



R(D)SVS



# A practical alternative to tight rubber rings for castration of older lambs.

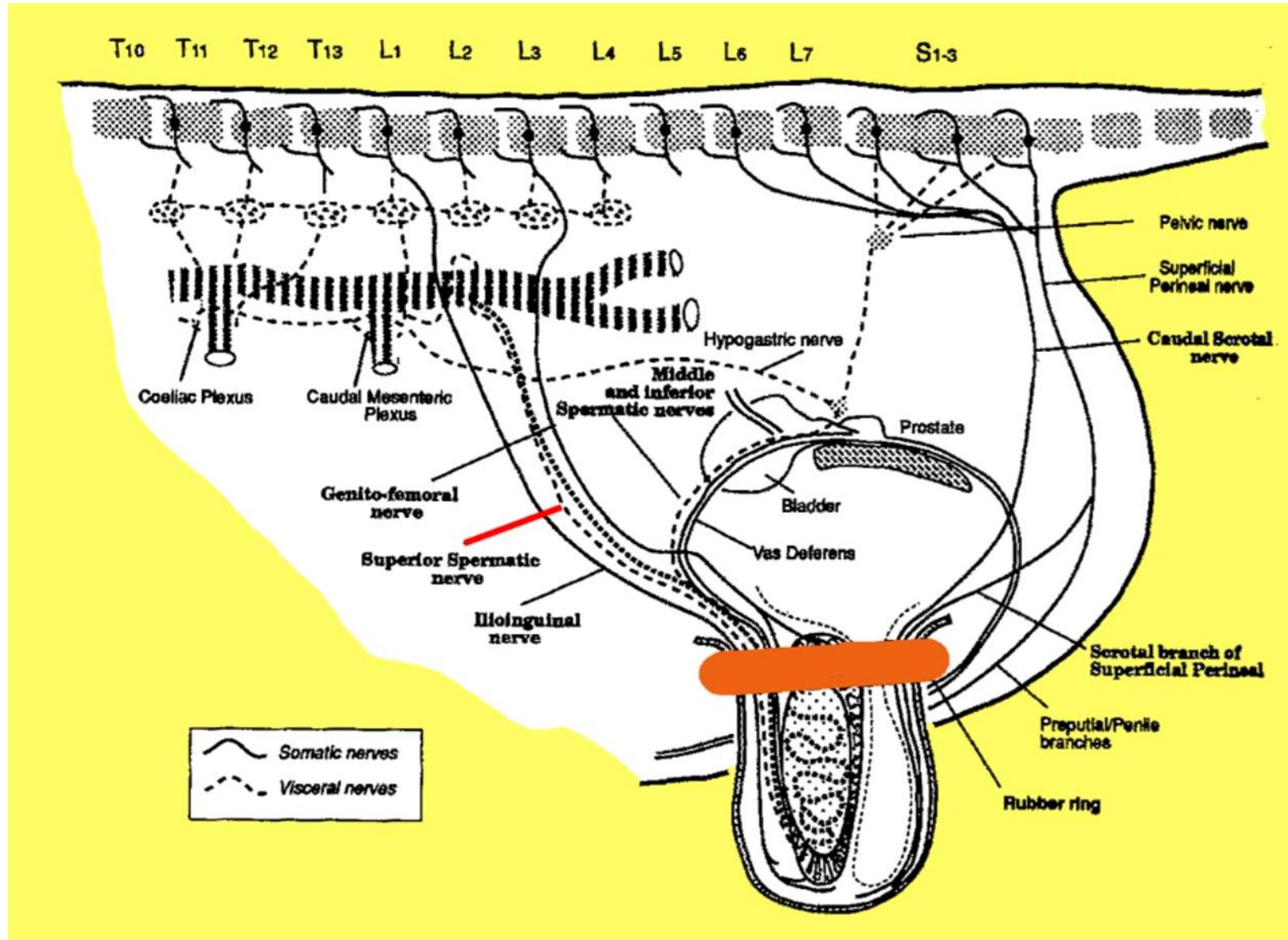
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# INTRODUCTION /BACKGROUND

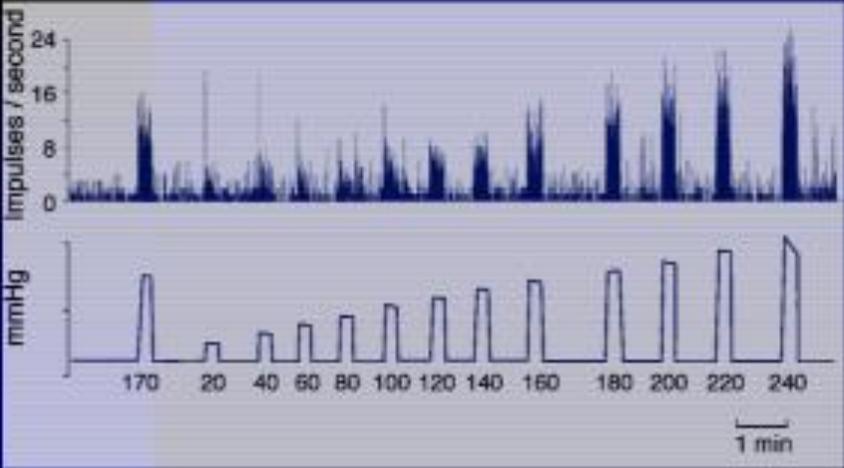
- More than 20 years ago we showed that lambs of all ages suffered severe pain for up to 2 hours after castration with tight rubber rings.
- We also showed that this (acute) early pain could be followed by chronic inflammation and evidence of pain for up to 6 weeks as the scrotum and its contents became necrotic and fell off.
- We went on to show that the early pain could be greatly reduced by injection of local anaesthetic at the time of castration and that sheep farmers could obtain similar reductions in pain, at least in 'lowland' lambs of < 1 week.
- In older 'hill' lambs, sheep farmers did not always obtain the pain relief expected from injection of local anaesthetic but we concluded that this was due to unreliability of some of the needleless injectors with which we supplied them, for this unpublished trial.
- In the field trials (Kent et al 2004) farmers also assessed the 'Combined' castration method and they were able to obtain similar pain reductions to those we had achieved in experimental trials.
- The farmers, in the field trials, preferred using local anaesthetic, administered with the needleless injector, to the 'Combined' method but indicated that they would not adopt either method unless obliged to do so.
- This has proved to be the case because rubber ring castration, without local anaesthesia, still appears to be the most commonly used method for castration of lambs. Our estimate is 6-8 million male lambs each year in the UK.
- An alternative is required, one which sheep farmers will prefer to rubber rings and will enthusiastically adopt. This is a very ambitious target, because rubber rings are so cheap, quick/easy to apply and are reliably effective.
- We tried (2012) to improve rubber rings so that they would produce rapid anaesthesia, as can be achieved with a Burdizzo clamp. We did **not** succeed and concluded that rubber castration rings could not be made to achieve the necessary crushing pressure.
- However, we thought that the necessary crushing pressure might be achieved with a disposable castration clamp and this has evolved into the practical and potentially commercially viable solution called *CLAMPEASY*.

