



A Detailed Guide

Targeted Pain Relief for Tail Docking and Castration

Version 2 June 2021

- Provides fast-acting, pain-free and bloodless lamb marking
- Meets industry best practice guidelines for animal husbandry
- For tail docking and castration of lambs with rubber rings from 2 to 12 weeks of age
- Clinically evaluated by CSIRO and the University of Melbourne
- Launched in 2019, by 2021 over 1.2 million lambs have received Numnuts
- R&D by Moredun Research Institute and 4c Design, with funding support from MLA and AWI
- Available in Australia & New Zealand
- A 2 in 1 tool. An ergonomic ring applicator with injector, for a fast and effective work flow.
- Improved ergonomic tool, reduced RSI



“Animals that are treated well, perform better. They are more vigorous and don’t have setbacks in their lives.”

Jodie Green | Aloeburn

Pain Relief makes Business Sense

Improved Mothering Up

A farmer's goal, is for their animals to grow as quickly as possible. Setbacks, when animals stop growing or even lose weight, must be avoided or minimised. Well-evidenced veterinary research has highlighted that severe pain can restrict healthy development.

Low Stress Flock Movement

A long-established practice for marking (tail docking and castration) is the application of rubber (Elastrator®) rings. Research shows that marked animals experience acute ischemic pain which is most severe 15 to 45 minutes after application. This pain manifests visually as abnormal behaviour including lying down and mis-mothering occurs.

2in1 Tool = Workflow Efficient

Current marking practices are coming under increased scrutiny from animal welfare groups, particularly when carried out on older animals. In the UK, 1954 legislation makes it illegal to use a rubber ring on lambs more than 7 days old without local anaesthetic. A growing consumer trend is to buy products demonstrating higher animal welfare.

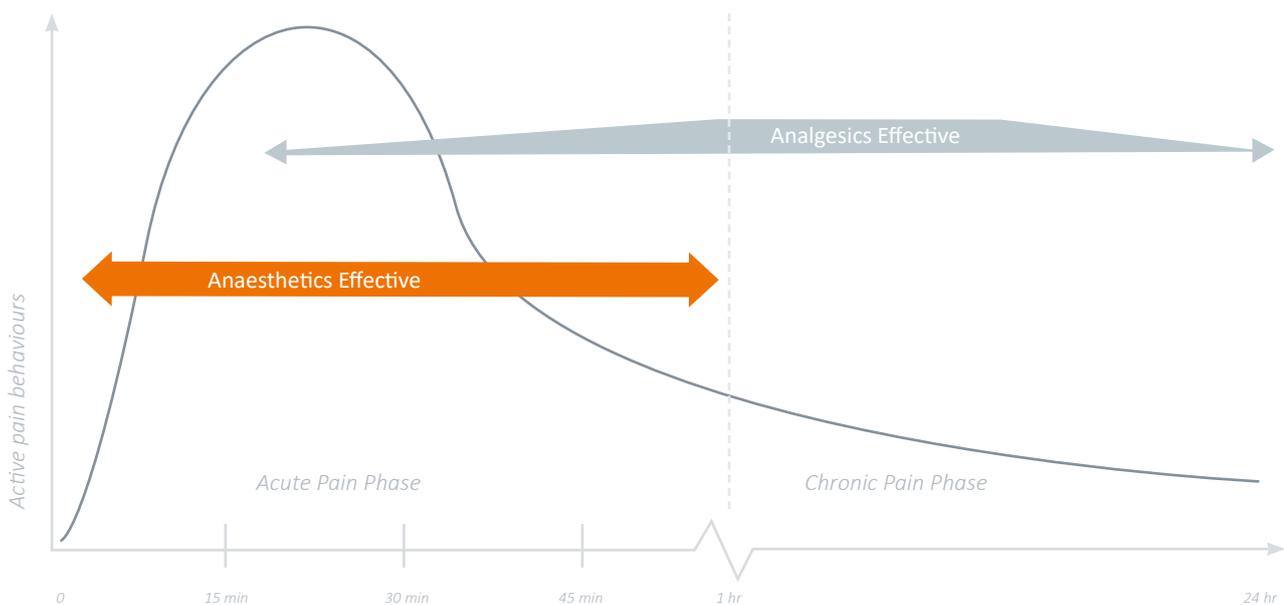


NumOcaine

Pain Management Options for Tail Docking and Castration	
Local Anaesthetics	Analgesics
NumOcaine®	NASIDs
<ul style="list-style-type: none"> • Blocks pain and sensory function is lost • Fast acting, 1 – 2minutes to take effect • Not long-lasting • Subcutaneous injection desensitizes a defined location • Reduces ‘nerve wind-up’ 	<ul style="list-style-type: none"> • Relieves inflammation • Slower to act • Longer-lasting • Systemic action following oral or subcutaneous injection

