68
Groups B 1 - B 11	1 783	776	43.52

Table 2. Reliability of pH₁ after electrical stimulation of carcasses as a criterion for DFD detection.

	6.2	6.3	6.4	6.5	6.6	6.7
a) lower than pH ₁ :						
b) higher than pH ₁ :						
a) DFD according to pH ₁ , no DFD according to pH ₂₄	39.2 %	27.8 %	22.8 %	12.7 %	8.9 %	7.6 %
b) normal meat according to pH ₁ , DFD according to pH ₂₄	0.0 %	15.6 %	24.4 %	28.9 %	46.7 %	66.6 %

lity considered in Czechoslovakia is housing the animals in individual boxes, in case of need.

Research oriented for finding the possibility of fast identification of DFD indicated that measuring pH₁ is useful when electrical stimulation is established in the slaughter line. Rapid fall of pH in MLLT is more distinct in cases of greater amount of glycogen in the muscle, and consequently in the meat of low pH₂₄. For using pH₁ for identification of DFD a question remains which pH₁ value ought to be chosen as criterion. Table 2 indicates probable errors when pH₁ 6.2 to 6.7 are chosen. The results indicate that at pH₁ 6.4 22.8 % carcasses would be identified wrong as DFD, and 24.4 % carcasses with normal meat would be identified as DFD. pH₁ 6.2 may be taken as more suitable criterion because all DFD would be identified, but with that knowledge that 39.2 % carcasses are included which are not DFD when evaluated on the basis of pH₂₄.

pH₁ 6.2 appears to be satisfactory criterion for the detection of DFD under practical conditions in meat plants. Meat with higher pH₁ values is used as raw material for other production. The results indicate that electrical stimulation used for acceleration of glycolytic and glycolytic processes in meat may be used for rapid identification of DFD also.