# Nerves to and from the scrotum and testes

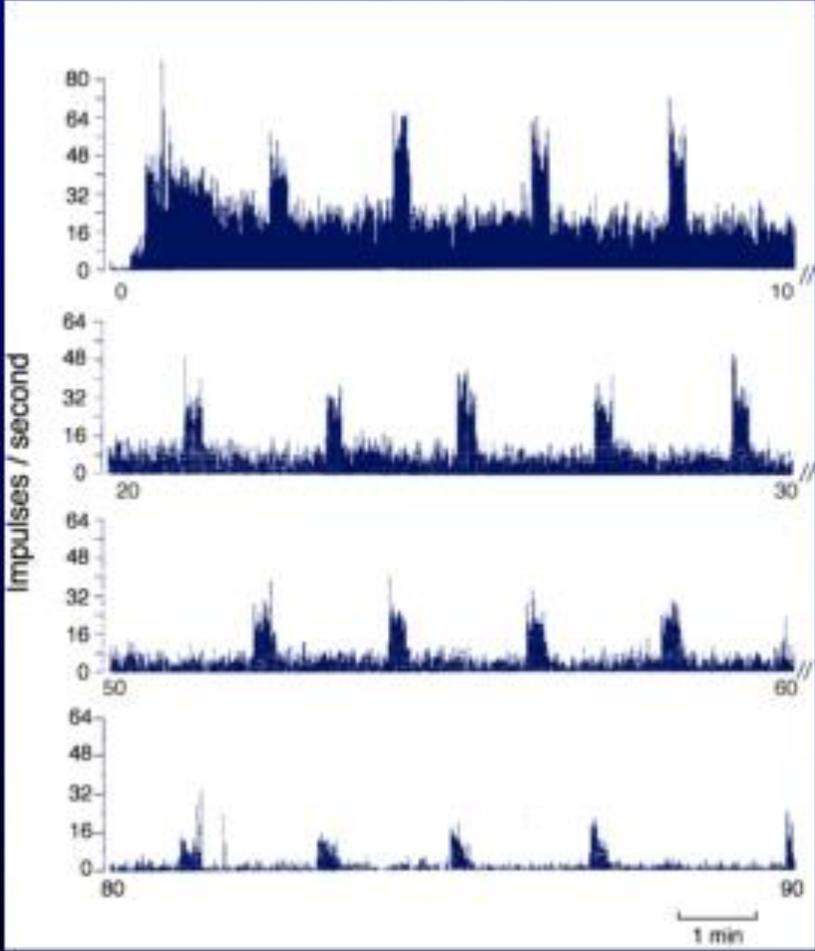


# Response of testicular receptors to controlled compression.

Without application of a rubber ring



After application of a rubber ring



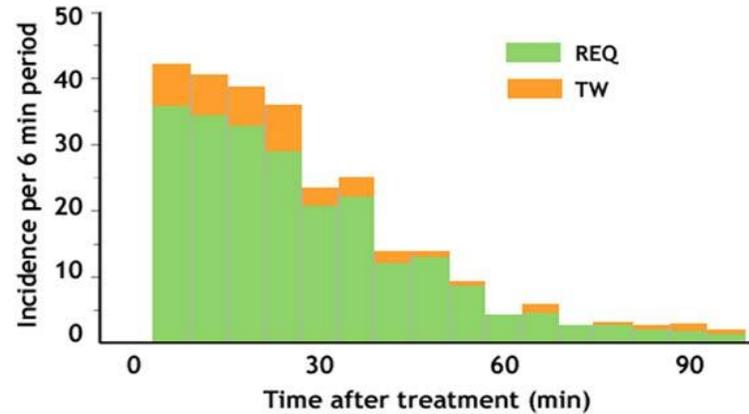
2-3min of one of our (VM/JEK) videos of lambs showing typical signs of pain in response to rubber rings.

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Your video (~2min) of many NCC lambs rolling and kicking after rubber ring castration, I'm not sure at whose farm.