The onset of acute ischemic pain from a rubber ring occurs in the minutes after it has been applied. 30 years of veterinary research carried out in New Zealand, Australia and the UK has identified injectable local anaesthetic as the preferred solution for pain relief while castrating and tail docking with rings. Local anaesthetics block this pain, providing fast-acting pain relief during the first 45 minutes, when lambs experience the highest magnitude of acute pain. This is caused by the loss of blood flow. Anaesthetics reduce the stress on the lamb during the most extreme pain phase. Reducing the trauma of acute pain in sentient animals delivers well-being benefits long after the drug’s medicinal properties have gone.

Illustration showing Anaesthetics and Analgesics alleviating the Ischemic Pain from rubber ring over time.



*Tri-Solfen is a topical formulation for use on open surgical wounds, such as knife castration.

Effectiveness of Numnuts



Efficacy of Numnuts has been studied in field trials by CSIRO in Australia and in pen trials by Moredun Research Institute in Scotland. During Numnuts' development, more than 1000 lambs have been studied.

- Lambs were noticeably more relaxed when released from the cradle
- The number of pain behaviours observed were reduced by up to 68%

Developing a delivery device that can safely administer local anaesthetic quickly and efficiently within the lamb marking environment has been key to the success and uptake of pain relief during lamb marking.

The device has been designed to fit within the traditional lamb marking system. Numnuts improves the ergonomics of ring application and removal. Crucially it does not require the user to put one tool down and pick another up, providing workflow efficiency.

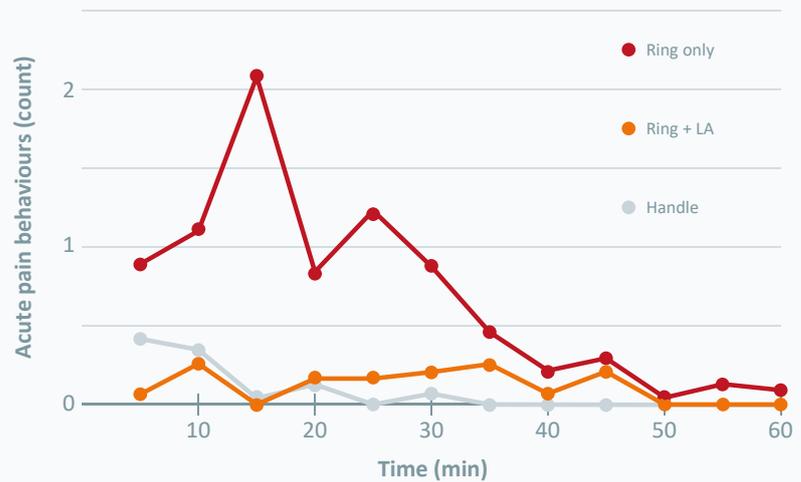


Figure 1: Acute pain behaviours expressed by lambs in the first hour post tail docking. a, b: Means within a time interval with different superscripts are significantly different ($P < 0.05$)

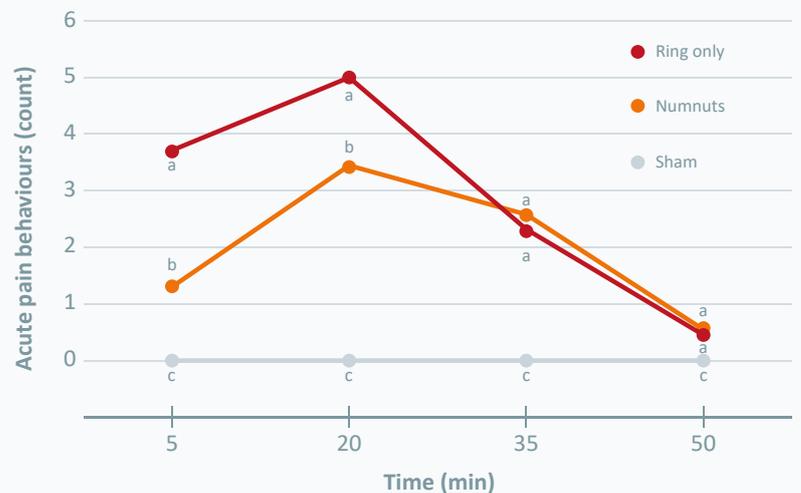


Figure 2: Acute pain behaviours expressed by male lambs post tail docking and castration. a, b, c: Means within a time interval with different superscripts are significantly different ($P < 0.005$)

