

2020 FLYSTRIKE PREVENTION RD&E PROGRAM PROJECT SUMMARY REPORT

AWI PROJECT NO: ON-00550

GAP EVALUATION OF PAIN ALLEVIATION RESEARCH

AUTHOR

Dr Alison Small, CSIRO Agriculture and Food
FD McMaster Laboratory, Locked Bag 1
Armidale, NSW 2350



The Animal Welfare
Science Centre



SUMMARY

Increasing societal and customer demands to provide animals with ‘a life worth living’ continue to apply pressure on industry to alleviate pain associated with husbandry practices, injury and illness. Over the past 15-20 years, there has been considerable research effort, with funding in the order of AU\$9 million from AWI, to better understand and develop mitigation strategies for painful husbandry procedures in sheep. This stocktake review of research literature published between 2000 and 2019 was undertaken so that AWI can strategically focus future project activities on the most important challenges, and the avenues which offer the greatest potential to be incorporated into industry best practice in pursuit of continuous improvement.

PROJECT REPORT

Social values, across a wide spectrum of concerns, continually change. For animals, the widespread view that animals deserve ‘a life worth living’ applies pressure on industry to improve pain management for husbandry practices, injury and illness. Notably, over the past 15-20 years, there has been considerable research effort across research organisations, industry (including funding in the order of AU\$9 million from AWI) and commercial pharmaceutical companies, to better understand the impact of, and to develop mitigation strategies for painful husbandry procedures in sheep. This international research effort, and particularly the recent collaborative approach of industry and commercial companies, has led to the successful launch in Australia of two registered Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) – Ilium[®] Buccalgesic OTM[®] and Metacam 20[®], and two local anaesthetic products for sheep – Tri-Solfen[®] and NUMNUTS[®]. However, even with multimodal approaches to analgesia using both Local Anaesthetic and NSAID, pain is not obliterated, and the challenge of pain mitigation and phasing out of painful husbandry practices remains. To ensure the sheep industry stays abreast of opportunities for improving pain control, it is important to take stock periodically of progress in international research into pain relief in other species so that AWI can strategically focus on the most important challenges, and identify avenues which offer the greatest potential to be incorporated into industry practice in a process of continuous improvement.

The project undertook a stocktake of published research into the welfare impacts of castration, tail docking and mulesing; alternatives to these procedures; and potential pain relief strategies. The stocktake catalogue included research on:

1. Mulesing and its alternatives; castration and tail docking (ring and knife, hot/cold); Laparoscopic Artificial Insemination and shearing cuts. Relevant literature pertaining to other husbandry procedures were considered.
2. Pain mechanisms and pain mitigation strategies, considering the context of the procedure and the pain mechanisms triggered. ‘Pain mitigation strategies’ examined both pharmaceutical agents and delivery mechanisms.
3. Methods of assessing pain and analgesic efficacy.

This was quite a broad remit – when the term ‘analgesia’ is entered into one of the literature database search engines (in this case Web of Science®, Thomson Reuters), 73,045 potential articles are returned (Figure 1). This enormous number of research articles is evidence that the issue of pain relief has not yet been solved, for any species. In order to bring the task into a more manageable size, it was decided to focus only on articles published from 2000 to 2019, there having been some very comprehensive reviews published in the early 2000’s. Merely reducing the time-frame in the literature search dropped the number of articles to 52,302 (Figure 2).

Furthermore, it is important to focus on the important underlying questions to the review. We also didn’t really need to cover other review articles, other than recording their existence for cross-referencing purposes, or to set a context, and we didn’t need to cover ‘opinion’ or ‘discussion’ articles that have no experimental content. There are also language aspects: many languages are beyond the skills of the immediate research team, so a sensible criterion was to exclude ‘language other than English’. This led to the development of strict inclusion-exclusion criteria (Table 1), against which each title and abstract was assessed as an initial step.