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## The effect of rubber ring castration in lambs on the movement of their legs and tail

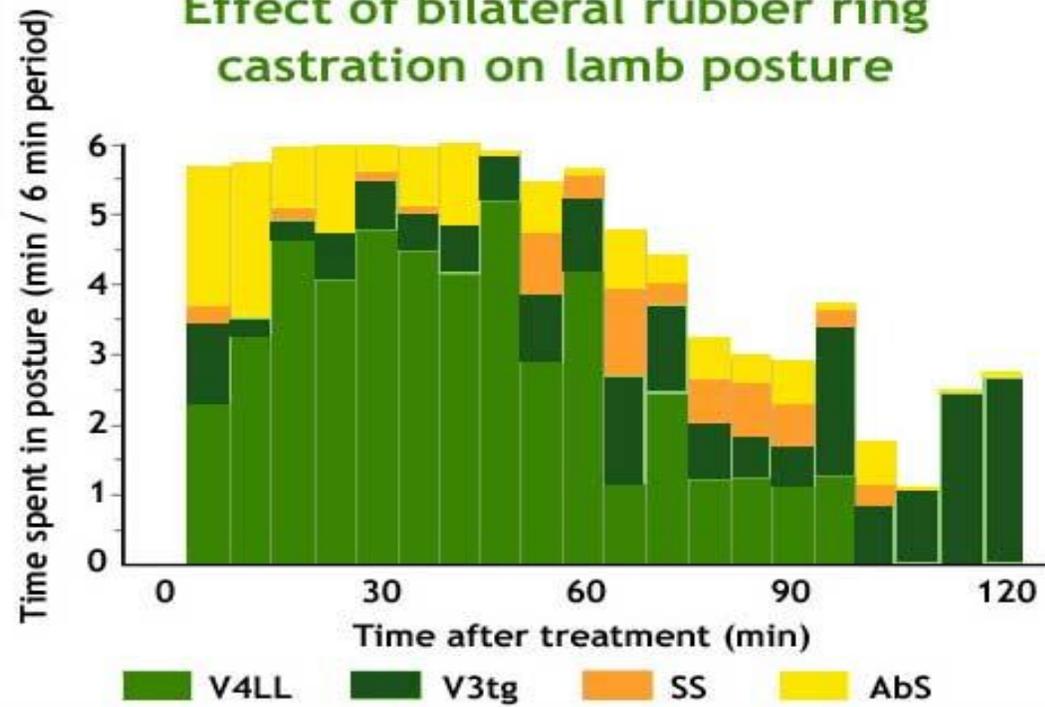


REQ - total incidence of getting up and down, jumping, rolling, foot stamping, kicking, stretching and easing quarters

TW - incidence of tail wagging

Note how most of lamb's time for the first 30 minutes after treatment is taken up performing these activities (more than six movements per minute).

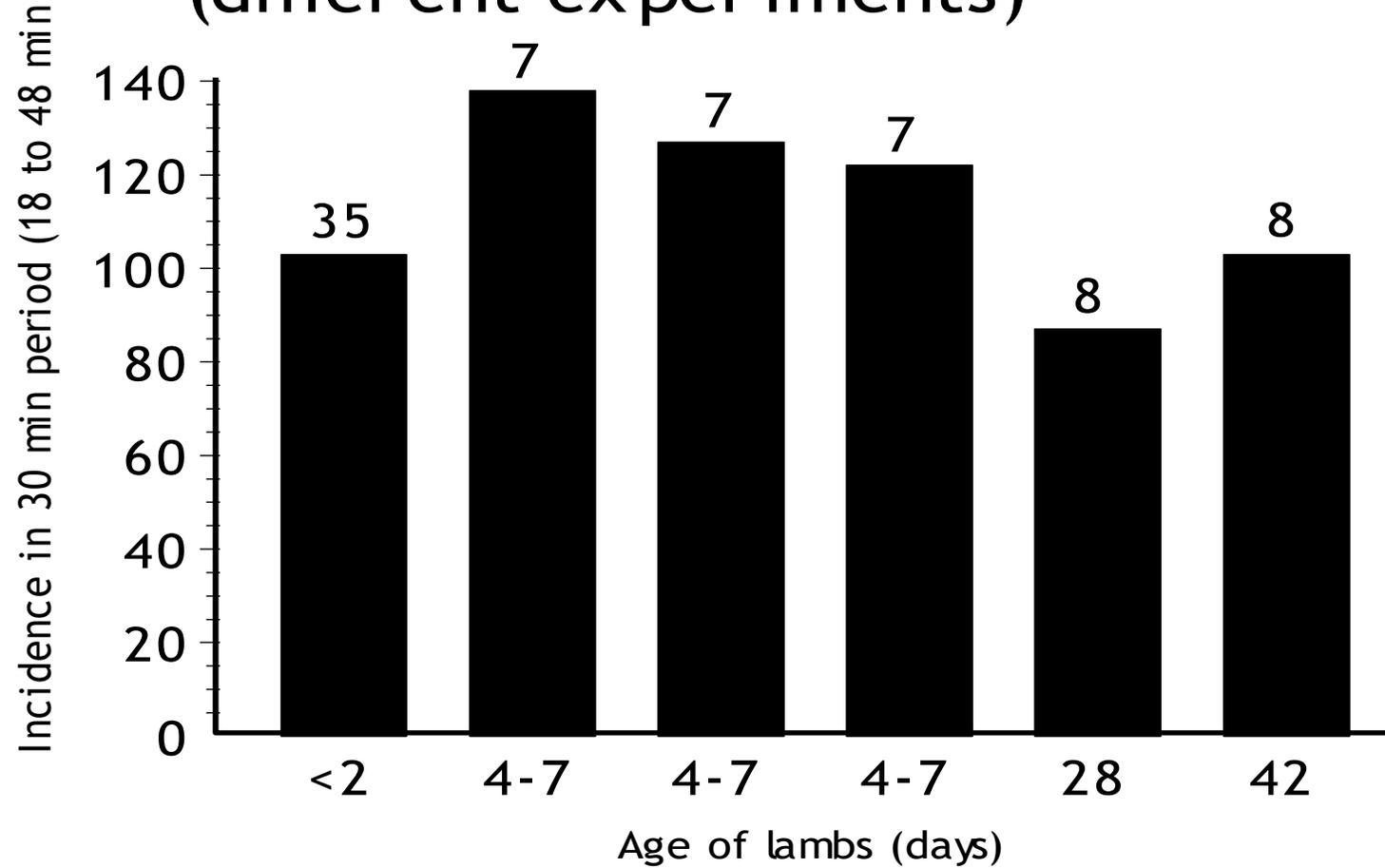
## Effect of bilateral rubber ring castration on lamb posture

