

Can sheep alleviate pain through free choice of medicated feed?

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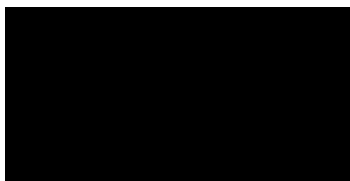
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Declaration

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree of qualification.

I certify that any help received in preparing this thesis, and all sources used, have been acknowledged in this thesis.



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Preface

This Thesis is being submitted as a Thesis by publication. Therefore, some of the chapters contained in this Thesis are written in journal article format. Each will contain an introduction, methods and materials, results and discussion. The format of each article will be presented according to the journal that they were submitted to or are intended to be submitted to.

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Summary

The focus of this thesis was to look at alternative pain-relief options for sheep with the possibility of an easy application method by providing analgesics in feed. Furthermore, if sheep can be taught to self-select and self-administer feed containing analgesics, it can provide insight into animal pain states. In order to understand why medicating livestock for pain is important, **Chapter 1** provides an introduction into pain in livestock and its impact on their welfare.

An overview of the four key experiments conducted as part of this thesis and their chapters:

Chapter 2: Bioavailability and efficacy of orally administered flunixin, carprofen and ketoprofen in a pain model in sheep. There are currently no registered non-steroidal anti-inflammatory drugs (NSAIDs) for use in sheep in Australia. This chapter describes the first experiment conducted for this thesis, which compared the effectiveness of three NSAIDs at relieving pain in sheep when administered orally. The experiment used a previously validated lameness model which applied oil of turpentine subcutaneously above one hoof of the animal. The hypothesis “sheep receiving NSAIDs were expected to exhibit fewer or less severe signs of pain and inflammation associated with the oil of turpentine injection when compared to placebo-treated sheep” could not be supported as evidence of anti-inflammatory or anti-pyretic activity was not observed for any NSAID administered, this is due to an anomalous response of placebo sheep to oil of turpentine injection. However,

flunixin preformed consistently better than the other NSAIDs and so was used in further experiments.

Chapter 3: Palatability of flunixin and pharmacokinetics when administered to sheep through feed. It was investigated whether flunixin may have a flavour or odour that sheep find aversive. Sheep were provided with a feed containing flunixin and a normal feed; the total intake of both feeds was measured. The pharmacokinetics of flunixin in sheep has only been studied when administered intravenously. This chapter also examined the pharmacokinetics of flunixin when given to sheep as an oral solution through feed.

Chapter 4: Can flunixin in feed alleviate the pain associated with castration and tail docking? As the aim of the thesis is to provide pain-relief to livestock that undergo painful procedures, this chapter looks at the efficacy of providing flunixin as pain-relief through administration in feed to relieve the pain associated with castration and tail-docking in lambs.

Chapter 6: Can lambs indicate their experience of pain through a preference for medicated feed? Lambs were given the opportunity to learn that feed laced with flunixin provided pain-relief following castration. After a training period of four days lambs were then provided with the medicated feed and normal feed following tail-docking and their feed intake was recorded.

Chapters 2, 3 and 4 build on the aspect of the possibility of providing sheep with analgesia that would be feasible for practical application on farm.

The success of providing pain-relief to lambs through feed opened up the opportunity to develop a test to see if lambs could learn to self-medicate with feed containing flunixin. **Chapter 5** is a review paper that discusses current evidence of self-medication in both wild and domesticated animals, as well as the methods used in experimental settings to teach animals to self-medicate for negative states, before leading into a self-medication experiment (**Chapter 6**). **Chapter 7** is an overall conclusion which summarises the findings of the thesis.