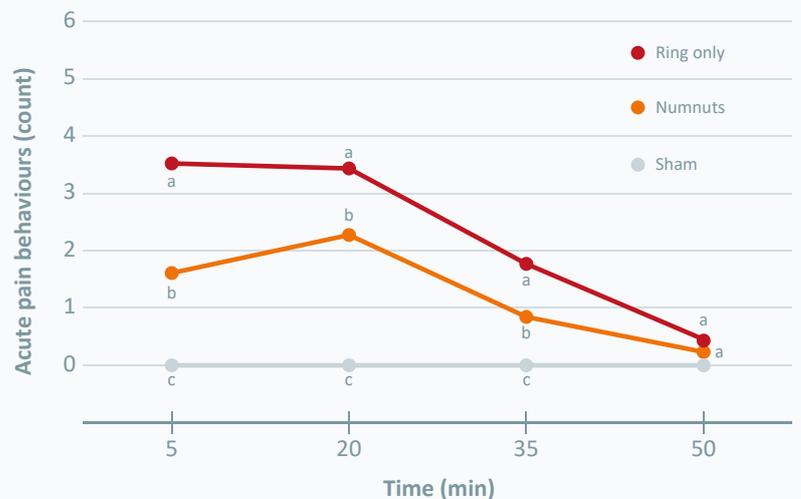


Figure 3: Acute pain behaviours expressed by female lambs post tail docking. a, b, c: Means within a time interval with different superscripts are significantly different ($P < 0.005$)

The Numnuts[®] System

NumOcaine and Quick Change Cartridge (QCC)

Tamper-resistant QCC and a 100 mL bottle are supplied as a single unit to speed up changeovers and minimise the risk of drug misuse. 65 procedures per 100 mL bottle.

Fluid Junction and O-ring seal

Changing the fluid junction every 2000 lambs or each season, whichever comes first, allows for hygienic and effective function.

Needle

Regular changeover of the high quality, stainless steel needle reduces infection risk, minimises animal discomfort and keeps injection loads low for the operator. Replacement recommended after every 2nd NumOcaine bottle (130 procedures). The size, gauge and type of needle is critical for the correct operation of the tool. Therefore, only use Numnuts needles for full effect of the procedure.

2-Stage Injector

The patented 2-stage injector allows for a pre-calibrated dose of 1.5mls of NumOcaine without risk of premature dispensing of local anaesthetic. The mechanism will only dispense the NumOcaine once the needle is correctly engaged.

Ring Applicator

Ergonomically designed for the professional farmer or marking contractor. Engineered to be a robust 'accident-proof' tool lasting over 100,000 ring applications.



How to use the Numnuts device

Shown on a demonstration rig



Step 1

With ring on, open Numnuts tool and position ring over tail or testes.



Step 2

Release pressure on metal lever to close ring which automatically aligns tool for injection.



Step 3

Press injector plunger firmly. The two-stage mechanism first pushes the needle through the skin, then delivers a measured 1.5 mL dose.



Step 4

Release plunger and tilt down. Pull tool up to release ring.

Note: This is different (easier) than standard elastator ring pliers.

After further Support?

Numnuts does not require clinics to receive training upon registration but if your clinic would like a demonstration please email us at info@numnuts.store

Additionally we provide how to videos, troubleshooting guides and support on our website www.numnuts.store/support



Safety

- Needle automatically withdraws between procedures to minimise risk of needle stick injuries
- Tamper-proof QCC prevents access to drug via needle and syringe to minimise drug misuse
- NumOcaïne has a very wide safety margin and is approved for injection volumes up to 60mL in sheep

Advantages

- No extra procedure or equipment required to administer pain relief
- Uniquely ensures correct dose of local anaesthetic is delivered to the right place without specialist operator training or veterinary observation
- Operating force is delivered without twisting the forearm through 90°, reducing fatigue and risk of Repetitive Strain Injury (RSI)
- Over-centred design requires minimal force to hold device fully open, making it easier for operators of all sizes and strengths to undertake marking
- Easier operation allows attention to be focussed on correct positioning of the ring, minimising distress to the animal
- Left or right handed use

Supplying NumOcaine®

NumOcaine is an Australian & NZ Schedule 4 (S4) drug which should be supplied by vets to their clients in accordance with the Veterinary Practitioners Board guidelines.

