The evaluation of two commercial electric sheep stunning systems: current applied and the effect on heart function

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Abstract

The maintenance of head-only minimum stunning currents for sheep to ≥ 1.0 Amp as per current legislation was examined in two trials in a commercial abattoir. In the first trial, a Jetco MS100 stunner failed to maintain the current to > 1.0 Amp in 118 of the 228 sheep. In a second trial, a Jetco MS105 delivered sufficient current in all sheep (n = 275) to meet the legislative requirement, apart from a single animal. Recorded electrocardiograms showed a regular heartbeat, with no evidence of ventricular fibrillation, in all animals in both trials following stunning and neck-cut. Only one of the two stun units may therefore be considered to meet the statutory requirements but both may meet the requirements for halal slaughter where pre-stun is considered acceptable.

Keywords: animal welfare, electrical stunning, electrocardiogram, halal, sheep, voltage current

Introduction

There are two types of slaughter of animals for food production from an animal welfare perspective, slaughter with stunning and slaughter without stunning. The derogation from stunning within current legislation (EC 1099/2009) permits religious groups to perform slaughter without stunning where their beliefs dictate. However, the requirements for halal slaughter can be interpreted to permit the use of a stunning method that provides the animals are slaughtered whilst healthy and alive and that the stunning method is recoverable (Fuseini et al 2016). Head-only electrical stunning is therefore accepted by many Muslim groups but any change in the applied electrical parameters, for example the requirements of EC Regulation (1099/2009), must be tested to show that there is no change in the animal’s ability to recover after the stun.

Effective stunning can be produced when sufficient current is passed through the brain. The total impedance of the pathways between the electrodes will depend on the shape, size, material and cleanliness of the electrodes, tissue resistance, the pressure applied during stunning and the voltage used. The time taken to break down the inherent high resistance of living tissue is shorter when higher voltages are applied (Wotton & O’Callaghan 2002). EFSA (2004) reported that when constant voltage stunners are used, the current starts to flow from zero to the maximum, which would be time-dependent on the magnitude of the voltage. However, constant current stunners are designed and constructed in such a way that they anticipate high resistance in the pathway and hence start with the maximum available voltage. Owing to this, the target current is reached within the first few current cycles (within milliseconds of the start of current application) and the applied voltage may also be modulated according to the changes in the resistance. Therefore, constant current stunners are preferred to constant voltage stunners (EFSA 2004).

Stunning an animal prior to slaughter is defined in EC Regulation (1099/2009) as: “any intentionally induced process which causes loss of consciousness and sensibility without pain, including any process resulting in instantaneous death”. The duration of this unconscious state must be long enough to prevent the animal from regaining consciousness before death occurs by exsanguination.

EFSA (2004) reported that cardiac ventricular fibrillation threshold testing in experimental models suggests that cardiac tissue is most sensitive to stimulation between 30 and 60 Hz of sine wave alternating current and increased stimulus duration increases the effectiveness of the application (Weirich et al 1983). However, the induction of cardiac ventricular fibrillation would depend upon the delivery of sufficient electrical current to the myocardium. EC Regulation 1099/2009 came into operation in January 2013 and specifies the minimum head-only electrical stunning current as 1.0 Amp for sheep. Previous Codes of Practice (HSA Guidance Notes 2000) had suggested 1.0 Amps for sheep and 0.6 Amps for lambs. Therefore, concern was raised within the Muslim population as to the effect an additional 0.4 Amp at 50 Hz AC could have on the potential for...