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RESULTS OF A PRODUCER DARK CUTTING SURVEY

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SUMMARY
Dark cutting in beef carcases can represent a significant financial loss to processors and producers involved in direct marketing. In our study we valued dark–cutting downgrades to a loss of $100 to $150 per carcase since all such bodies had to be diverted away from their primary export market, and additional cattle had to be killed in their place. A supplier survey conducted in November 2000 documented the on-farm histories of 937 market-specific yearling cattle killed at the one meat plant over an 18 months period. This enabled the examination of on-farm records pertaining to the handling, treatments, grazing history and preparation for sale of turnoff lots that were then correlated to the number and percentage of dark cutters. By association we pinpointed a number of social and behavioural background factors that applied to the circumstances, such as handling issues, long pick-ups, purchased stock, mixed mobs and limited weaner training. Although not commonly observed, improving pasture conditions were a possible nutritional influence associated with less dark-cutting. In conclusion, we suggest that animal behavioural influences reported in this paper are worth managing in the lead up to processing. However the number of dark cutters was not considered to be high by industry standards for pasture fed cattle

Keywords: beef carcases, dark-cutting, cattle handling issues

INTRODUCTION
Northern NSW and southern Queensland producer suppliers of Banksia beef in 1999/2000 completed a teleform questionnaire documenting the on farm history of 35 lots of yearling cattle totalling 937 head. They recorded their time of turnoff, grazing history, cattle management and preparation for sale, details of trucking, mustering and loading, weather conditions pertaining at the time and any unusual events that occurred between yarding and slaughter. The origin of the cattle and previous on-property handling was noted.

METHODS
Cattle were processed sequentially each fortnight from May 1999 to October 2000 at a southern Queensland abattoir and carcases were Ausmeat chiller assessed. For this investigation, a carcase with a meat colour of 4 or higher was regarded as being a dark cutter.

Handling issues were nominated and assessed within turnoff lots, as was the effect of cold or rain. Here 'handling issues' describes any abnormal occurrence or observed reaction by stock to their immediate environment. These include yarding problems, excitable cattle, unscheduled mixing, waiting on trucks or penning beside 'stirry' cattle at the abattoir. All other issues (other than handling isues) were developed for analysis by comparing the number and percentage of dark cutters with the total number delivered in that category.

Using χ^2 analysis, a range of factors were tested for evidence of association with the level of dark cutting in Banksia beef carcases.

RESULTS
In this study, the cattle 'handling issues' emerged as the factor most consistently associated with dark cutting. When the dark cutting was classified into three incidence levels ie. 0%, 0-10% and > 10%, it was possible to observe a strong (Table 1; $P<0.01$) association between handling issues and dark cutting ($\chi^2 = 17.99$). Conversely, when there was no dark cutting, there were no handling issues.

Table 1. The effect of handling problems on the incidence of dark cutting

% Dark Cutters	Nil handling issues	Some handling problems	Total
0%	19	0	19
0-10%	6	2	8
>10%	2	6	8
Total	27	8	35

The added effects of cold or rain when combined with handling issues on a delivery day compounded the results ($\chi^2 = 19.30$; $P<0.05$) as shown in Table 2.

Table 2. The effect of handling or cold or rain on the incidence of dark cutting

% Dark Cutters	Nil issues	Handling, cold, rain	Total
0%	17	2	19
0-10%	5	3	8
>10%	0	8	8
Total	22	13	35

The association of pasture conditions at delivery with dark cutting incidence can be seen in Table 3 ($\chi^2 =14.52$; $P<0.01$). The bulk of the observed dark cutting occurred with animals from the properties of 28 respondents whose pasture conditions at the time were either static or drying off.

Table 3. The effect of pasture conditions on the incidence of dark cutting

Pasture conditions	Number delivered	Number of dark cutter	% Dark cutters
Drying off	178	12	6.7
Static	519	42	8.1
Improving	199	1	0.5

The effect of cattle origin is indicated in Table 4 ($\chi^2 =15.97$; $P<0.01$). Purchased stock had the highest incidence of dark cutters.

Table 4. The effect of cattle origin on the incidence of dark cutting

Cattle origin	Number delivered	Number of dark cutter	% Dark cutters
Vendor bred	636	25	3.9
Purchased	58	8	13.7
Mixed origin	235	22	9.4

Owners nominated how often their cattle were yarded on the property prior to delivery. Table 5 shows the range of dark cutting results by frequency of yarding ($\chi^2=18.22$; $P< 0.01$). Cattle yarded every three to four months showed the highest incidence of dark cutting.