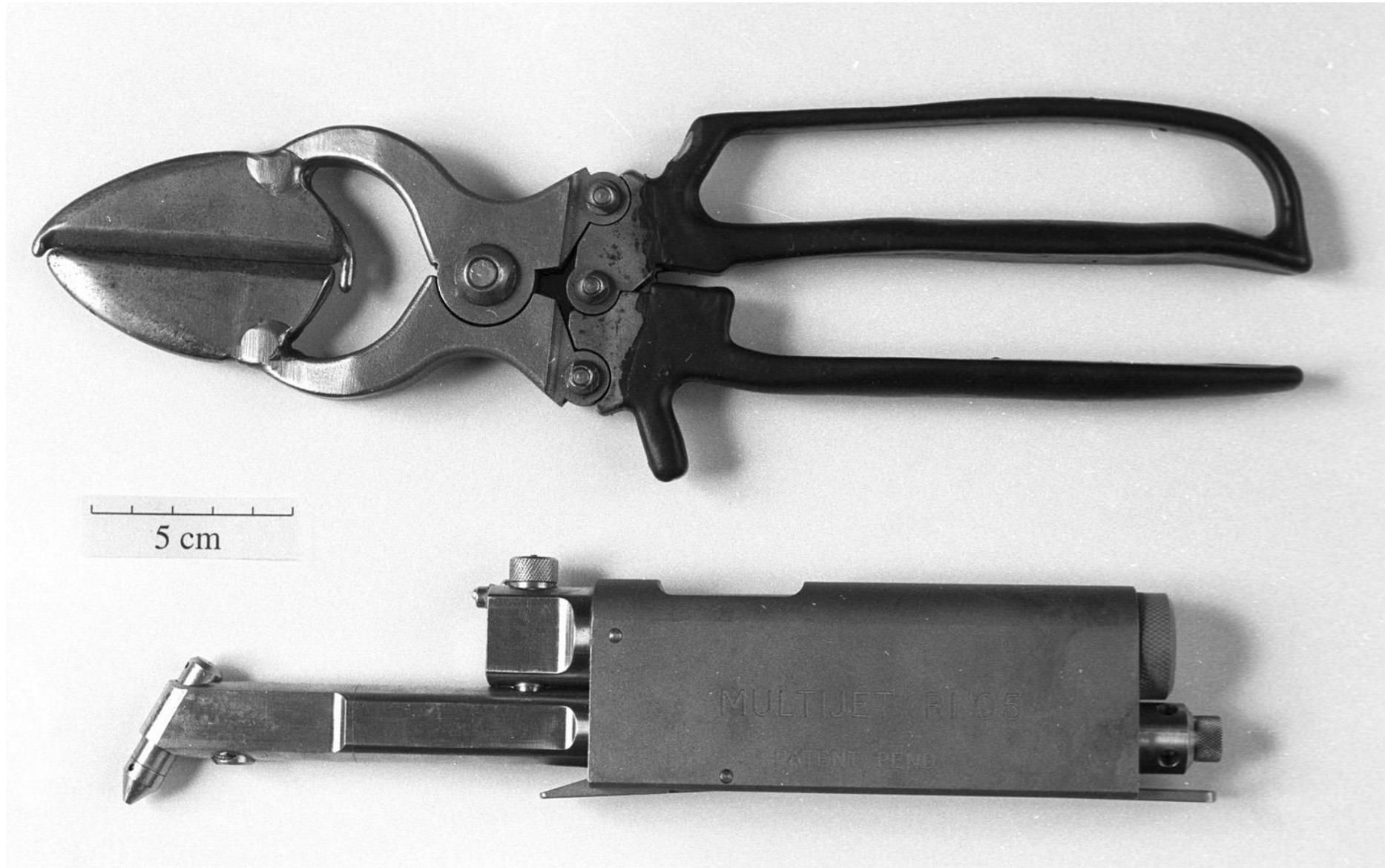


- V4LL - lying with full extension of the hind legs
- V3tg - lying in a normal posture but with trembling dog sitting or lying with partial extension of the hind legs
- SS - 'statue' standing
- AbS - standing with stretching, walking on knees, swaying, frequent tail wagging and stamping and falling over

Note how the whole of the animal's time is spent in abnormal postures for at least an hour.

