

Fact sheet

Pain mitigation in sheep

The provision of pain relief with routine husbandry practices is now an expectation. Not only do producers need to consider the use of pain relief products in their animals, but also alternative husbandry procedures and management practices. This fact sheet outlines best practice recommendations for specific husbandry practices for sheep, and considerations for alternatives of some of these practices.

A note on the cost: benefit of pain relief in sheep. While pain experienced during routine husbandry procedures may result in decreased feed intake in the short-term, animals generally compensate and 2–4 weeks later there is no measurable benefit from pain relief. The benefit for producers in using pain relief during routine husbandry procedures is not only for their own peace of mind, but also in meeting consumer expectations and protecting the product they market. Where producers engage in quality assurance programs that require pain relief, specific financial benefits may accrue.

The Australian Animal Welfare Standards and Guidelines for Sheep stipulate that good husbandry principles include:

- “assessment of the need to undertake any husbandry procedures that may result in significant short-term pain against alternative strategies for the long-term welfare of the sheep/cattle.”
- “undertaking of any husbandry procedures required for planned flock herd management in a manner that reduces the impact of these procedures and minimises risks to sheep welfare.”

Specifically for sheep producers:

- “G6.14 Tail docking and castration should be accompanied by pain relief when practical and cost-effective methods become available. Operators should seek advice on current pain minimisation strategies.”
- “G7.8 Mulesing should be accompanied by pain relief where practical and cost-effective methods are available. Operators should seek advice on current pain minimisation strategies.”



Registered products available for routine animal husbandry use

There are currently four products on the market that have pain relief claims in sheep. These are:

- **Tri-Solfen** (Bayer Australia) – local anaesthesia, post-op
- **NumOcaine** (Mavlab) – local anaesthesia, pre-op
- **Ilium Buccalgesic OTM** (Troy Laboratories, meloxicam) – Non-Steroidal Anti-Inflammatory Drug (NSAID)
- **Metacam** (Boehringer Ingelheim, meloxicam) – NSAID

Tri-Solfen® is a topically applied combination agent that includes lignocaine, bupivacaine, adrenaline and cetrimide. It was initially registered for treatment of sheep undergoing surgical mulesing, and its use has been extended to include other painful procedures and conditions in sheep. It is applied to wounds, so it is a post-operative product for routine animal husbandry procedures. It is an S5 drug so it is available over the counter from major distributors directly to farmers. Current costs are approximately \$780 for 5L or \$2,620 for 20L (86c for a 6ml dose).

NumOcaine® is the local anaesthetic lignocaine marketed together with the NumNuts ring application system. At present it is only registered for use in sheep. The NumNuts device is purchased separately to the NumOcaine, which has to be ordered through a veterinarian. The NumOcaine contains the lignocaine in a sealed system that only allows access through the NumNuts applicator, and is applied at the same time as the ring. Applicators cost approximately \$400 and NumOcaine is approximately 67c/dose. NumOcaine is an S4 drug so it must be purchased from a veterinarian. Each 100ml bottle gives approximately 65 doses.

Buccalgesic® is a meloxicam (NSAID) gel that is administered by oral application in the buccal (cheek) pouch in lambs, rather than drenching for the animal to swallow. At present it is available in a 200ml pack costing approximately \$80–100, or 40c/10kg for lambs. It is an S4 drug so it has to be purchased from a veterinarian.

Metacam® is a meloxicam (NSAID) injection (subcutaneous, under the skin at a rate of 1ml/20kg). It is available in 100ml bottles costing approximately \$150–200, or 75c/10kg for lambs. It is an S4 drug, so it has to be purchased from a veterinarian.

Trisolfen dosages and costs by procedure

Weight kg	Mulesing		Tail docking		Castration	
	Dose ml	Cost \$	Dose ml	Cost \$	Dose ml	Cost \$
<=10	6	0.86	1.5	0.21	3	0.43
15	8	1.15	2	0.29	4.5	0.64
20	10	1.43	2	0.29	4.5	
>20	12	1.72	2	0.29	4.5	

Buccalgesic 10mg/ml meloxicam dosages and costs

Sheep (1 ml/10kg)		
Weight kg	Dose ml	Cost \$
<10	1	0.40
15	1.5	0.60
20	2.0	0.80
25	2.5	1.00
30	3.0	1.20

Local anaesthetics versus NSAIDs

Pain is sometimes classified as **immediate** (fast) pain, and **chronic** (slow) pain. During painful animal husbandry procedures, there may be immediate pain associated with the procedure, as well as slower long-term pain associated with any injury and healing.

