REVERSIBLE ELECTRICAL HEAD-TO-BODY PRE-SLAUGHTER STUNNING OF LIVESTOCK FOR HALAL MEAT PRODUCTION

Mustafa M. Farouk[1*], Jim Webster[1], Craig Johnson[2], Ngaio Beausoleil[2] Awis Q. Sazili[3]

[1]AgResearch Ltd, Hamilton, New Zealand; [2]Massey University, Palmerston North, New Zealand; [3]Universiti Putra Malaysia
[*]Corresponding author (phone: +64-7-838-5260; fax: +64-7-838-5625; e-mail: Mustafa.farouk@agresearch.co.nz

Abstract- A low frequency (50Hz) reversible head-only electrical pre-slaughter stunning (LF-HOS) system is widely accepted in the production of halal meat. We determined the compliance of a new reversible head-to-body electrical pre-slaughter system (RHTB) to halal requirements using post-stun recovery, behavioural and EEG studies. Forty sheep, goats and bobby calves each (n = 120) were stunned using LF-HOS and RHTB systems and brain EEG and ethograms of the behaviour of the animals following stunning were determined (Figs 1 & 2). RHTB stunned sheep and goats took longer to recover compared to LF-HOS. All the animals recovered following the stun with no noticeable adverse effect on their behaviour or welfare. Hence, both stunning systems met the current animal welfare and halal meat production requirements.

Key words: Halal meat, animal behaviour, animal welfare, ethograms, EEG, recovery

I. INTRODUCTION

The aim of the present study was to: (1) Confirm that (RHTB) stunning produces a period of insensibility sufficient for humane Halal slaughter to be carried out in lambs, goats and bobby calves; (2) Confirm that RHTB produces a reversible stun such that animals will recover normal behaviour and/or normal Central Nervous System (CNS) function post-stun; and (3) Compare the stunning effect of RHTB with the halal compliant existing low-frequency head only stun (LF-HOS) method.

II. MATERIALS AND METHODS

Ethograms were constructed for significant behaviours relating to the effects of electrical stunning including the duration of tonic and clonic seizures, head lifts, attempts to right, righting, attempts to stand and standing. Sheep, goats and bobby calves (n=10 per stunning method, 20 per species) were randomly selected weighed and either LF-HOS; (50Hz; 1A, 2 seconds) or RHTB (50Hz; 1A 2 seconds to the head followed by 2000Hz / 2Amps 4 seconds to the body) using a Jarvis VF 2000 Stunner (JETCO, Jarvis Engineering Technologies, New Zealand) and immediately placed in a recovery pen specifically designed for this study (Fig. 1). Video recordings of the recovery were carried out for 30 minutes post stun or until the animal was standing in a stable posture. Cameras were positioned above the recovery pen and also hand held. Following recovery animals were returned to the mob prior to disposal.

Figure 1. Representative digital images of one of the sheep, goat and booby calves used for behaviour studies. From left to right for each specie – in the recovery pen immediately following stunning; and fully recovered.

The same number and species of animals as with the behaviour study were randomly selected, weighed, minimally anaesthetised, stunned as their counterparts used for the behavioural study and their brain EEG measured (Fig. 2) (Johnson *et al*., 2009). The EEG and ECG were amplified using isolated differential signal amplifiers and ECG data digitised at a rate of 1 kHz then analysed off-line after completion of the experiment. EEG recordings were collected successfully for 30 minutes post-stun on each species.

The design was a complete randomised. Data were analysed using one-way ANOVA. Massey University Ethics Committee approved the study.

Figure 2. Representative digital images of EEG data being collected from minimally anaesthetized and stunned sheep, goat and bobby calve. The third and fourth images from left show views of the whole set up showing, the stunning box, anaesthetic agent monitor, monitoring the end-tidal halothane and carbon dioxide tensions, and heart and respiratory rates, and another monitoring ECG and EEG.

III. RESULTS AND DISCUSSION

All the 120 animals (40 each: sheep, goats and booby calves) recovered following the LF-HOS or RHTB and were returned to pasture or euthanised. For sheep and goats the recovery time of the two methods diverged, becoming significantly longer (P=0.009) for time to first standing with RHTB. The time progression of the various response and recovery behaviours to the two stunning methods for goats and sheep respectively are shown in Fig. 3.

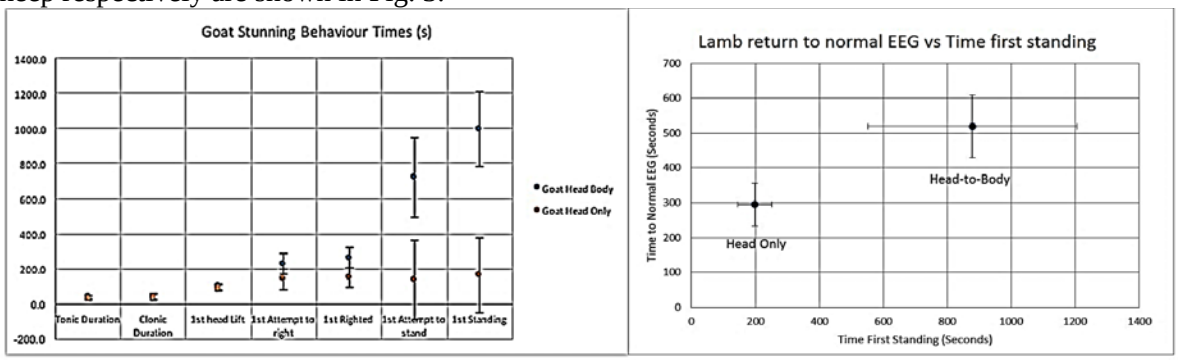

Figure 3. Left = Goats behaviour following stunning; right = Lamb return to normal EEG vs Time first standing

For the goats, the duration of tonic seizures, time to first attempt to stand and time to first standing were all significantly longer following RHTB than LF-HOS ($P<0.05$). The calves regained consciousness quickly, with no significant difference ($P > 0.05$) between the stunning methods. The EEG of the minimally anaesthesised and stunned animals (data not shown) indicated the duration of insensibility caused by both stunning methods were sufficient for animals to be bled while unconscious without compromising their welfare.

IV. CONCLUSION

The following are the conclusions within the scope of the present study: (1) both the Low Frequency Head-only (LF-HOS) and the High Frequency Head-to-body (RHTB) forms of stunning are recoverable in all the three species – sheep, goats and bobby calves; (2) both stunning methods caused an immediate loss of awareness in all animals; (3) the duration of insensibility caused by both stunning methods was sufficient for animals to be bled out without return to consciousness and compromising their welfare providing this is completed within the present industry guidelines; (4) both techniques are capable of stunning animals for slaughter that satisfies current animal welfare and halal requirements; and (5) behavioral responses to RHTB were more variable and lasted longer than LF-HOS.

ACKNOWLEDGEMENT

The Meat Industry Associations of New Zealand (MIA, Contract # A20960) funded this project. Susanne Dowling and Frankie Huddart of AgResearch Ltd and Neil Ward of Massey University provided technical support.

REFERENCES

Johnson, C. B., Sylvester, S. P., Stafford, K. J., Mitchinson, S. L., Ward, R. N., & Mellor, D. J. (2009). Effects of age on the electroencephalographic response to castration in lambs anaesthetized