

**P-01-35****Impact of the presence of blood during the slaughter of cattle (#541)****Aimee Smith**, [Karim Farag](#)

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**Introduction**

The relationship between pre-slaughter stress and meat quality in cattle is well known. Chronically stressed cattle have depleted glycogen levels in the muscle, which retains high muscle pH >6 for 12-48 hours post slaughter (Adzitey and Nurul, 2011). High pH results in reduced consumer desirable attributes including a darker colour (Hughes *et al.*, 2017), commonly known as Dark, Firm and Dry traits (DFD). Acute stress ante-mortem causes a dramatic reduction in muscle pH <6 within 45 minutes post slaughter causing Pale, Soft and Exuberant traits (PSE), although this is more commonly seen in poultry and pork (Barbut *et al.*, 2008).

Pre-slaughter stress can be a result of fearful emotions caused by novel experiences such as transport and handling (Boissy and Bouissou, 1995). A variety of papers have presented the physiological and behavioural responses to biological significant odours from stressed conspecifics which include faeces, urine and blood (Mackay-Sim and Laing, 1980; Vieuille-Thomas and Signoret, 1992; Terlouw *et al.*, 1998). The physiological and behavioural changes in response to the presence of blood has not yet been researched in the context of a pre slaughter stressor. Therefore, the aim of this study was to evaluate the effect of the presence of blood in the stun box on processing time, cortisol levels and carcass pH.

**Methods**

Observations of 80 Aberdeen Angus sired heifers were made over an 8 day period between January and April of 2019 at a UK abattoir. A factorial trial was implemented to determine the effect of the presence of blood in the stun box on processing time, cortisol levels and carcass pH. The treatments, lairage duration and blood presence were allocated to the cattle by random chance. CCTV footage and cattle information provided by the abattoirs computer generated reports allowed for the calculation of processing times and additional animal information including producer, haulage duration and load type. Blood samples were collected within 60 seconds post exsanguinations, using 90ml plastic sample pots and then transferred into SARSTED S-Monovett 4ml Z-Gel test tubes containing a clotting activator to stabilise the blood sample for analysis. Blood cortisol levels were analysed by a third party Clinical Laboratory using an Elecsys Cortisol II assay. Carcass pH was recorded at 1 and 24 hours in the *Longissimus dorsi* between the 10<sup>th</sup> and 11<sup>th</sup> rib and at a depth of 4cm using a Teso 205 handheld pH meter. GENSTAT's (18<sup>th</sup> Edition) factorial ANOVA, Pearson's Correlation Coefficient and Linear Regressions were used to statistically analyse the data.

**Results**

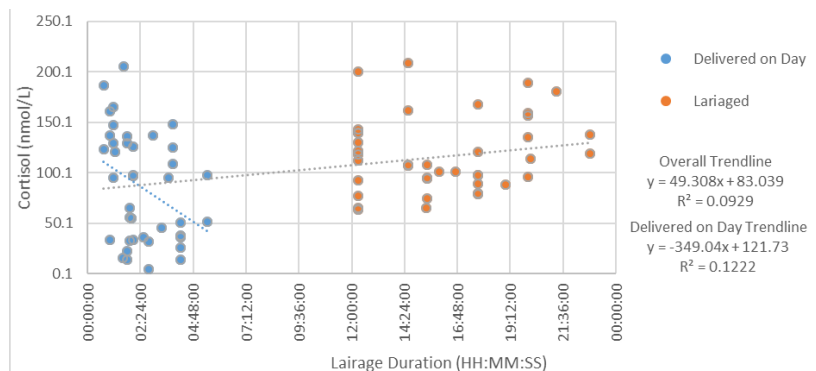
There was no significant effect ( $P = >0.05$ ) of the presence of blood on processing time, animal welfare or meat quality (See table 1) therefore, a requirement to wash the stun box between each animal to remove the blood has no additional benefit. All faeces and urine was removed from the stun box for both treatments therefore, the benefit of washing the stun box after each animal compared to allowing a build-up of blood, faeces and urine was not reviewed. Further research is needed to determine the benefit of frequent stun box cleaning between cattle.

Cattle lairaged overnight due their significantly higher ( $P = 0.003$ ) cortisol levels (118.5 noml/L) compared to cattle delivered on the day of processing (85.9 noml/L), however the mean cortisol values for both treatments were typical for cattle within the abattoir environment (Lu *et al.*, 2018). The relationship between lairage duration and cattle cortisol levels is complex. A positive weak linear relationship (Pearson's Correlation Coefficient +0.30) exists between increased lairage duration of all cattle and cortisol levels (See figure 1). With a Coefficient of determination of 0.09<sup>2</sup> (9%) and  $P = 0.005$ , indicating that increased duration length resulted in elevated cortisol levels. However, a negative weak linear relationship (Pearson's Correlation Coefficient +0.35) exists between increased lairage duration in cattle delivered on day and cortisol levels. With a Coefficient of determination of 0.12<sup>2</sup> (12%) and  $P = 0.02$ , resting cattle post transport can aid in the reduction of cortisol levels, see figure 1.

**Conclusion**

The presence of blood in the stun box during slaughter has no significant implications on processing, animal welfare or carcass quality. Although further research surrounding the cleanliness of the stun box between cattle is needed to determine the overall importance and frequency of regular cleaning the stun box during production. The research identified an elevated stress response in cattle lairaged overnight. Conflicting with this a negative weak linear relationship was also identified in the cattle delivered on the day of production, indicating the benefit of resting the cattle in the lairage for a short duration post transport.

**Notes**



**Figure 1:** Effect of lairage duration on cortisol levels.

Variable	No Visual Blood	Visual Blood	s.e.m.	Sig.	P-Value	Lairaged	Delivered on day	Sig.	P-Value
Loading Time (Seconds)	9.38 (1.811)	8.15 (1.760)	0.1300	NS	0.967	8.97 (1.854)	8.55 (1.760)	NS	0.608
Ready to Stun Time (Seconds)	16.85 (2.43)	13.70 (2.31)	0.142	NS	0.574	16.85 (2.48)	13.42 (2.26)	NS	0.276
Total Stunning Time (Seconds)	34.88 (3.517)	38.97 (3.622)	0.0414	NS	0.076	39.52 (3.629)	34.33 (3.510)	*	0.045
Cortisol (nmol/L)	100.8	103.5	7.45	NS	0.802	118.5	85.9	**	0.003
1hr Carcass pH	6.642	6.665	0.0250	NS	0.160	6.669	6.665	NS	0.916
24hr Carcass pH	5.493	5.544	0.0199	NS	0.076	5.49	5.54	NS	0.076

\*Transformation values stated in brackets, due to skewed histograms

NS – No Significance  
 \* P < 0.05 Significance Level  
 \*\* P < 0.01 Significance Level  
 \*\*\* P < 0.001 Significance Level

**Table 1:** Effects of blood presence and lairage duration on welfare measurements and carcass quality.

## Notes