In general, **local anaesthetics** deal with immediate pain, making the animal more comfortable while the procedure occurs and shortly after. Generally, local anaesthetics are immediate and short-acting, lasting for less than one hour. They provide a high degree of analgesia (pain relief) during that period, but no pain relief once they wear off. NumOcaine uses a short-term local anaesthetic (lignocaine), so will only provide any level of analgesia for less than one hour. Tri-Solfen contains two local anaesthetics, lignocaine and bupivacaine (a longer acting local anaesthetic), as well as adrenaline, and appears to provide longer analgesia (up to 24 hours has been reported) when applied to a wound, particularly in terms of reducing wound pain.

NSAIDs reduce inflammation, pain and fever. They stop the transmission of pain signals by blocking the synthesis of prostaglandins. They have been used in people (e.g. Nurofen, Voltaren) and in cattle (e.g. flunixin injections) for years, but have only recently been registered in sheep (Metacam, Buccalgesic). NSAIDs take 15–30 minutes to take effect, and generally provide pain relief for at least nine hours, but often longer. For example, Colditz et al (2019) reported meloxicam's maximal effect 6–9 hours post treatment. Small et al (2014) reported a seven-fold decrease in adverse animal behaviours seven hours after surgical castration and hot iron tail docking with post treatment of buccal meloxicam, and only a small effect at 24 hours.

Despite being anti-inflammatory, Colditz et al (2019) reported no effect of meloxicam on inflammation and appetite in sheep, and Small et al (2014) found no improvement in movement of treated lambs or any production gain.

- “Although local anaesthesia does provide amelioration of the acute pain response to painful husbandry procedures, the pharmacodynamic duration of action is short-lived... it appears that durations of greater than 3–4 hours are not currently achievable.”
- “Use of local anaesthesia with NSAIDs, for livestock undergoing routine husbandry procedures provides greater amelioration of the pain response than use of a single agent alone, and should be recommended as current best practice.”

Gap Evaluation of Pain Alleviation Research

Alison Small, Andrew Fisher, Caroline Lee and Ian Colditz, June 2020

AWI Final report, ON-00550, June 2020

Take home message

Most pain relief products help with some of the pain an animal experiences, but not all. Using a combination of products will provide greater pain relief. **Local anaesthetics** provide relief from immediate pain but are short-acting. **NSAIDs** provide a longer duration of pain relief but do not deal well with the immediate pain.

Application of pain relief to specific animal husbandry procedures

It is necessary to assess each specific husbandry procedure to fully understand the best pain mitigation strategy. In many cases, a number of these procedures occur concurrently (e.g. in sheep: mulesing, castration and tail docking; earmarking and/or ear tagging).

Mulesing

Mulesing is the removal of skin around the breech area of a sheep to decrease the risk of breech flystrike and aid in crutching. There is a strong expectation that if mulesing is performed, it will be done so in conjunction with the provision of pain relief medication. In at least one state this is now a legislative requirement. Research studies looking at pain-related behaviours suggest:

- Tri-Solfen and Buccalgesic both provide pain relief with mulesing, with Tri-Solfen providing a faster response (especially in the first four hours) and Buccalgesic four to six hours post treatment (but likely longer). Tri-Solfen also provides a sustained effect (at least 24 hours) on the development of mulesing wound pain.
- **A combination of Buccalgesic and Tri-Solfen provides the best pain relief.**
- Pain still occurs after these products wear off.

Specific research has not been reported using injectable meloxicam, but it is expected to have the same effect as reported for Buccalgesic.

Castration

Castration of male lambs may occur either by removing the tip of the scrotum and both testes (surgical castration) or by applying a rubber ring to the neck of the scrotum, with castration occurring via ischaemic necrosis (ring castration). Ring castration is considered to be less stressful than surgical castration and is the preferred method. A recent survey suggests 97% of producers use ring castration in lambs. As castration in male lambs is invariably undertaken in conjunction with tail docking, trials assessing the effects of pain mitigation with castration have occurred together with tail docking studies.

