Long-term hyperalgesia and traumatic neuroma formation in tail-docked lambs

C Larrondo*,†, H Bustamante‡, E Paredes§ and C Gallo*

1 Escuela de Graduados, Facultad de Ciencias Veterinarias, Universidad Austral de Chile, Independencia 631, Valdivia, Chile
2 Instituto de Ciencias Clinicas Veterinarias, Universidad Austral de Chile, Independencia 631, Valdivia, Chile
3 Instituto de Patología Animal, Universidad Austral de Chile, Independencia 631, Valdivia, Chile
4 Instituto de Ciencia Animal, OIE Collaborating Centre for Animal Welfare and Livestock Production Systems-Chile, Universidad Austral de Chile, Independencia 631 Valdivia, Chile
* Contact for correspondence: cristian.larrondoc@gmail.com

Abstract

This study aimed to determine if tail-docking induces long-term hyperalgesia, chronic pain and histopathological changes in tail stumps of tail-docked lambs. Fifty male lambs of 45 days of age were randomly allocated in two groups. One group of 25 lambs was tail-docked using a hot cautery iron and a second group of 25 lambs was subjected only to handling as a control group (undocked lambs). Prior to tail-docking and at intervals of 15, 30, 60 and 90 days after the procedure, infra-red thermography (IT) and mechanical nociceptive thresholds (MNTs) tests were carried out in both lambs’ tails/stumps, and animals were weighed. In addition, the visual degree of inflammation of tail stumps was evaluated. Finally, animals were slaughtered in a commercial slaughterhouse and tail sections of ten lambs from each group were examined histopathologically. Tail-docking was associated with an inflammatory process according to IT and visual observation in tail stumps at 15 and 30 days post-docking. Tail-docked lambs had lower MNTs than undocked lambs at all evaluated times after tail-docking, indicating the presence of long-term hyperalgesia. Also, traumatic neuroma formation was found in tail stumps of 2/10 tail-docked lambs, and 6/10 presented neuromata tissue development. It is concluded that tail-docking induces acute and chronic pain in lambs, initially through inflammation, and then via long-term hyperalgesia and traumatic neuroma formation. These long-term findings would have negative implications for the animal welfare of tail-docked lambs.

Keywords: animal welfare, chronic pain, hyperalgesia, lamb, neuroma, tail-docking

Introduction

Tail-docking is a routine practice in most sheep-producing countries (Grant 2004; Zanolini 2006; Fisher et al 2007). The main productive and sanitary justification is the improvement of the sanitary conditions of the herds as a result of removing a portion of the tail of lambs, because there would be less accumulation of faeces and urine in the tail and breech area, thus decreasing the incidence of flystrike (Scobie & O’Connell 2002; Grant 2004; Zanolini 2006; Clark et al 2011). Under this premise, tail-docking would be a practice that would improve animal welfare and health in ovine flocks (Fisher et al 2007). However, currently, there is no consensus in the scientific field regarding the implications from the point of view of the welfare and health of the animals subjected to this handling (Fisher et al 2007; Fisher & Gregory 2007; Sutherland & Tucker 2011). It has been demonstrated that tail-docking in lambs, irrespective of the technique, ie whether surgically, with a knife, hot iron or rubber ring, produces acute pain in the animals, affecting their physiology, anatomy, and welfare (Grant 2004; Sutherland & Tucker 2011). However, there is considerable evidence supporting the hypothesis that tail-docking could generate chronic pain in animals, which at present has not been well characterised (Viñuela-Fernández et al 2007; Di Giminiani et al 2017). In humans, the presence of neuropathic pain is described in 60–80% of people who have undergone the amputation of a limb (Viñuela-Fernández et al 2007; Nikolajsen 2012). Neuropathic pain originates as a consequence of an injury or illness of the somatosensory system and may persist for some time after the acute phase of injury, transforming itself into chronic pain (Devor et al 2014).

Currently, there is an increasing interest, from a research and animal welfare standpoint, on the routine procedures of productive species that have the potential to cause chronic pain in animals (Viñuela-Fernández et al 2007). Pathologies and inflammatory processes are some of the main sources of pain in ruminants (Fitzpatrick et al 2006). A tool that has been validated in various species for the evaluation of animal welfare and inflammatory processes is infra-red thermography (IT) (Stewart et al 2009; Dowling et al 2013; Rekant et al 2016; Van der Saag et al 2018). In this sense, IT can be used to determine local inflammation generated as