NumOcaine, a local anaesthetic, works by affecting the nerve cell membrane's permeability to sodium ions, thus blocking nerve impulse transmission. All nerves are effected but those concerned with pain and temperature are most sensitive. Onset of action is rapid when given by injection.

Composition	Lignocaine hydrochloride 20 mg/mL; benzyl alcohol 10 mL/L as preservative.
APVMA / AVCM	APVMA no. 87460/118755 ACVM no. A011834
Poisons Schedule	S4
Dosage	Lambs, 1.5 mL dose
Shelf Life	24 months
Storage	Store below 30°C (room temperature). Protect from light

Indications

For castration and tail docking of lambs aged 2 – 12 weeks of age, by application of rubber rings in accord with Australian industry best practice guidelines for sheep husbandry.

Contra-indications

Animals with conduction disturbances of the heart, hypovolaemia, bradycardia, cardiac decompensation, or hypotension not due to treatable tachyarrhythmias. Animals with known hypersensitivity to lignocaine.

Safety

- NumOcaine is presented in a 100 mL bottle with a tamper-proof, quick change cartridge (QCC) that prevents access to drug via needle and syringe

- ONLY for use with Numnuts tool for castration and tail docking of lambs in accord with industry best practice guidelines
- Applicator design ensures needle is retracted between procedures minimising risk of needle stick injury
- NumOcaine has a wide therapeutic window and is registered for administration of up to 60 mL per animal in sheep. If unsure whether an injection has been made the injection procedure can be repeated

Quantity required

Up to 65 procedures per 100 mL bottle. 3 bottles per 100 male lambs (2 procedures per lamb). 1.5 bottles per 100

female lambs (1 procedure per lamb). The number of bottles required can be estimated on the Numnuts on-line calculator at: www.numnuts.store/estimate-landing-page/

Training

Rings are applied with the tool as per standard industry practice for ring marking. The tool accurately injects 1.5mL of NumOcaine into the target tissues so no training is usually required for operators with prior experience of applying rubber rings.

Benefits

Clinical trials showed NumOcaine reduced pain from ring marking for up to 60 minutes and improved mothering up, though some lambs may show signs of residual pain during this period.

Adverse reactions

An epidural effect of NumOcaine has been observed in a very small number of lambs when tail docked with the Numnuts system. This is a rare outcome, with temporary hind limb paralysis lasting less than 1 hour.

If wobbly hind legs are seen after tail docking: Place lamb in a large holding pen or in isolation so it will not be trampled by the mob. Return lamb to usual paddock once hind-limb movement regained.

To help avoid epidural effect: Take extra care when injecting NumOcaine into the tail – slow and steady plunger action. Only inject as much of the dose as you can comfortably push in. In small lambs consider giving a part dose as this will still help reduce pain.

Numnuts for De-Tailing in combination with knife or hot knife

‘Ring and Remove’ is an option. This allows producers to still provide fast acting pain relief when removing tails with a knife.

1. Deliver NumOcaine and a ring to the tail at first station using the Numnuts Device.
2. Carry out other procedures (vaccine, ear tag etc.)
3. If musling, mules and apply tri-solfin.
4. Remove tail with a sharp clean Knife or hot knife 20mm distal (south) of the ring, leaving the ring in place.

Benefits of ‘ring and remove’

- Numnuts works as a pre-operative pain relief and

will kick in before the tail is removed

- The ring acts as a tourniquet and prevents blood loss in the event of the wound not cauterising.
- Leaving the ring on can prevent infection from the surrounding environment tracking up the tail.

Using Numnuts and Knife (or hot knife) together incurs a small-time penalty. Yet once in the swing of things it doesn't slow production but importantly provides best practice pain relief and infection prevention.

Combination therapy

Combined use of NumOcaine with a NSAID has not yet been evaluated, yet all indications are that a multi-modal approach will provide improved efficacy.

Hygiene and cleaning

As there may be dags or faeces at the injection site, best practice for minimising infection is to change the needle at the same time as the NumOcaine QCC.