# Effect of age at castration on REQ score (different experiments)

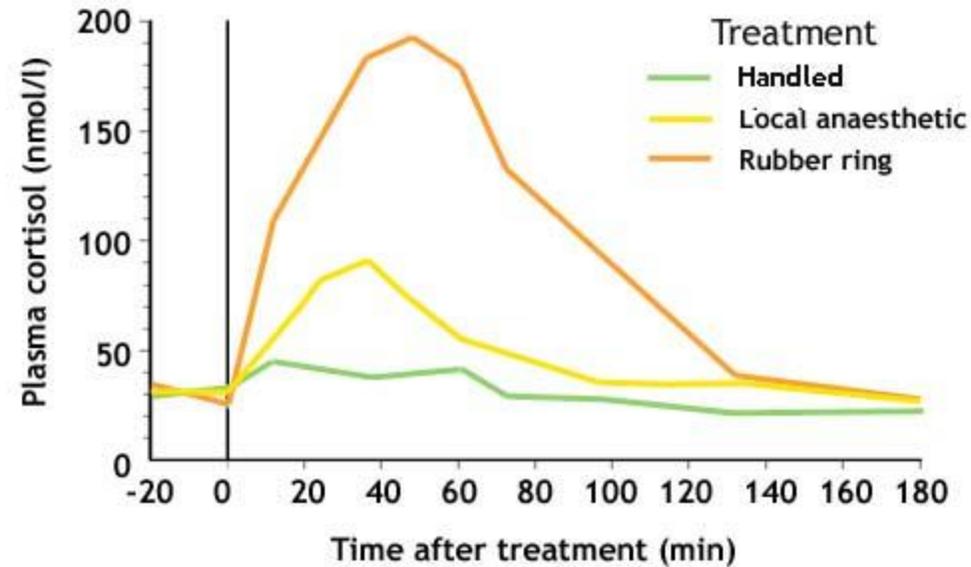






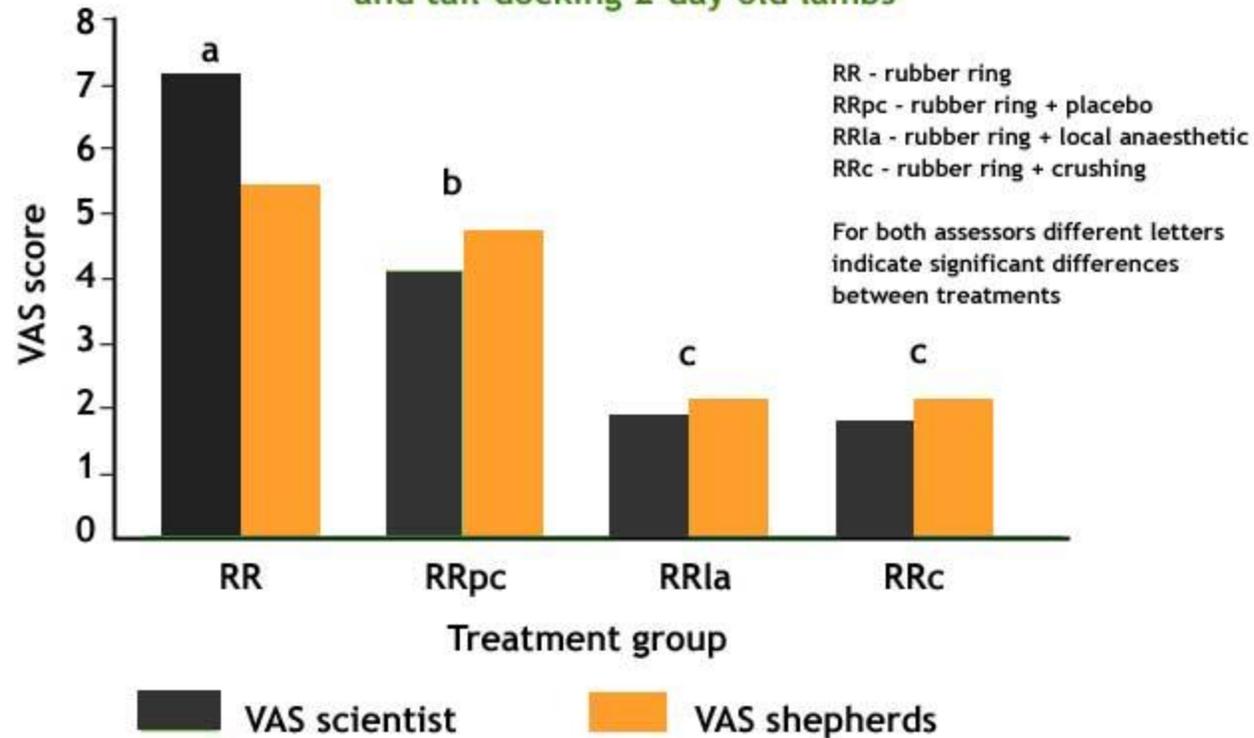


## Effect on plasma cortisol of rubber ring castration in lambs treated with or without local anaesthesia



The local anaesthetic did not completely remove the pain because, to reduce lamb handling, it was injected under the ring immediately after it was applied. However, it greatly reduced the response.

