Assessment of unconsciousness during slaughter without stunning in lambs

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Abstract

The aim of this study was to assess brain activity in lambs during slaughter without stunning and its correlation with heart rate (HR) and the absence of physiological reflexes. The index of consciousness (IoC-view®) assesses consciousness by an algorithm that analyses the EEG and gives an index from 0 (unconscious) to 100 (conscious). Eight lambs (Merino breed) of 20 to 25 kg live weight were individually restrained in a stretcher and three skin electrodes were placed at the level of the frontal bone. The electrodes were connected to the IoC-view®. Two additional electrodes were placed on the chest and the HR was transferred to a watch monitor. Recording time started 2 min prior to sticking to attain the basal IoC and HR value of each animal. During bleeding, presence of corneal reflex and rhythmic breathing were recorded every 10 s until brain death. Rhythmic breathing disappeared at an average time of 44 (± 4.2) s after sticking, ranging between 30 and 60 s. The corneal reflex disappeared at 116 (± 11.01) s, ranging between 80 and 160 s after sticking. Changes in the brain activity occurred between 22 to 82 s after sticking (52 [± 20.2] beats min–1) compared to basal values (139 [± 8.4] beats min–1) at 115 (± 97.5) s after sticking. Both brain activity and physiological reflexes revealed that when bleeding is performed, through a transverse incision across the neck without stunning, the onset of unconsciousness could last 1 min which impaired animal welfare. This prolonged consciousness compared to other authors’ findings may be attributable to inefficient bleeding when lambs are slaughtered without head restraint.

Keywords: animal welfare, consciousness, EEG, lambs, neck sticking, religious slaughter

Introduction

Stunning prior to slaughter is a legal requirement in the EU to induce unconsciousness and insensibility either immediately or sequentially, so that sticking can be performed without avoidable fear, anxiety, pain, suffering and distress (Council Regulation EC No 1099/2009). For this purpose, the stunning procedure should induce unconsciousness in the animal without pain and has to be prolonged until brain death by exsanguination. However, the OIE recommendations (OIE 2009), and the USA (USDA 2010) and the EU legislations (Regulation EC No 1099/2009) exempt religious slaughter from stunning. During halal and shechita slaughter the animals are restrained and bled through a transverse incision across the neck, severing the skin, muscles, trachea, oesophagus, carotid arteries, jugular veins and major nerves. The bleeding requires some time to provoke brain death. In sheep, after neck cutting, the time to loss of consciousness ranges from 14 to 298 s (Gregory & Wotton 1984). In addition, the cuts involve substantial tissue damage in areas well supplied with nociceptors (Kavaliers 1989). One EEG study developed in calves revealed that ventral-neck incision is associated with noxious stimulation that is expected to be painful prior to loss of consciousness (Mellor et al 2009). In sheep, there have been no direct EEG studies, however, based on the physiological similarities between sheep and cattle, it is reasonable to suppose that the neck cut in non-stunned sheep causes pain (Hemsworth et al 2009). Furthermore, during bleeding, animals may feel also anxiety, pain, distress and other suffering (EFSA 2004). Thus, there is concern about the extent of time that lambs are conscious or able to perceive pain, anxiety and distress after neck cutting (von Holleben et al 2010). One of the most reliable methods of assessing the state of consciousness is monitoring the brain activity by recording the EEG (Raj et al 1997; Rodriguez et al 2008). The index of consciousness® (IoC, IoC-view®, Morpheus Medical, Spain) is a monitor based on wireless technology that assesses brain activity in non-restrained animals. The IoC analyses the raw EEG giving a unitless scale from 0 (null brain activity) to 99 (awake) (Revuelta et al 2008). The IoC-view® monitor is currently used in human patients (Revuelta et al 2008), rabbits (Silva et al 2011) and pigs (Llonch et al 2011). The recommended IoC for surgical anaesthesia is under 60 whereas an IoC under 40 would suggest deep unconsciousness (Revuelta et al 2008). In commercial conditions, the state of consciousness tends to be assessed by means of the presence of some physiological reflexes (von Holleben et al 2010), such as the corneal reflex and rhythmic