Use of meloxicam, buprenorphine, and Maxilene® to assess a multimodal approach for piglet pain management, part I: surgical castration

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Abstract

Surgical castration of piglets is a routine procedure on commercial pig farms, to prevent boar taint and reduce aggression. This procedure is known to cause pain, yet piglets are often not provided appropriate analgesia for relief. The objective of this study was to assess a multimodal approach to managing post-castration pain in piglets, using 0.4 mg kg⁻¹ meloxicam (MEL), 0.04 mg kg⁻¹ buprenorphine (BUP), and Maxilene® (MAX). Efficacy was evaluated using behavioural indicators, vocalisation, and facial grimace analysis. Male piglets were randomly assigned to one of ten possible treatments (n = 15 piglets per treatment group): MEL + BUP + MAX (castrated or uncastrated); MEL + BUP (castrated or uncastrated); BUP + MAX (castrated or uncastrated); MEL + MAX (castrated or uncastrated); saline (castrated control); or sham (uncastrated control). Castrated piglets in the MEL + BUP + MAX, MEL + BUP, and BUP + MAX treatment groups displayed significantly fewer pain behaviours than piglets administered saline. MEL + MAX was insufficient in reducing surgical castration pain behaviours. At 24 h post-procedure, saline and MEL + MAX-castrated piglets displayed significantly more pain behaviours than all other treatment groups and time-points. Facial grimace analysis indicated that MEL + MAX-castrated piglets had significantly higher grimace scores than MEL + BUP (castrated and uncastrated) and BUP + MAX-uncastrated. There were no significant differences in emitted vocalisations between the analgesia-treated and saline-castrated piglets. All treatment groups with buprenorphine were effective in alleviating castration-associated pain behaviours, suggesting that opioid administration is beneficial for managing piglet castration pain.

Keywords: analgesia, animal welfare, castration, multimodal, pain assessment, piglet

Introduction

Surgical castration of boar piglets is performed on commercial pig farms in North America to prevent boar taint and reduce aggressive behaviour (Rault et al 2011). It is known to cause acute pain, based on specific behaviour and physiologic alterations, such as rump scratching, increased blood cortisol, and high frequency vocalisations, that can persist beyond 24 h post-procedure (Hay et al 2003; Moya et al 2008; Sutherland et al 2012). Both Canada and the EU have animal care guidelines that require analgesia administration to alleviate piglet castration pain (EU Commission 2010; National Farm Animal Care Council [NFACC] 2014). Non-steroidal anti-inflammatory drugs (NSAIDs) are recommended for use on-farm; however, recent research exploring meloxicam and ketoprofen use found them both to be ineffective at alleviating post-procedural pain in piglets (Kluivers-Poodt et al 2012; Viscardi & Turner 2018a). Combining an NSAID with a more potent analgesic, such as an opioid, is common practice in companion animal medicine for post-operative pain management (Shih et al 2008; Epstein et al 2015). The efficacy of such an approach to control pain in piglets following castration has not been assessed.

A previous study demonstrated that the opioid buprenorphine was highly effective at alleviating surgical castration pain in piglets without causing any adverse side-effects (Viscardi & Turner 2018b). Most drug combinations and inhalants used for general anaesthesia, which renders an animal insensible, would be inappropriate to administer to piglets on-farm, as recovery times can be prolonged (eg 3 h for ketamine-azaperone) (Schmidt et al 2012), and piglets would have to be separated from the sow until fully sensible to avoid crushing risks. Anaesthesia administration may also require specialised equipment, as is the case with inhalants (eg isoflurane), which are impractical to use in a farm setting. A topical anaesthetic, used to numb and temporarily reduce the sensation of pain, is more practical and could be used to alleviate the initial pain of castration (eg the scrotal incision) (Sutherland et al 2010). Combining this with an NSAID and opioid may provide piglets with longer-term pain control (up to 12 h), improving their post-operative well-being (Keita et al 2010; Thiede et al 2014).