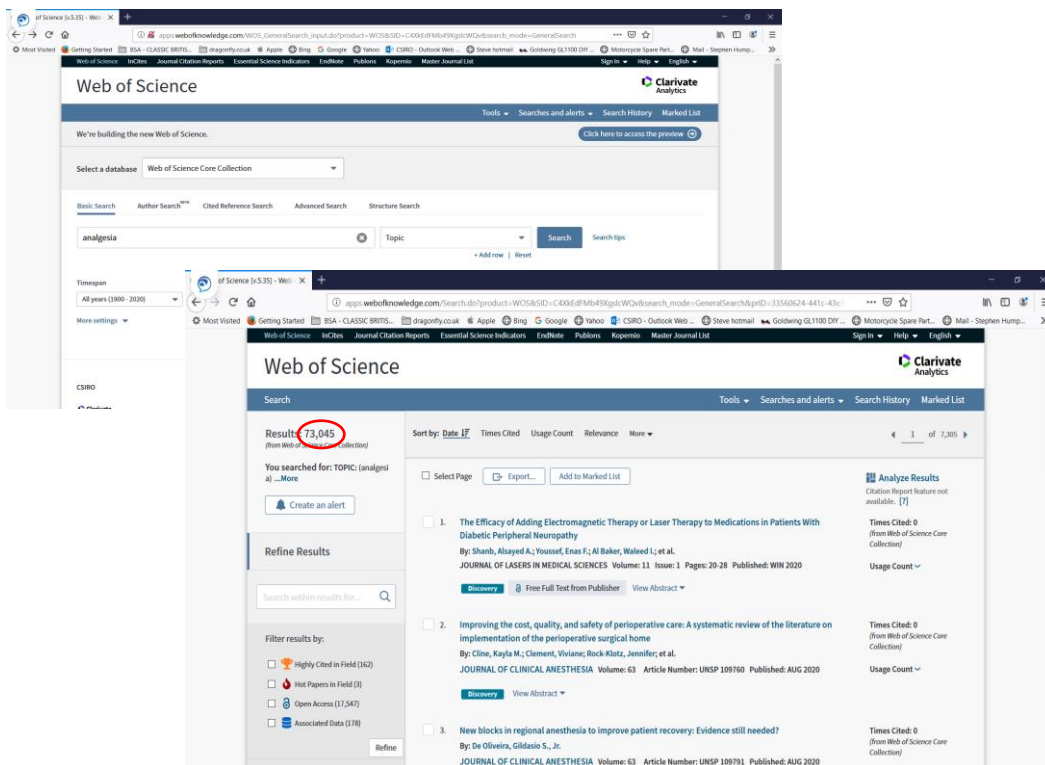


Figure 1. A simple search on Web of Science®, using the search term ‘analgesia’ returned over 73,000 potential articles.

Table 1. Literature Search Criteria.

Databases to search	Web of Science core collection PubMed MedLine Scopus
Inclusions	Research Papers Analgesic agents Husbandry procedures Livestock Companion animals Humans
Exclusions	Policy documents Reviews (except as a means to identify other research) Philosophical/opinion papers Patents General anaesthesia Papers published prior to 2000* Language other than English
*Although the focus of the review is on papers published between 2000 and 2019, some earlier papers have been cited in this report in order to provide context.	

