Acute nociception in neonatal pigs undergoing tail docking: Influence of docking method and age, evaluation of pain mitigation strategies, and assessment of the potential for longer-term pain

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ABSTRACT

Tail docking of pigs is performed routinely in many parts of the world to reduce the incidence of unwanted tail biting behaviour. Whilst tail biting can have serious welfare consequences for affected pigs, tail docking may also negatively affect pig welfare as a result of acute pain induced by the procedure itself, as well as through long-term changes in afferent neural inputs from the remaining tail stump. The aims of this thesis were to examine the influences of docking method and piglet age on acute nociceptive responses to tail docking; to evaluate the efficacy of selected anti-nociceptive strategies in mitigating acute nociceptive responses to tail docking; to determine whether docking method affects subsequent neural morphology of the healed tail stump. The minimal anaesthesia model (MAM), which involves analysis of electroencephalographic (EEG) data, was used to evaluate acute nociceptive responses and to ascertain the efficacy of anti-nociceptive strategies. Histopathological examination of tissue harvested from tail tips was performed to evaluate alterations in neural morphology that might be associated with long-term changes in pain processing.

Comparison of the acute nociceptive responses of 2- and 20-day-old pigs to tail docking revealed little evidence of nociception in the younger age group compared with a typical response in the older pigs. In addition, total EEG power was lower in 2 day-old pigs. These results suggest that there are differences in either neural maturity, and/or in nociceptive processing between the two ages.

Tail docking using cautery iron appears to be less acutely painful to pigs than tail docking using clippers. However, the longer-term pain consequences associated with the two methods need to be assessed before one method is recommended over the other.

Prior application of a topical anaesthetic (EMLA) cream to the tail abolished EEG indicators of acute nociception in pigs tail docked using clippers, whereas prior administration of oral meloxicam had no effect on EEG responses. When no analgesia was used, tail docking using cautery iron ameliorated EEG indicators of nociception, relative to docking using clippers. Thus, prior administration of EMLA cream or the use of cautery iron in place of clippers have the potential to reduce the acute pain during routine tail docking.

Acute EEG responses of pigs to the noxious stimulus of tail docking varied significantly with postnatal age over the first 15 days of life. Docking at 1 day-of-age elicited no EEG evidence of nociception, whilst cortical responsiveness to tail docking increased with postnatal age across the range of 5–15 days. This enhanced responsiveness may be due to the gradual withdrawal of fetal neurosuppressive mechanisms after birth, or rapid postnatal maturation of the cerebral cortex, or a combination of both.

Tail docking using both side clippers and cautery iron resulted in the formation of neuromas, which have been associated with neuropathic pain, in the tail stump. Neither the proportion of tails with neuromas, nor the degree of abnormal nerve proliferation in the tail tip differed between the two docking methods. This suggests no longer-term welfare advantage of one method over the other, at least in terms of the potential for alterations in pain processing following stimulation of tail stump nociceptors.

In terms of best practice guidelines for the performance of tail docking in pigs, this research provides support for current recommendations that tail docking, along with other painful husbandry procedures, be performed within one week of birth. Furthermore, tail docking with cautery induced less acute pain than docking with clippers, whilst both methods cause long-term changes in neural morphology in the tail stump. Docking using cautery may therefore be preferable to docking with clippers. Whilst cautery reduces the acute pain associated with docking relative to clippers, prior application of a topical anaesthetic cream (EMLA) completely abolished acute nociceptive responses to. Prior administration of topical anaesthesia, or the use of a cautery iron in place of clippers, has the potential to improve the welfare of pigs undergoing routine tail docking.

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"Life is not easy for any of us. But what of that? We must have perseverance and above all confidence in ourselves. We must believe that we are gifted for something and that this thing must be attained"

– Marie Curie

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