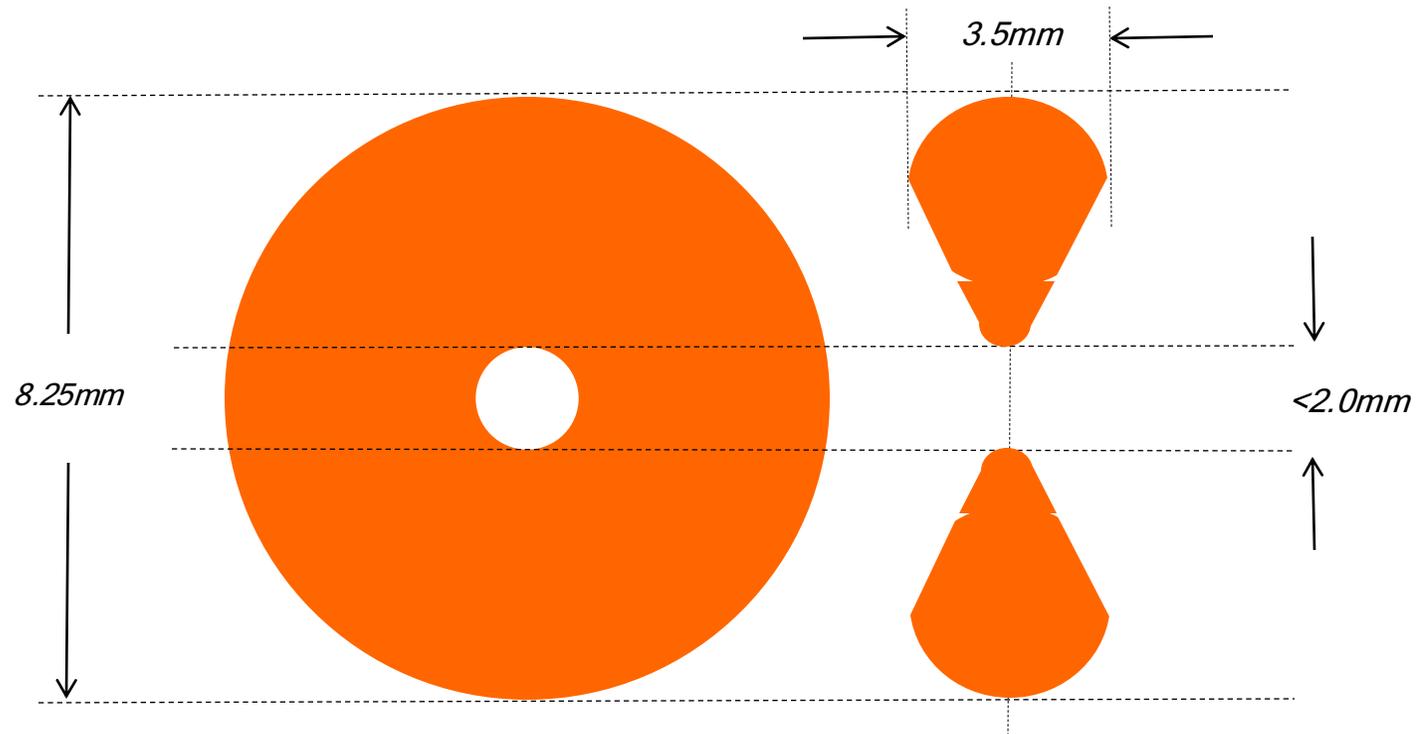
The use of VAS to show the effectiveness of pain-reducing techniques on the rubber ring method of castrating and tail-docking 2-day old lambs



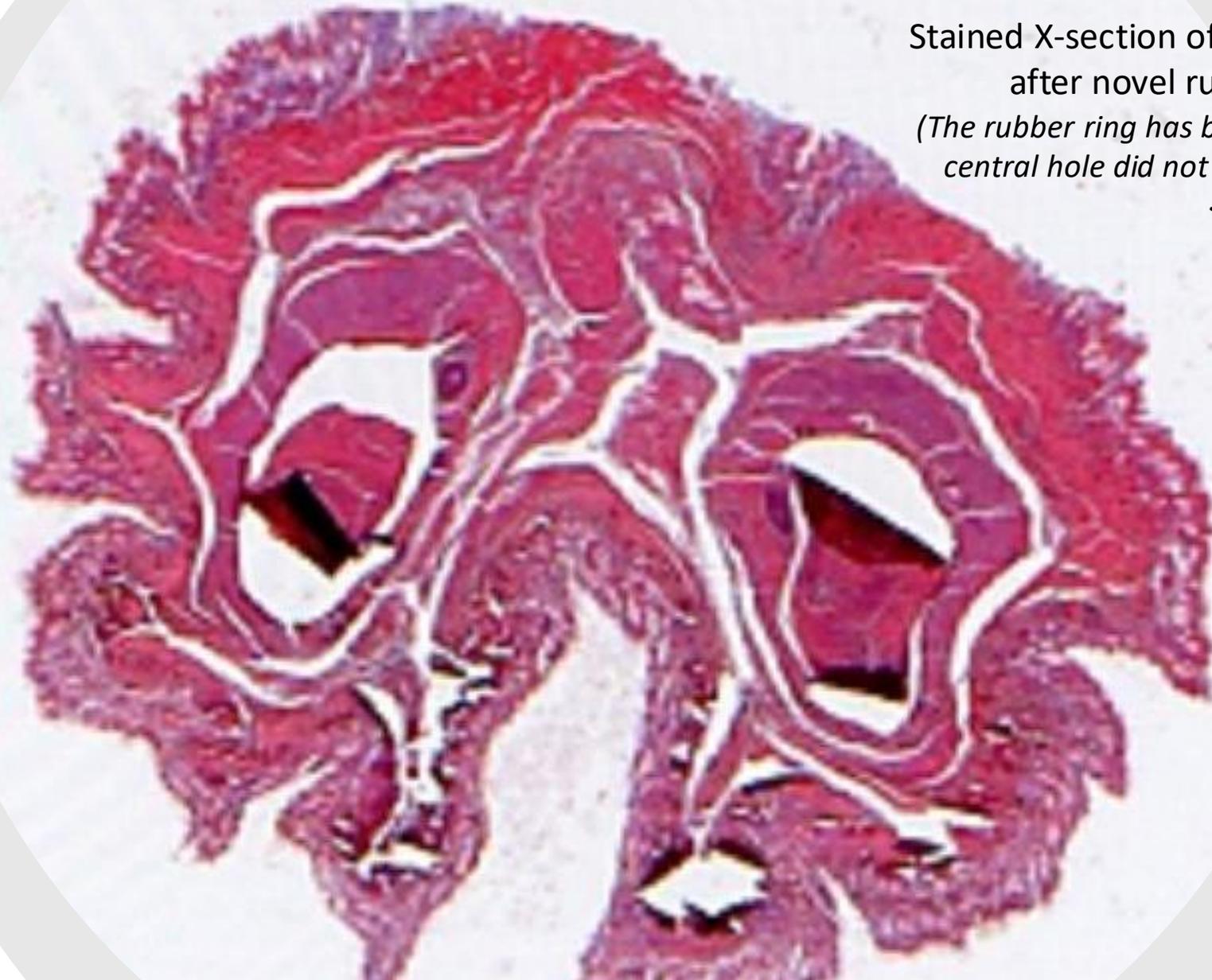
Both the local anaesthetic and crushing were considered, by both the scientist and the shepherds, to have reduced the pain following rubber ring castration and docking - this agreed with the results of the objective behavioural measurements. (Kent et al 2003)

By 2012 it was clear that alternatives were required because, in general, farmers did not adopt either local anaesthetic by injection or the 'Combined' method.  
So, we decided to try to make smaller, tighter rubber rings which would produce rapid anaesthesia like the Burdizzo.

