REDUCING PORK QUALITY DEFECTS IN 16 MAJOR AUSTRALIAN ABATTOIRS

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Background

Inconsistent meat quality costs the Australian pig industry in excess of A$22 million per year (Whan, 1993). This loss is largely attributable to the condition in pork called pale, soft, exudative (PSE) in which the colour is paler than normal, has a soft texture and a wet surface. PSE pork also has a lower eating quality than normal pork as it may be dry, tough and unacceptable to the consumer (Warner, 1994). A recent national study investigated the abattoir factors affecting pork quality and implemented recommendations that reduced the incidence of PSE pork in four national participating abattoirs by 38% (King, 1996). Another category of pork is that of Dark, Firm and Dry (DFD) pork. The pork is dark and unattractive, firm to the touch and has a dry surface. This pork has poor keeping qualities and more recently has become a quality issue for the export market (Gursansky, pers com.).

The basis of the project was to provide an on-site demonstration of the management and reduction of PSE pork. This approach enabled abattoir management to become aware of the benefits as they applied to their own processing facilities. Ownership of the process would thus be far greater and the end results would reflect a greater effect than if a generic document based on a few abattoir experiences or case studies was to be circulated.

Objectives

The major objectives of this national project were to conduct pork quality surveys at major Australian pork abattoirs targeting in excess of 80% of the Australian pork production to determine the incidence of PSE and DFD pork at each facility and to provide specific recommendations to each abattoir to reduce the incidence of PSE and DFD pork. After implementation of the recommendations, the facilities were resurveyed to measure the impact at each abattoir. An overall target was to reduce the overall incidence of PSE pork by 50%.

Methods

An initial baseline survey of the level of PSE and DFD pork in each abattoir was carried out. A minimum sample rate of 20% of the kill was maintained where possible. Critical control points within each abattoir were identified and recommendations were made to each abattoir to reduce the incidence of PSE & DFD. Abattoir operations were assessed by regular monitoring of all procedures including observation of pig handling and lairage management, the stunning process, temperature and time in scald-tank, dehair, processing times along the chain, deep butt temperatures and chiller management.

The procedures followed were those documented by Eldridge *et al* (1995) and King (1996). Each survey was carried out over 2 consecutive days. Carcases were measured for pork quality by measurement of pH (Jenco 6007 pH meter with a glass electrode, Envirosensors, Sydney) at 8 hours post-slaughter in the loin (*M. Longissimus dorsi*, at the P2 site) and the ham (*M. Semimembranosus* adjacent to the *tuber ischii*). A duplicate measure of pH was made at each site and the average used for determining the quality category.

The pork quality was described according to the following parameters (Joo *et al.*, 1995):

Potential PSE (soft, exudative)	$pH \leq 5.6$,
Normal	$5.6 < pH \leq 6.0$ and
Potential DFD (dark, firm , dry)	$pH > 6.0$.

Carcasses were described as having an extensive (Ext) quality defect if the condition was found in both the loin and ham, or localised (Loc) if the condition was found in only one of the two sites. Although referred to as extensive and localised PSE or DFD, the results considered as "potential" levels of the two conditions within Australian abattoirs as it was only possible to determine the incidence of these conditions based upon a measurement of muscle pH postmortem.

After the recommendations were implemented for at least three months, a follow up survey at each of the abattoirs to assess the impact of the recommendations was conducted.

Results and discussion

The incidences of PSE and DFD pork are presented in Table 1. The results indicate that the incidence of PSE pork was reduced after the first survey –following the implementation of recommendations provided to each abattoir. The incidence of normal pork significantly increased, however the level of DFD pork also increased slightly.

The level of PSE pork was reduced by 40% (P=0.015) while normal pork increased by 25% (P=0.083) and DFD by 12% (P=0.187). The survey indicates that there has been an increase in muscle pH from survey 1 to survey2, which has been reflected more in a reduction in PSE rather than an increase in DFD. The reduction in PSE pork is similar in magnitude to the 38% reduction reported by King (1996), who also found that the incidence of normal pork increased by 69% and DFD reduced by 25%.

The incidence of both PSE and DFD are still at significant levels within the Australian pork industry and requires considerable attention. In contrast to King (1996), the level of DFD pork (Extensive and Localised) increased to above 30%. This increase in DFD pork is of major concern to the export market and also needs considerable attention.

Factors that were identified at the abattoirs as contributing to the level of PSE and DFD are similar to those identified by King (1996). These include:

- Poorly designed or inadequate unloading facilities.
- Very steep raceways or offloading ramps.
- Lairage facilities were either inadequate or of the design that does not facilitate the easy movement or handling of pigs.
- Mixing of farm groups into large lairage pens was common practice.

- Insufficient water supply in lairage.
- Excessive use of electric goads, largely due to the poor unloading and holding facilities, and the practice of moving pigs in large groups (20+) up to the stunning point.
- Poor stunning procedures were common where an electric stunning system was in use. Double stunning was common.
- Overcrowding of carcasses in chillers, with carcases in contact with each other causing severe restrictions in air movement, thus affecting chill rates.

Conclusions

In the 16 participating abattoirs the level of PSE pork was reduced, on average, by 40% while normal pork increased by 25% and DFD by 12%. In previous projects similar benefits in terms of reduction of PSE levels have been seen (King, 1996). The changes that were made from recommendations identified following survey 1 were largely management related and involved merely improving the way that stockpeople worked with the pigs, more effective stunning procedures and improved chiller management.

The project has clearly shown that changes can be made, cost free or at low cost, which have a significant impact on pork quality and thus have significant financial benefits. The abattoirs that implement changes pre- and post-slaughter can therefore expect to have positive effects on the production of high quality pork resulting in economic benefits to the company and also to the Australian pork industry as a whole.

Pertinent Literature

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Table 1. The average incidence (%) of pork quality defects in 16 major Australian abattoirs

	Survey 1	Survey 2	Overall (weighted mean)[1]	P value
No of pigs	4501	5128	9629	
Ext PSE	14.2	6.5	10.1	0.015
Loc PSE	18.2	13.0	15.4	0.038
Normal	37.5	46.8	42.4	0.083
Loc DFD	16.8	18.3	17.6	0.336
Ext DFD	13.3	15.5	14.4	0.256

[1] Incidence of PSE, normal and DFD carcases averaged over the two days and weighted for the number of pigs measured per abattoir and per survey.