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How's it hanging? Head down behavior in beef cattle increases in response to pre-slaughter hide washing and is associated with increased dark cutting incidence (#215)

Farrah L. Preston[1], Michael J. Wilkes[1], Peter McGilchrist[2], Wayne S. Pitchford[1]

[1] The University of Adelaide, School of Animal and Veterinary Sciences, Roseworthy, Australia; [2] University of New England, School of Environmental and Rural Sciences, Armidale, Australia

Introduction

Dark cutting has a negative impact on beef eating quality and results from insufficient levels of muscle glycogen at slaughter, occuring due to poor nutrition and/or stress. The causes of pre-slaughter stress are multifactorial and abattoir-based factors including pre-slaughter hide washing are associated (Preston *et al*. 2018). Whilst pre-slaughter hide washing is a standard procedure in Australian beef processing, its effect on animal behaviour and welfare has not been considered. Animal behaviour is a useful, non-invasive measure for identifying stress and can be considered an outcome of environment (Stockman *et al.* 2012), thus providing a unique opportunity to assess welfare and identify potential for dark cutting issues. This work forms part of a larger trial investigating lairage factors affecting dark cutting beef. The aim of this study was to determine if cattle behaviour, specifically head down, changed in response to pre-slaughter hide washing, and if this behaviour was associated with the incidence of dark cutting.

Methods

Data for this observational cohort study were collected from a Southern Australian abattoir processing up to 800 head of cattle per day. Mobs were selected only if they would be presented for Meat Standards Australia (MSA) grading. A total of 2,390 head of cattle from 75 mobs including steers, heifers, and mixed-sex groups were observed in this study. On arrival, mobs were split into 129 wash groups averaging 20 head and these formed the unit of replication. Cattle were washed in these groups on the morning of slaughter using an in-floor sprinkler system. All animals were observed and their behavior recorded prior to- (pre-wash), during- (water on), and following- (water off) pre-slaughter hide washing treatments. Prior to washing, cattle behavior was recorded using scan sampling over one 15-minute period. Behavior was recorded during- and following- washing using scan sampling over periods of 11 minutes on a subset of nine wash groups (177 animals). The number of times a group was washed varied, and this was determined by plant management. The first three water on and water off events for each wash group were observed and recorded. At each scan, the number of cattle with head down (scored when the animal's head and neck extend 45° or more below the point of its wither) were recorded, and the percent of the wash group displaying this behavior was determined. Carcass grading data from MSA was used to identify dark cutting carcasses (pH >5.70; meat colour >3), and the percent of dark cutters within a wash group was calculated. This project was approved by The University of Adelaide Animal Ethics Committee (S-2016-096).

The data were analysed using GenStat, 18thEdition. Linear mixed models were developed to test: (1) the effect of washing on behavior and (2) the relationship between behaviour and dark cutting incidence. In the first model, the effect of washing (pre-wash, water on, water off) was tested on the percent of cattle with head down with wash group fit as a random term. For the second model, the effect of head down was tested on the percent of dark cutters with both day killed and wash group fit as random terms. Results are presented as mean±standard error.

Results

Overall dark cutting incidence was 26.8% within this study. Pre-slaughter washing (pre-wash, water on, water off) had a significant effect on head down behaviour ($P<0.001$). Head down was observed in 8.6±4.9% of cattle during pre-wash. During water on, this behaviour increased to 31.6±3.2% and remained elevated during water off with 14.2±3.2% of cattle observed displaying head down. Each 1% increase in head down within a wash group was associated with a 0.33±0.16% increase in dark cutting incidence ($P=0.038$).

Conclusion

Head down behavior in cattle increases in response to pre-slaughter hide washing, and is positively associated with dark cutting incidence. Pre-slaughter washing has a large effect on behaviour, with water on increasing head down by 23% compared to during the pre-wash period. Similar results have also been reported in dairy cattle where animals spent more time with their head down when exposed to sprinklers (Chen *et al.* 2016a, Chen *et al.* 2016b, Kendall *et al*. 2007). Additionally, a positive relationship between head down and dark cutting was observed. Head down appears to be associated with stress, occurring here in response to the use of water sprinklers. This behaviour is likely a form of avoidance of an aversive stimuli and may reduce head exposure to water. This also supports previous work which found an increase in dark cutting incidence with each additional wash cattle received (Preston *et al*. 2018). The results of this study further suggest pre-slaughter hide washing is a stressful period for cattle, and additional work is necessary to determine a suitable method for this practice which controls meat hygiene, without negatively affecting beef quality or animal behaviour and welfare.

Notes