*Dimensions for the unstretched novel rubber ring (Molony et al 2012)*



5 mm



Stained X-section of the neck of a cast scrotum  
after novel rubber ring castration.  
*(The rubber ring has been removed but note that its  
central hole did not reach its unstretched size of  
<2.0mm)*

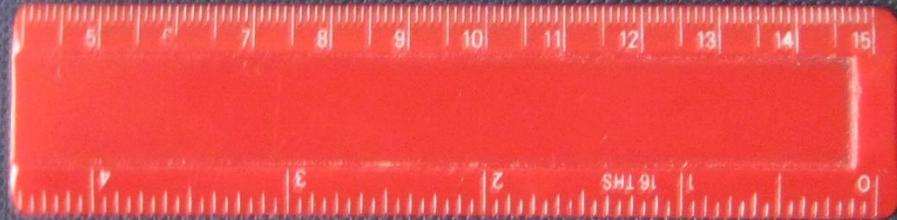
Around 2015 colleagues at the Moredun, in collaboration with 4C-design, decided to develop a practical, user-friendly system for the administration of local anaesthetic, i.e. more practical than a multi-dose syringe and needle or a needleless injector. This they have developed into the *Numnuts system*.

There was the possibility of another approach, and in 2017, with encouragement and help from Brian Eadie, we developed and tested an experimental castration clamp which has evolved into the *Clampeasy system*.

## The experimental castration CLAMP was intended to:

- Apply sufficient pressure to rapidly overcome the physical resilience (modulus) of the tissues at the neck of the scrotum in 6-8 week old lambs and to rapidly produce permanent local anaesthesia of the scrotum/testes by irreversibly disrupting conduction in nerves capable of carrying afferent nociceptor (*pain*) activity from the scrotum and its contents to the central nervous system. *Rubber rings do not do this.*
- Stop blood-flow to and from the scrotum and its contents, causing death and shedding of these tissues. *Rubber rings do this.*
- Seal the living tissues of the lamb, on the proximal side of the clamp, from the dying/dead tissues on the distal side of the clamp. *With rubber rings there can be leakage through tissues in the centre of the rubber ring.*
- Remain on the lamb until after adequate healing and scar formation has occurred on the lamb's side of the clamp (estimated at 7-14 days). *The clamp must not cut through the skin and other tissues causing the scrotum and its contents to be shed too early or an open wound would occur.*
- Be shed with the dead tissues after 14-21 days. *When rubber rings are used for castration of lambs of <1 week the rubber rings are shed, on average, after about 28 days (Kent et al 2000).*

**Future** clamps need to be biodegradable to avoid long-term environmental contamination. *It is not considered practical to expect farmers to retrieve 'shed' clamps for safe disposal.*