Local anaesthetic as an antimicrobial agent

In addition to its anaesthetic properties, Lignocaine hydrochloride has been shown to exhibit bacteriostatic, bactericidal, fungistatic, and fungicidal properties against a wide spectrum of micro-organisms*. If the needle cannula and housing sections around the device can be kept wet with NumOcaine this should help prevent infection.

Disposal

Wrap empty bottles and dispose in landfill. Dispose of needles safely, ideally in a commercial sharps disposal container. Most local Councils provide sharps disposal facilities at waste collection stations. Check www.safesharps.org.au for local sharps disposal locations.

Replacement parts

Tools, injectors, needles and other parts can be obtained at: www.numnuts.store

* JOHNSON, S. M., JOHN, B. E. S. & DINE, A. P. 2008. Local Anesthetics as Antimicrobial Agents: A Review. *Surgical Infections*, 9, 205-213.

Using Numnuts with Cattle

Background

Vets around the world currently provide local anaesthetic lignocaine(lidocaine) to alleviate the acute pain associated with castration of cattle. The efficacy of this has been validated in numerous published science papers back to 1992.*

Topic	State	What We Know	What is Still to be Established?
Drug Regulations		NumOcaine is approved for use in Cattle. 0 days meat withholding.	
Organic Farms		NumOcaine active (lignocaine) is approved for organically certified meat and milk (US export).	
Dose of NumOcaine		At least 4.5ml dose (3 pumps) should be given.*	Efficacy data on the dose response
Efficiency		Multiple scientific papers have shown that local anaesthetic given by a vet reduces acute castration pain.	That the Numnuts delivery system reduces pain in a similar manner to that induced by manually injected local anaesthetic given by a vet.
Speed / Safety of Application		Using Numnuts and NumOcaine is as quick and is safer than using a knife.	
Age of Calves		The younger the better, rings > 1 day and ideally < 2 weeks old.	Whether NumOcaine works on 2-to-3- month-old calves
Numnuts for use with Adult bulls > Young Steers 6 months		Studies have shown that using rings or emasculator bands on older bull calves/ young steers is less humane than surgical castration. Pre-operative Anaesthetic/ Analgesic should be applied by a Vet	Bloodless emasculator bands are commonly used in older cattle in AUS and the US. Yet literature shows that surgical castration (with anaesthesia) provides a better overall welfare outcome for large bulls. Numnuts would like to develop a safe pre-operative anaesthesia system for older cattle but this requires R&D funding.

Pain Management Options for Castration (Cattle)

Knife with Topical Anaesthetic

- Poses risk to knife user
- Gory and visually unpleasant, not a 'good look' for the beef industry
- The topical anaesthetic available only works post-operatively and is applied after the procedure.
- Topical anaesthetic is not registered for use with organic farms and has a 90-day meat withholding period.
- 2-3 weeks after surgical castration the wound is normally healing (assuming no infection).
- Knife castration (with Anaesthetic/Analgesic) can be done at all ages. Younger calves will recover more quickly.
- There is a lesser magnitude yet longer duration chronic pain associated with knife castration after the initial surgical phase, some of this duration can be alleviated with NASIDs.

Ring with Local Anaesthetic

NumOcaine®

- Inherently safer
- Rings are bloodless at time of application and virtually invisible
- Ischemic pain from rings takes a few moments to build up, the same time that fast acting local anaesthetics start to work
- NumOcaine (with Lignocaine) is registered and used in sheep/ beef enterprises.
- Testicles can take 2-3 weeks to drop off. Wounds from rings worse the older the animal and the more tissue band has to constrict through.
- Rings should only be used on young calves. Green rings have been put onto a calves up to 180kg 12weeks with Numnuts device, yet this is not recommended as science studies show their can be downstream complications/ swelling and pain from using rings on older calves.
- There is a lesser magnitude yet longer duration chronic pain associated with ring castration, some which of which can be alleviated with NASIDs

Requirements

- A tipping calf cradle (or method of holding calves on their side or back) is required
- If the calf is standing (in a crush) the Numnuts device, currently does not work upside-down
- Castration rings should only be used on young Calves. Numnuts Device can expand Elastrator (green) and SM Calf bands.
- Literature review suggests at least 4.5ml (3pumps) NumOcaine is required. Recommend 5 pumps (7.5ml) for larger animals



