

THE INFLUENCE OF PRE SLAUGHTER TREATMENT ON MEAT PROPERTIES IN HEIFERS

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SUMMARY

We analysed the influence of the fattening technology and pre slaughter stress (the duration of animal transport from stable to slaughter-house and different waiting period from arrival to slaughter) on meat colour and pH in heifers. The meat colour was measured with FOP and Minolta CR300, which measure total (L), red (a) and yellow (b) reflected light, 24 hours p.m. At the same time pH was also recorded. Heifers from farms, which were fattened more intensively had in comparison with heifers from co-operatives lower pH and lighter meat. a and b values were also higher for heifers fattened in farms. The duration of transport, four to seven hours, compering with up to one hour, had no negative effects on meat pH and colour. Only a and b values were lower for heifers transported only up to one hour. Prolonged waiting period from arrival to slaughter from 2 to 17-20 hours had as a consequence darker meat measured with Minolta. L, a and b values were higher in heifers slaughtered within 2 hours after arrival. FOP values did not differ significantly. After even longer waiting for slaughter (64 hours), the meat colour improved again and did not differ from heifers that were slaughtered within 2 hours after arrival, but differed significantly from heifers that were slaughtered 17-20 hours after arrival. pH values in heifers slaughtered between 2 hours after arrival differed significantly from that in heifers slaughtered after 17-20 hours after arrival, but not from that slaughtered after 64 hours. Also the difference between heifers slaughtered 17-20 hours and after 64 hours after arrival did not differ significantly. It appears that after longer waiting period the animals can recover, if they are properly housed and fed.

Introduction

In the past much attention was paid to genetic and environmental factors determining meat quality. It was shown that inappropriate animal treatment in pre slaughter period was the most common reason for DFD meat occurrence in cattle (Augustini, 1981; Hedrick, 1981; Kallweit et al., 1981; Tarrant, 1981; Èepin, 1988; Jones and Tong, 1989). Although the occurrence of DFD meat in heifers is usually lower than in bulls and steers (Tarrant, 1981; Jones and Tong, 1989; Èepin, 1991) it is important quality deficient because heifers represent an important exporting item Slovenian. The aim of this study was to examine the causes for DFD meat development in heifers.

Materials and methods

In one of the commercial slaughter-hause 444 Simmental heifers were slaughtered in the period of nine months. They originated from farms and co-operatives. Heifers from farms were fattened more intensively than those from the co-operative. Their live weight was between 400 and 450 kg. The duration of animal transport with lorries varied from quarter to seven hours. Heifers were slaughtered in up to 2 hours, after 17 to 20 hours or after 64 hours after arrival. 24 hours after slaughter and chilling, pH and colour measurements were recorded on the longissimus muscle cross section between 7th and 8th rib. Colour was measured with FOP (Fibre Optic Probe) and Minolta CR300 spectrophotometer, which measure total (L), red (a) and yellow (b) reflected light. FOP and L, a, b values represent average of three measurements on longissimus dorsi cross section. Data were analysed with GLM procedure (SAS, 1989). Origin of the heifers, duration of transport, waiting period from arrival to slaughter and the date of slaughter were included in the model as fixed influences. The differences between heifers originating from co-operative and farms, between different transport duration and between different waiting period from arrival to slaughter were tested with F-test for significance.

Results and discussion

In Table 1 mean values and coefficients of variability of analysed traits are shown. The mean pH value was 5.41 with small variability of 4%. The pH greater than 5.8, which indicate the occurrence of DFD meat (Fischer, 1981; Tarrant, 1981; Gariepy, et al., 1990) had 5.9% carcasses and pH greater than 6.0, where the characteristics of DFD meat are more pronounced, was found in 4.3% carcasses. Similar results for heifers was found also by Tarrant (1981). The average FOP value was 34.5 and showed high coefficient of variability of 25%. 5.6% carcasses had lower or equal FOP value of 25, which indicate the occurrence of DFD meat. This is almost the same result as it was found with measuring pH. Also the mean values for colour measured with Minolta indicated normal values with small coefficient of variability, which were smaller than 10%.

In Table 2 the influence of duration of transport, four to seven hours, compering with up to one hour, on meat properties is represented. The prolonged transport had no negative effect on meat pH and colour measured with FOP. Also L values did not differ significantly, but a and b values were significantly lower for heifers transported only up to one hour. The influence of waiting time before slaughter is shown in Table 3. pH values in heifers slaughtered within 2 hours after arrival differed significantly from pH in heifers slaughtered after 17-20 hours after arrival. The difference between heifers slaughtered after 64 hours and within 2 or after 17-20 hours after arrival did not differ significantly. Prolonged waiting period from arrival to slaughter from 2 to 17-20 hours had also as a consequence darker meat measured with Minolta. L, a and b values were higher in heifers slaughtered within 2 hours after arrival. After even longer waiting for slaughter (64 hours), the meat colour improved again and did not differ from heifers that were slaughtered within 2 hours after arrival, but differed significantly from heifers that were slaughtered 17-20 hours after arrival. FOP values did not differ significantly between different waiting periods, but showed the same tendencies as L, a and b values. Carcasses with pH higher than 5.8 and FOP lower than 25 were from groups of animals that were transported 4 to 7 hours and had to wait 18 hours for slaughter. The transport and new environment represent stress for animals which can lead to DFD meat. But it appears that after longer waiting period the animals can adopt to new environment and so overcome stress situation and recover, if they are properly housed and fed.

Table 4 shows heifers from farms, which were fattened more intensively, had in comparison with heifers from co-operatives lower pH and lighter meat (significantly higher FOP and L values). a and b values were also significantly higher for heifers fattened in farms. The influence of nutrition on meat colour was pointed out also by Fischer (1981), Kousgaard (1981) and Tarrant (1981). Enough light soluble carbohydrates in food increased glycogen content in muscle (Kousgaard, 1981).

In Table 5 correlation coefficients between different meat characteristics are represented. They are all significant, but not really high, so it is not possible to predict one meat characteristic from another. The highest correlation coefficient was between a and b values obtained with Minolta.

Conclusions

Investigating the influence of the fattening technology, the duration of animal transport from stable to slaughter-house and different waiting period from arrival to slaughter on meat colour and pH in heifers, the following can be concluded:

- DFD meat occurred in 5.9% of heifers carcasses,
- the duration of transport, 4 to 7 hours, compering with up to 1 hour, had no negative effects on meat pH and colour measured with FOP and L value from Minolta,
- prolonged waiting period from arrival to slaughter from 2 to 17-20 hours had as a consequence darker meat and lower pH, but after even longer waiting period (64 hours), the meat colour improved again and did not differ from heifers that were slaughtered within 2 hours after arrival,
- heifers from farms, which were fattened more intensively had in comparison with heifers from co-operatives lower pH and lighter meat,
- with appropriate animal treatment in pre slaughter period DFD meat occurrence can be avoided and meat colour improved.

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