EFFECT OF FASTING BEFORE DELIVERY ON PORK QUALITY AND CARCASS YIELD

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INTRODUCTION

In earlier work from our Institute distinct differences were shown in the incidence of PSE between halothane positive (HP) and halothane negative (HN) Landrace pigs (Eikelenboom and Minkema, 1974; Eikelenboom et al., 1978). It was recently (Eikelenboom and Nanni Costa, 1988) found, however, that the PSE condition is more severe in HN pigs with respect to waterbinding. A higher drip loss associated with a lower ultimate pH was observed in HN/PSE pigs, compared with HP/PSE pigs.

Ultimate pH (pH_u) can be altered by manipulating the interval between last feeding and slaughter. Warriss (1982) found that muscle pH_u increased with increasing period (up to 50 h) of feed withdrawal before slaughter, but this increase was not sufficient to result in any DFD meat. Jones et al. (1985) studied the effects of 0, 24 and 48 h fasting and water restriction in lairage, after a 17 h interval between food withdrawal and arrival at the slaughterhouse. They found effects on colour, firmness and drip loss, and although there was no increase in DFD, they concluded that the time from last feeding to slaughter should be minimized to avoid losses in carcass weight. In contrast, Fischer et al (1988) concluded from their experiments on fasting (up to 72 h) on the farm or in lairage, that the method does not provide any useful way of alleviating the PSE problem. The treatment increased the incidence of DFD and losses in carcass weight.

The present study was conducted to evaluate the effect of relatively short (16 and 24 h) periods of feed with drawal before delivery on pork quality and carcass yield.

MATERIAL AND METHODS

The animal material consisted of a total of 270 pigs, from a 3-way [Yorkshire x (Duroc x Dutch Landrace)] cross from the Institute's experimental farm, which were fed ad lib in mixed (gilts and barrows) groups (8/pen) a normal commercial ration. Pigs were weighed one (Exp.1 and 2) or two (Exp.3) days prior to delivery and slaughter, to determin initial liveweight. Pens were allocated to treatment groups based on mean liveweight and sex distribution.

Pigs were fasted (with access to water) before delivery for 24 vs. 0 h (Exp.1), 16 vs. 0 h (Exp. 2) and 24, 16 and 0 h (Exp. 3). In exp. 2 and 3 the extra feed consumption of the group(s) without or with the shorter fasting period was recorded. After a 2-3 h transport, the pigs were rested for 2 h in lairage, during which period they were sprinkled with water. All pigs were slaughtered at the same commercial abattoir.

After assessment of weight and meat percentage (HGP) at 45 min post mortem (p.m.) pH (pH_1) of the M. longissimus (LD) was measured. At 19 h p.m. pH (pH_u) of the LD and M. semimembranosus (SM) was assessed and, after cutting, a sample of the LD was removed between the 2^{nd} and 4^{th} lumbar vertebrae and transported to the laboratory. Colour was visually judged using the Japanese colour scale and L* values were assessed with a Hunter Labscan 5000 (lightsource D65, standard observer 10^o, 30 mm sample port) after blooming for 30 min. In exp. 2 and 3 muscle firmness was scored subjectively on a 3 point scale(1=soft, 3=firm). Drip loss (48 h) and heating loss were assessed as previously described (Eikelenboom and Nanni Costa, 1988).

The data from each experiment were subjected to an analysis of variance using a model which included the fixed effects of treatment and sex and their possible interaction.

RESULTS AND DISCUSSION

The analysis of variance showed, as expected, a significant ($P < .05$) effect of sex on liveweight, carcass weight and meat percentage in all 3 experiments. However, in Exp. 1 and 3 a significant effect of sex on ultimate pH (LD and SM), percent drip loss and heating loss was also observed. These results indicate that gilts may show an inferior waterbinding capacity in comparison with barrows, due to a lower pH_u. For the meat quality traits a significant interaction between sex and treatment was observed for pH_u (LD and SM) in Exp. 1 and for pH_1 in Exp. 3.

In table 1 the results are presented for the various treatments used in the three experiments. Dressing percentage was significantly lower(-1,6 %) after fasting only in Exp. 1. The difference in dressing percentage between the fasted groups and the control group (0 h) was smaller in the third experiment, than in the first two experiments, which might be due to the difference in the time of assessment of the initial liveweight. No significant effect of the treatment on meat percentage was observed. If the extra feed consumption of the control group is taken into account, there is in general no economic disadvantage in withholding feed for 16 h. Warriss and Brown (1983) concluded from their experiments with pigs reared on a restricted feed regimen, that the optimum time for slaughter in terms of carcass yield is 9-18 h after the last meal. They also presented evidence that part of the carcass loss is attributable to loss of water.