*American Veterinary Medical Association. (2014). Literature Review on the Welfare Implications of Castration of Cattle. Carter, B., Mathis, C., Löest, C., & Wenzel, J. (2016). Castrating Beef Calves: Age and Method. Cooperative Extension Service- College Of Agricultural, Consumer And Environmental Sciences, Guide B-227. Cattle Standards and Guidelines Writing Group. (2013). Cattle Standard and Guidelines- Castrations. Cattle Castration Discussion Paper Public Consultation Version 1.3.13. Coetzee, J. (2011). A review of pain assessment techniques and pharmacological approaches to pain relief after bovine castration: Practical implications for cattle production within the United States. Applied Animal Behaviour Science, 135(3), 192-213. <https://doi.org/10.1016/j.applanim.2011.10.016>

Numnuts® delivers Targeted Pain Relief for Tail Docking and Castration

For many years, veterinary research has shown that pain after marking can be alleviated by local anaesthetics. However, until now, the risk of needle stick injury to the farmer, the time required to administer the drug by needle and syringe, and uncertainty about how and where to administer it have created a barrier to use local anaesthetics by farmers.

“We can’t obliterate pain for humans yet and we certainly can’t obliterate it for animals, but we can make a difference to the level of pain experienced.”

Alison Small BVM&S, CSIRO

Numnuts is a game changer, enabling sheep handlers to accurately inject local anaesthetic (NumOcaine®) at the same time as ring application.

In trials by CSIRO and the University of Melbourne, Numnuts substantially reduced the number of lambs displaying pain behaviours immediately after marking.

- *Up to 68% reduction in pain-related behaviours*
- *Faster mothering-up*
- *Reduction in mismothering*

With any assessment of pain there is a massive grey area. Like humans, some lambs are very stoic and will just ‘grit their teeth’ and bear it, whereas others show a wide range of pain behaviours.

As with other on-farm pain management practices Numnuts does not eliminate pain. However, veterinary field trials in the UK and Australia have demonstrated a substantial reduction in pain behaviours compared to lambs marked without Numnuts.

The **Five Freedoms** outline aspects of welfare of animals under human control. They have been adopted by professional veterinarian groups, farming producers as well as animal welfare organisations. Numnuts significantly improves at least 3 of these freedoms (pain, discomfort, normal behaviour) and supports the other two.



1. Tails are removed to reduce Blowfly strike
2. Sheep are castrated to improve genetic selection so sheep can thrive in their environment
3. Numnuts reduces pain, distress and discomfort
4. Numnuts speeds up return to normal behaviour



Technical Support

NumOcaine®	Paul Ross BVSc paul@mavlab.com.au
Numnuts®	Robin Smith CEng robin@numnuts.store
Eastern States Veterinary Support	Dr Tristan Jubb BVSc PhD tristan@bendigoshsheepvets.com
West. Aust Veterinary Support	Dr Michylla Seal, BSc BVMS mic@genstock.com.au

Future Developments

NumOcaine tube fed version for use with standing cattle

Fast acting combined with longer duration anaesthesia in one bottle, delivered by the Numnuts Device.

Utilising the design of the Quick change cartridge system and dual stage injector system into the delivery of other drugs used in animals.

The extensive Numnuts R&D is protected by:

- Three international patents
- A family of international design rights
- A series of international trademarks

Senesino is seeking investment funding aligned with our vision of 'Innovation to Improve Lives' to support ongoing R&D and commercialisation.

Numnuts® and Accredited Wool & Meat Schemes

Demand for sheep products produced under accredited farming practices is increasing. Whilst accredited schemes vary their specific requirements, a consistent theme throughout is a focus on best practice and high animal welfare standards. Numnuts helps to achieve these goals, by giving lambs the best start in life by reducing the pain that accompanies these necessary husbandry procedures.



'For all methods of castration and taildocking, pain relief shall be applied {when suitable pain relief is available}.'

RWS (Responsible Wool Standard)



Who's Behind Numnuts?

Numnuts has been developed by engineering design company 4c Design, in close collaboration with veterinarians at CSIRO Armidale in Australia and Moredun Research Institute in Scotland. Development and testing of a series of prototypes has been funded by MLA, AWI and the Moredun Foundation. Numnuts is being brought to market by Senesino Ltd.



TA Fields, one of Australia's largest sheep producers has used Numnuts on over 60,000 lambs



“If you are currently doing nothing in terms of pain relief during lamb marking, then it is time to start doing something.”

Dr. Allison Small BVM&S | CSIRO

See case studies at
www.numnuts.store/reviews/



Want to know more?

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www.numnuts.store

Development Partners



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