

Effects of Moderate Frequency Immobilisation, Low Voltage Electronic Bleed and Post-Dressing Medium Voltage Electrical Stimulation (MVS) Individually and in Combination on Sheep Meat

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Many studies have shown how individual electrical stimulation units (high, medium and low voltage) can improve meat quality Toohey *et al* (2008). The aim of this experiment was to examine the impact of moderate frequency immobilisation, low voltage electronic bleed and post dressing medium voltage electrical stimulation units individually and in combination with each other on meat quality with a particular focus on meat colour.

In total 140 lambs from 4 different lots were examined for 7 different treatments (20 animals from 4 different lots per treatment). The animals were slaughtered over two days (70 per day). The lambs were of varying backgrounds and breeds typical of the lambs commercially processed. All animals were exposed to the high frequency immobilisation unit, applied for 25-35 secs (2000 Hz, 400 volts, and a maximum current of 9 amps over 7 animals, pulse width of 150 microseconds). The other electrical inputs were: **A** = Moderate frequency immobilisation (800 Hz, 300 peak volts, a constant current of 1.7 amps, pulse width 150 microseconds) applied for 5-7secs. **B** = Low voltage electronic bleed (15 Hz, 550 peak volts, constant current of 0.8 amps, pulse width 500 microseconds) applied for 20secs. **C** = Post dressing medium voltage electrical stimulation (MVS) with a constant current 1.0 amp and pulse width of 2500 microseconds, but variable frequency across the 6 electrodes (the frequency for electrodes 1 & 2 was set at 25 Hz, 3 & 4 at 15 Hz and 5 & 6 at 10 Hz, with 300 peak volts) applied for 30-35secs. The 7 electrical stimulation treatments were; A, AB, ABC, AC, B, BC, C. An initial sample was taken 60 mins post-slaughter from the *longissimus thoracis et lumborum* (LL), frozen in liquid nitrogen and pH measured using an iodoacetate method (Toohey *et al* 2008). The ultimate pH measurement was recorded in the LL and the *semitendinosus* (ST) approximately 24 hours after death using a pH temperature probe (Toohey *et al* 2008). The meat colour reflectance of the LL was measured on 1 day aged samples. A fresh surface was prepared by cutting in a transverse direction across the fibres of the LL to allow the meat to bloom for 30-40 minutes. Colour measurements were then taken using a Minolta Chroma meter (Model CR-400) set on the L*, a*, b* system. Carcase and meat quality traits were analysed using a REML procedure fitting treatment as a fixed effect and kill day and consignment as random terms.

Predicted means and standard error of difference between stimulation treatments for final L, a, b values, pH LL initial, pH LL ultimate, pH ST ultimate.

Trait	Stimulation	A	AB	ABC	AC	B	BC	C	Av SED
L*		35.4a	35.8a	36.1a	36.1a	35.7a	35.3a	36.6a	0.68
a*		18a	18.3ab	18.5ab	18.6abc	19.4c	17.9a	18.9bc	0.47
b*		7.3a	7.6ab	7.8ab	7.8ab	8.1b	7.3a	8.0b	0.33
pH LL Initial		6.51b	6.49b	6.35a	6.38ab	6.46b	6.38ab	6.44ab	0.05
pH LL Ultimate #		5.69ab	5.68ab	5.62a	5.66a	5.79b	5.65a	5.67ab	0.06
pH ST Ultimate ^		6.00bc	6.05bc	5.95ab	5.94ab	6.15c	6.05bc	5.85a	0.08

Means followed by a different letter in a row (a, b) are significantly different ($P < 0.05$). # adjusted to an ultimate LL temperature of 6.1 °C, ^adjusted to an ultimate ST temperature of 5.4 °C.

The electrical stimulation treatments had no effect on the L* (lightness) of the meat, however there was an effect on a* (redness) and b* (yellowness) meat colour values. Although there is a difference it would have minimal impact on consumer preference. Initial pH showed that treatment ABC (immobiliser + bleed + MVS) had the lowest pH and was significantly different to A (immobiliser), AB (immobiliser + bleed) and B (bleed). This shows that MVS is having greatest impact on the initial drop in pH. Ultimate pH of the LL showed that ABC (immobiliser + bleed + MVS), AC (immobiliser + MVS), and BC (bleed + MVS) were all significantly different to B (bleed). Ultimate pH of the ST showed that C (MVS) had a significantly lower pH than A, B (bleed), AB (immobiliser + bleed) and BC (bleed + MVS). There were inconsistent effects of stimulation on pH, although the data does indicate that MVS individually and in combination has the greatest impact lowering initial pH, which is of particular importance when hot boning meat.

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