Table 5. The effect of yarding frequency on the incidence of dark cutting

Yarding frequency	Number delivered	Number of dark cutter	% Dark cutters
Every 1 month	97	6	6.2
2 months	280	16	5.7
3 months	130	15	11.4
4 months	125	13	10.4
6 months	210	3	1.4

The incidence of dark cutting was marginally improved when cattle were slaughtered within 12-24 hours of pick-up rather than 25-36 hours of pick-up (Table 6, $\chi^2 = 4.24$; $P<0.05$).

Table 6. The effect of pick-up to slaughter times on the incidence of dark cutting

Pick-up to slaughter	Number delivered	Number of dark cutter	% Dark cutters
12-24 hours	673	28	4.2
25-36 hours	238	18	7.6

On farm water curfew times affected the incidence of dark cutting (Table 7), with cattle off water for less than 2 hours showing a lower incidence of dark cutting than cattle off water for 4 hours ($\chi^2 = 4.04$; $P<0.05$).

Table 7. The effect of time off water on the incidence of dark cutting

Time off water	Number delivered	Number of dark cutter	% Dark cutters
< 2 hours	538	29	5.2
< 4 hours	388	34	8.7

The number of days weaned in yards was recorded by those participants who yard weaned as a regular practice, and this information is presented in Table 8. Longer weaning periods was associated with less dark cutting ($\chi^2 = 14.38$; $P<0.01$).

Table 8. The effect of weaning on the incidence of dark cutting

Days weaned	Number delivered	Number of dark cutter	% Dark cutters
3-7 days	330	35	10.6
8-14 days	267	7	2.6

Where an individual producer's Banksia stock had been all run together, as opposed to being mixed with other market cattle or other livestock groups on the property, the percentage of dark cutters was reduced (Table 9, $\chi^2 = 5.33$; $P<0.05$).

Table 9. The effect of running together on the incidence of dark cutting

Run together	Number delivered	Number of dark cutter	% Dark cutters
Yes	834	48	5.7
No	125	14	11.2

Mouthing cattle at delivery appeared to be a disadvantageous practice (8.4% vs 5.0% dark cutting) $\chi^2 = 3.71$ ($p=0.054$) although this result failed to reach statistical significance.

Seasonal or grazing history associations with dark cutting incidence were not recorded in the current study. Further, whether stock were supplementary fed on farm, or not, prior to slaughter had no association with the number of dark cutters.

DISCUSSION

The above results provide evidence that stressing animals increases dark-cutting. This can occur from handling difficulties accentuated with cold or rain, declining feed, mixing with strange mobs, delayed slaughter, denying access to water and implementing short weaning times. Although an association is quoted with the autumn months in northern New South Wales (G. Chappell, pers. comm.), in the current study, no clear pattern emerged when dark cutting percentage was plotted against month of turnoff. The worst months were in fact February, May and December. Recent studies (Warner and Pethick 2000) emphasise glycogen depletion in animals as a major predisposer to dark cutting. The current study did not measure glycogen and therefore our results cannot add further to that hypothesis. Our results, taken from a producer observation perspective, do however imply that behavioural aspects, learned or otherwise, can play a part at any stage in the hierarchy of influences right through to the abattoir knocking box. Longer transport and delivery times and significant periods off water which may cause dehydration have been referenced previously by other authors (Warner and Pethick, 2000; B. Knee, pers. comm..) to be important considerations.

Warner *et al*. (1998) made the point that muscle glycogen concentration can be markedly reduced by pre-slaughter stressors such as transport, poor nutrition, cold or changing weather patterns, prolonged exercise, inappropriate pre-slaughter handling or extended time off feed. Multiple stressors obviously impose a greater effect as cattle encounter new stimuli in strange environments and their social hierarchy is disturbed

For beef producers to present cattle slaughter-ready, we suggest that emphasis be given to best management handling practices at all points and as far back as weaning time. Early memories of good handling can stay with animals through to later life (Lloyd Fell 1998) reduce yarding stress, and so have an effect on slaughter performance. In order to minimise the incidence of dark cutting in a practical sense, keeping pasture fed animals in a positive energy balance pre-slaughter, and preventing negative behavioural reactions by animals to their 'growing' and 'marketing' environment is recommended.

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