The effect of stun duration and level of applied current on stun and meat quality of electrically stunned lambs under commercial conditions

C Berg*,†, C Nordensten‡, J Hultgren† and B Algers†

* Contact for correspondence and requests for reprints: Lotta.Berg@slu.se

Abstract

Electrical head-only stunning is a widely used method in sheep (Ovis aries) slaughter. To investigate the influence of current level on stun and meat quality in practice, two studies were carried out at a commercial slaughterhouse. In trial one, 200 lambs were randomly assigned to four groups with a current level of 0.6, 0.8, 1.0 and 1.25 A, respectively, using 50-Hz sine wave supply voltage and a stun duration of 10.5 s. In trial two, 135 lambs were randomly assigned to two groups, with electrical current of 1.25 A applied for 14 and 3 s. For each lamb, the position of the tongs was observed and classified as correct or incorrect. The stun quality was evaluated based on observations of the corneal reflex, eye movements, rhythmic breathing, head-righting reflex and kicking during the tonic phase. Blood splash (haemorrhages in Longissimus dorsi muscle) was evaluated four days after slaughter. Incorrect tongs’ positioning was seen commonly, and positively correlated with poor stun quality. The lowest current level tested produced an unsatisfactory stun in the majority of animals observed. Short stun duration increased the risk of a poor stun quality. There was no significant effect of current level, stun duration or tongs’ position on the risk of blood splash. These data underline the importance of a correct technique, including choice of tongs’ positioning, sufficient current levels and sufficient stun duration, for electrical stunning of lambs to achieve unconsciousness before sticking and thereby avoiding unnecessary suffering at commercial slaughter.

Keywords: animal welfare, blood splash, electrical stunning, sheep, slaughter, stun quality

Introduction

Electrical head-only stunning of sheep (Ovis aries) is a widespread stunning method, which has been in use for more than 50 years (Croft & Hume 1956; Lambooy 1982). According to the recently adopted EU regulation on the protection of animals at the time of killing (European Union 2009), which includes minimum requirements to be met at slaughterhouses, a number of key parameters should be established to ensure sufficient stun quality when head-only stunning is applied on sheep and lambs. These include minimum current, minimum voltage, maximum frequency, minimum time of exposure (throughout this document the duration of the period of exposure to the stunning current is referred to as ‘stun duration’), maximum stun-stick interval and position of the electrodes. Furthermore, the regulation sets a specific minimum value for the current to be applied, ie 1.0 A, regardless of the size and type of sheep, or type of equipment with reference to waveform, frequency, stun duration etc. This regulation will apply from 1 January 2013.

In existing national legislation and international guidelines, various values for minimum current for the stunning of lambs are given, and the scientific background of these is often not clear. Warriss (2010) cites recommendations of 0.6 A for lambs and 1.0 A for sheep, whereas other values can be found in other sources. The Council of Europe (1991) recommends a minimum current level of 1.0 A for the stunning of sheep, regardless of their age, while the Swedish national legislation (Jordbruksverket 2007) stipulates a minimum of 1.25 A. Furthermore, the UK-based Humane Slaughter Association (2005) recommends 1.0 A for sheep, but only 0.6 A for lambs, and low current levels for lambs are also often applied in other countries. The stun quality will be influenced not only by the current applied but also by other factors, such as the electrical resistance or impedance of the animal (influenced, eg by the amount of wool where the electrodes are placed) and the cleanliness of the equipment. Together, these factors are vital for the stun quality and hence for the welfare of the animal which is to be slaughtered, although some of them are difficult to regulate and control in a systematic manner.

In the industry and also amongst veterinarians, it is a common belief that the longer the stun duration, the longer the application of the electrical current, the better the stun quality. Previous research has clearly demonstrated that this is not necessarily the case (Cook et al 1995; Gregory 1998). There are numerous publications available on the effect of current level and stun duration on the effectiveness of electrical stunning and meat quality parameters in sheep and