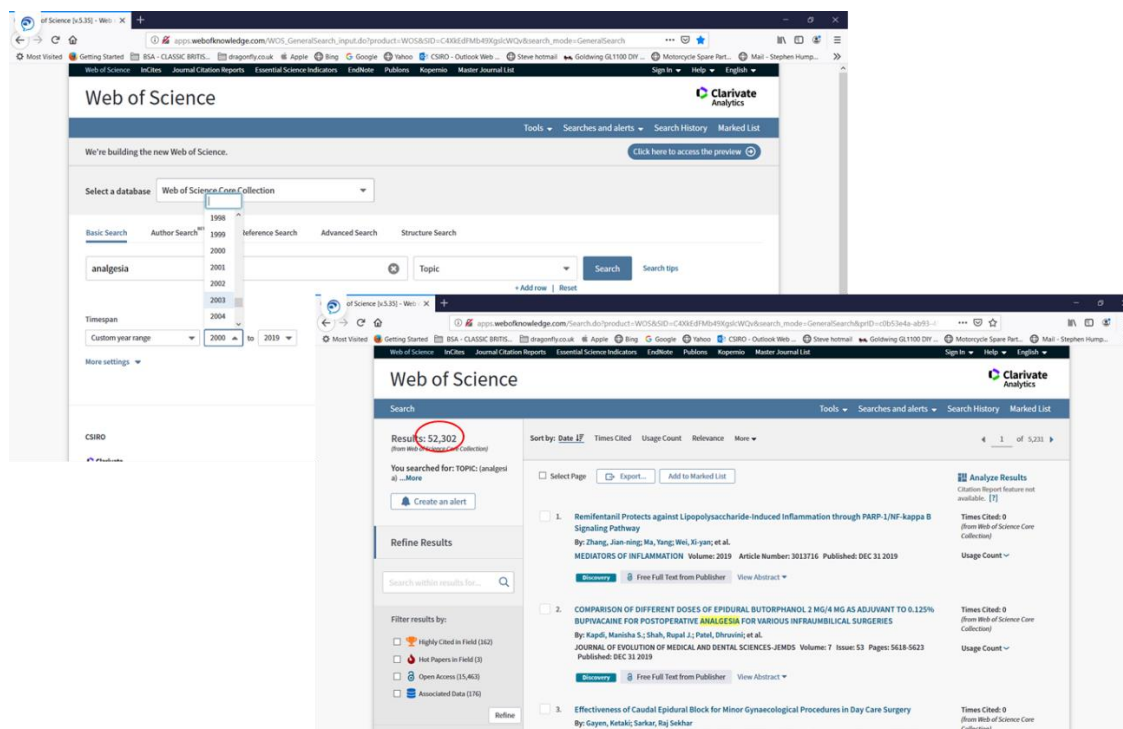


Figure 2. Refining the ‘analgesia’ search to 2000-2019 publications reduced the number of potential articles to 52,301.

After the primary screen against the inclusion/exclusion criteria in Table 1, each remaining abstract was read and considered in terms of ‘does this article have the potential to add value to the sheep industry?’ – there are many thousands of articles investigating the minutiae of pain physiology, or interaction of pharmaceutical agents with specific receptors in the body, and these were considered to be not directly relevant to the stocktake review.

Ultimately, a manageable subset of 1305 articles were included in the review. The review covered the following headings:

- Pain perception
- Assessment measures
- Husbandry procedures
- Analgesic agents
 - Local anaesthetics
 - NSAIDs
 - Sedative agents and opioids
 - New development in analgesic compounds
- Alternative analgesic modalities
 - Pulsed Electromagnetic Field (PEMF)
 - Electroacupuncture (EAP)
 - Transcutaneous Electrical Nerve Stimulation (TENS)
 - Topical cooling / cryoanalgesia
- Delivery systems
- Other knowledge gaps, e.g. neuropathic pain.

CONCLUSIONS/RECOMMENDATIONS

The review concluded that:

“Although a number of analgesic solutions are now available for sheep (Ilium Buccalgesic® OTM; Numnuts®; Metacam® 20; Tri-Solfen®), providing some amelioration of the acute pain responses, this review has highlighted a number of potential areas for further research, some of which can provide industry deliverables in a reasonably short time frame (within 5 years), while others are of a more long-term character.”

Some recommendations for further research include:

Activities with short term (< 5 years) outcomes

- Continue to systematically evaluate multimodal approaches to the various husbandry procedure methodologies (e.g. surgical or ischaemic) and combinations (e.g. mulesing with castration).
- Investigate non-pharmacological factors that can affect the pain response (e.g. handling, distraction or social context), toward the development of a holistic approach to integrated pain management.

Activities with medium term (5-10 years) outcomes

- Continue to develop delivery systems that are consistent, safe and easy to apply in the field.
- Continue to develop novel (e.g. sensor) technologies that allow practical assessment of pain status in a commercial setting.
- Develop formulations that allow for sustained analgesia (e.g. Combination formulations; sustained-release formulations; in-feed medication).
- Investigate enterprise-level benefit of use of analgesia for routine husbandry procedures. This data can support adoption of analgesia.
- Investigate the potential for ‘natural’ vanilloids (e.g. Eugenol or Camphor) and vapocoolants to be used as part of a multimodal approach.

Long term research programs

- Develop a deeper understanding of the molecular physiology associated with ischaemia-dependant procedures, such that selection of appropriate analgesic strategies to address pain associated with ring castration and tail docking.
- Investigate the potential for current and novel analgesic approaches to prevent the development of spinal pathologies associated with sustained or neuropathic pain.

FURTHER INFORMATION

A detailed [final report](#) of the project, including a response to the recommendations from AWI, is available at www.wool.com/flystrikelatest.

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