A lower pH_1 was observed in the pigs fed until delivery, although differences were only significant in Exp. 1 and 3. In agreement with reports from other authors (Warriss and Brown, 1983; Jones et al. 1985 and Fischer et al., 1988) ultimate pH (LD and SM) increased as a result of fasting for a 24 h. The incidence of DFD ($pH_u > 6.2$) in the LD was increased after fasting for 24 h in Exp. 1, while no DFD was found after fasting for 24 h in Exp. 3.

Percent drip loss was significantly decreased after fasting for 24 h, but not after fasting for 16 h. Percent heating loss was only significantly lower after fasting in Exp. 1, which is likely to have been caused by the higher incidence of DFD observed in that experiment. Firmness increased as a result of fasting. Judged from the L* and drip loss values, feeding until delivery resulted in a better meat quality in Exp. 2 than in Exp. 1 and 3. As found previously (Eikelenboom and Nanni Costa, 1988) it is often observed that for many meat quality traits an effect of day of slaughter exists, for which there is no obvious explanation. Therefore, the experimental treatment was replicated in the study presented here.

In general, our results indicate that prolonged fasting (24 h) reduces the incidence of PSE and results in a general improvement of colour, waterbinding and firmness of muscle. Fasting for 16 h does not improve waterbinding, but colour was improved in Exp.3, although not in Exp. 2. In order to minimize losses in carcass yields, a feed withdrawal period of 16-24 h before delivery is recommended in practice.

In addition to the effect on fresh meat quality, fasting will also improve the suitability for processing as cooked ham. The higher pH_u will improve the technological yield (Cariou et al.,1988). There are also other advantages associated with a longer interval between the last meal and slaughter.

The impression exist in practice that groups of fasted pigs are easier handle. If this assumption is correct, it may mean that the temptation to use artificial aids such as electric prods is decreased, thus making it a less stressful experience for the pigs.

Secondly, a full gastrointestinal tract results in heavier labour at dressing. Moreover, it may increase the risk that it is cut accidentally,with the consequence of bacterial contamination of the carcass. Furthermore, there is also an important environmental consideration: fasting reduces the waste to dispose off at the slaughterhouse. In earlier experiments we have observed that the mean weight of the gastrointestinal tract ranged from 6.7 kg (ad lib feeding, 24 h fast before slaughter) to 11.5 kg (restricted feeding, last meal 6 h before slaughter).

Finally, Warriss and Brown (1983) found that fasted pigs had a significantly lower loss of weight in chill. Since loss of exudate from slices of LD is well related to the overall loss of weight from the whole carcass when butchered and displayed as retail joints (Lopez-Bote and Warriss, 1988), fasting will also add here in reducing weight losses.

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Table 1. EFFECTS OF FASTING ON PORK QUALITY AND CARCASS YIELD

	Exp. 1		Exp. 2		Exp. 3		
	24	0	16	0	24	16	0
n	30	30	47	48	38	38	39
Init. livewt.(kg)	111.0	110.9	108.6	108.2	106.7	106.4	105.6
Carc. wt.(kg)	85.2	86.8	85.3	85.2	82.6	83.0	82.3
Meat percent.(HGP)	50.1	50.7	51.9	51.3	52.3	53.1	51.7
Dressing percent.	76.7^a	78.3^b	78.5	78.8	77.4	78.0	77.9
Extra feed cons.(kg)	-	n.d.	-	1.1	-	1.6	2.9
pH_1(LD)	6.43^a	6.20^b	6.28	6.20	6.33^a	6.32^a	6.16^b
pH_u(LD)	5.77^a	5.55^b	5.62	5.59	5.72^a	5.63^{ab}	5.61^b
pH_u(SM)	5.95^a	5.72^b	5.67	5.65	5.83^a	5.78^{ab}	5.70^b
Firmness score	n.d.	n.d.	2.4	2.1	2.5^a	2.1^b	1.9^b
Colour score	2.8^a	2.4^b	2.6	2.5	3.1^a	2.9^{ab}	2.6^b
Hunter L*	52.9^a	56.4^b	54.7	55.0	53.0^a	54.6^a	56.3^b
Drip loss(%)	2.17^a	3.35^b	2.30	2.35	1.95^a	3.06^b	3.59^b
Heating loss(%)	28.7^a	31.6^b	30.8	31.7	32.5	33.5	33.3

Within experiments, means in the same row with different superscript are significantly different (P< .05).