For ring castration, lignocaine appears to provide short-term pain relief, and NumOcaine should decrease short-term pain for less than one hour. Tri-Solfen is not suitable, as there is no wound. NSAIDs have not been shown to decrease behaviour responses (despite decreasing cortisol response), but would be expected to have some effect on pain. **A combination of NumOcaine (i.e. ring application using NumNuts) and meloxicam should provide the best pain relief under currently registered products.**

For surgical castration, Tri-Solfen has been shown to have beneficial effects at reducing pain behaviours. As with mulesing, **a combination of meloxicam and Tri-Solfen should provide the best pain relief.**

Tail docking

Tail docking may be performed by a sharp knife (cold knife), a heated cautery docking iron (hot iron docking) or use of a rubber ring (ring docking), with the latter resulting in ischaemic necrosis as the tail falls off 2–4 weeks post ring application. Hot iron docking is considered less stressful than cold knife, with ring docking being intermediate.

Behavioural responses to hot iron docking have been shown to be lessened by local anaesthetic.

There is no specific work looking just at tail docking, as it usually occurs in conjunction with castration and mulesing, although Tri-Solfen does not appear to be as effective on the cauterised tail as it is with surgical castration and mulesing.

Summary

- Assess if mulesing and/or castration needs to occur.
- If sheep need mulesing, and this occurs at lamb marking with tail docking and castration, then the optimal approach would be to pre-operatively treat all lambs with Buccalgesic, use a hot iron for tail docking, apply a ring to castrate male lambs with Numnuts (NumOcaine) and apply Tri-Solfen to the mulesing wound. If this system is not suitable, then alternatives are provided in the pain relief table (see below).
- If sheep only require tail docking and castration, the optimum approach would be to pre-operatively treat all lambs with Buccalgesic, use a hot iron for tail docking, and apply a ring to castrate male lambs with Numnuts (NumOcaine). Alternatives are provided in the pain relief table.

Pain relief table for sheep – mulesing, castration and tail docking

Animal husbandry procedure	Meloxicam	NumOcaine+	Tri-Solfen	Meloxicam plus Tri-Solfen	Meloxicam plus NumOcaine+	Numocaine plus Tri-Solfen
Mulesing	Suitable		Suitable	Best		
Hot iron docking (33-75%)	Suitable					
Ring docking	Suitable	Suitable			Best	
Ring castration	Suitable	Suitable			Best	
Surgical castration (3%)	Suitable		Suitable	Best		
Hot iron docking/ring castration	Suitable	Suitable			Best	
Hot iron docking/surgical castration	Suitable		Suitable	Best		
Ring docking / ring castration	Suitable	Suitable			Best	
Ring docking / surgical castration	Suitable			Suitable	Suitable	Suitable
Hot iron docking/ring castration + mulesing *	Suitable			More suitable*	Suitable	Suitable
Hot iron docking/surgical castration + mulesing	Suitable		Suitable	Best		
Ring docking / ring castration + mulesing *	Suitable			Suitable	Suitable	Suitable
Ring docking / surgical castration + mulesing *	Suitable			Suitable	Suitable	Suitable

* The use of all three pain relief options (Meloxicam, Tri-Solfen and NumOcaine in combination would be best, but the use of three PR products may not be practically feasible in most enterprises)

- This table assumes NumOcaine is administered as part of Numnuts, and so is done in association with the application of rings (for either castration or tail docking or both)
- While **bolded procedures** are expected to occur in most situations, other procedures are included for completeness



Alternate husbandry practices

Producers should always consider whether there is a need to undertake painful husbandry procedures on their animals or if there are suitable alternatives in their enterprises. Plainer breeches in Merino sheep, combined with dag management and additional crutching with or without reliance on chemical usage, may enable Merino producers to move away from mulesing.

For more details see this [Flyboss article](#) or this [AWI article](#).

Mulesing alternative – liquid nitrogen

Application of liquid nitrogen to the breech area is occurring in a small number of flocks. It is considered that this non-surgical modification will still be a painful procedure, and the extent and methods of ameliorating this pain are still being evaluated. Meloxicam is reported to have limited benefits.

Further reading and references

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