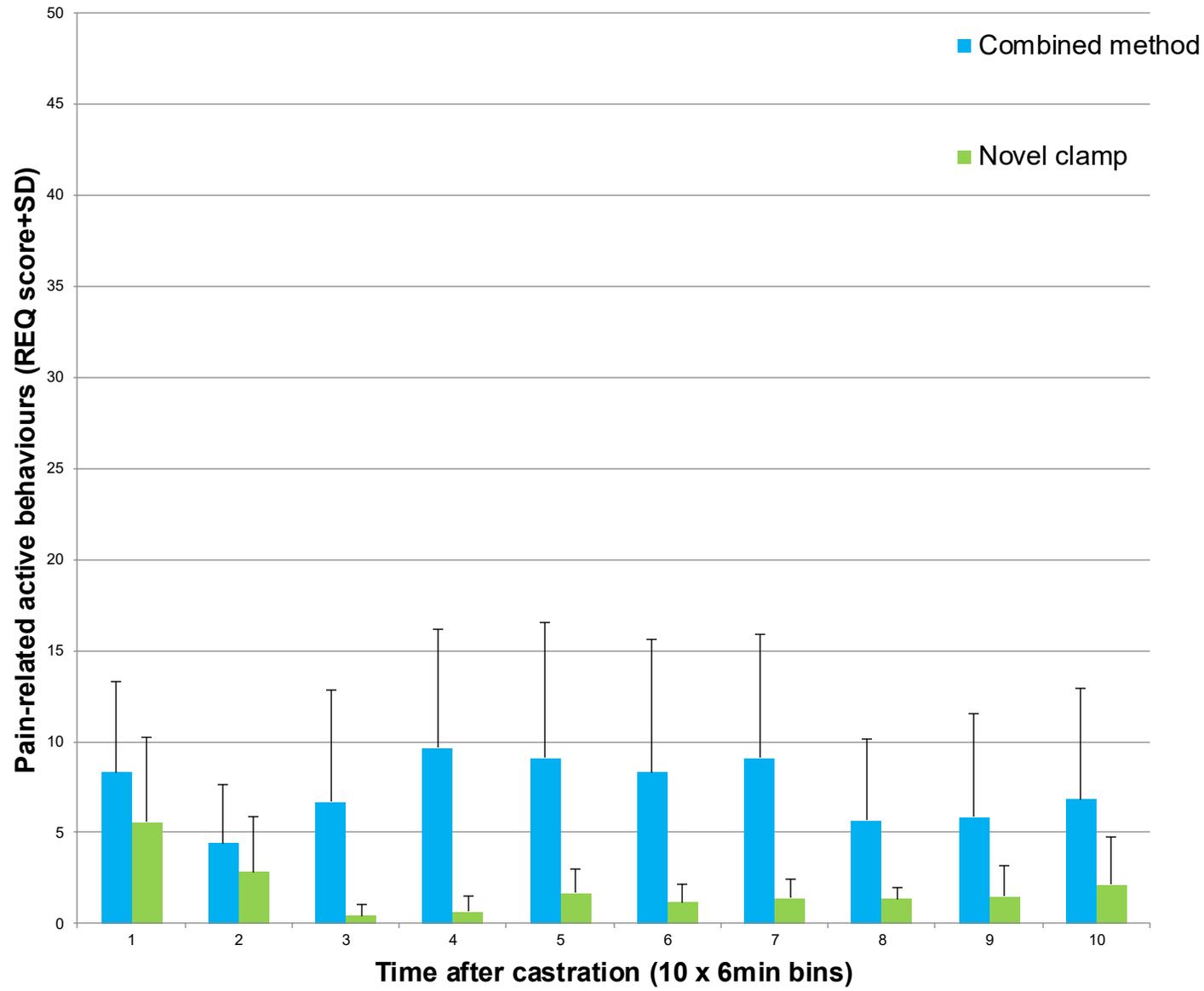


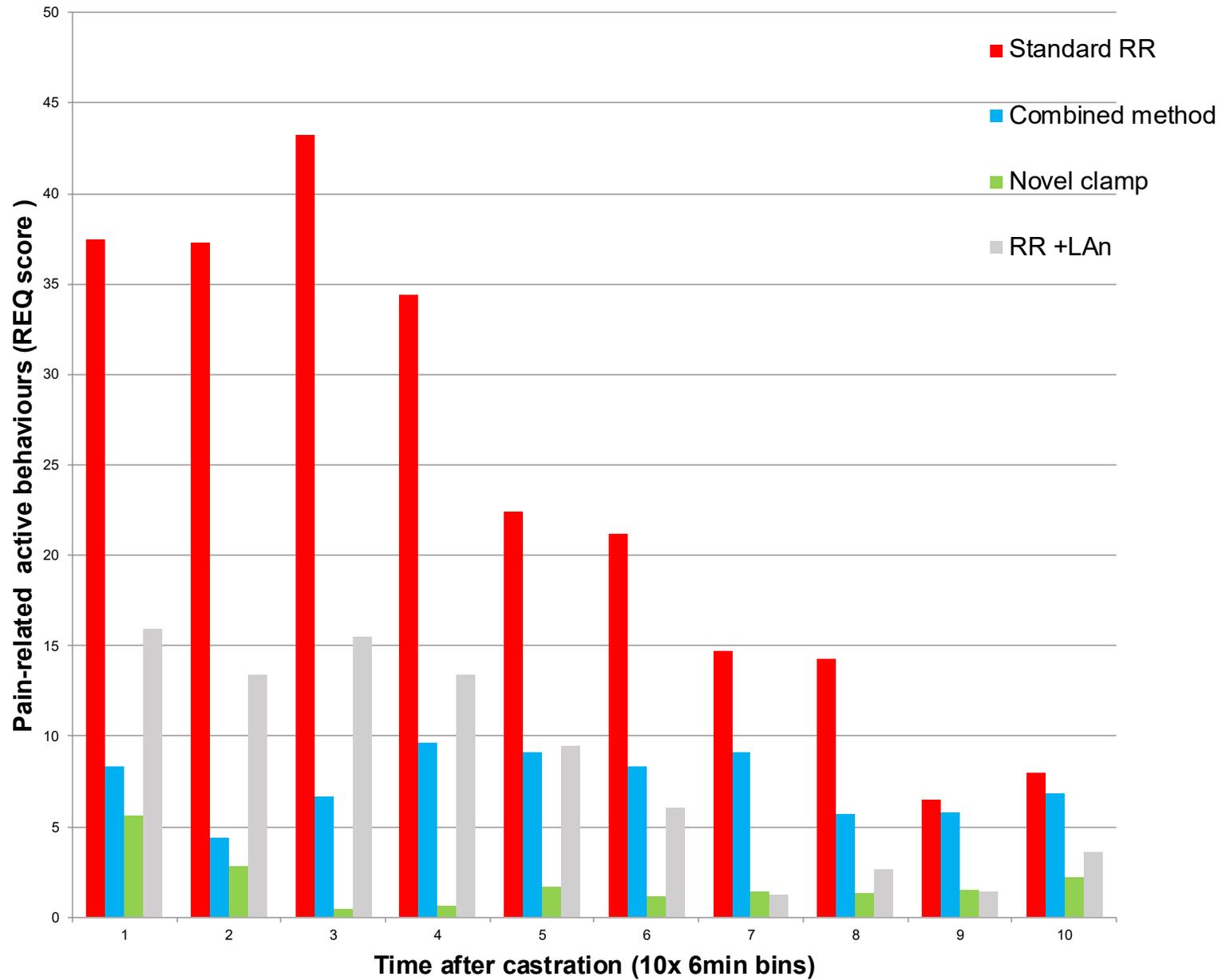
We carried out a *proof of concept* study, here, in March 2018 with the help of colleagues at SRUC, despite weather problems from the '*Beast from the East*'. We compared behavioural responses of groups of lambs (6-8 weeks old) castrated either with the new Clamp or with the 'Combined' method.

We considered the results of this small *proof of concept* study to be encouraging but editors and referees of the animal welfare journal, to whom we submitted a paper, rejected it.

However, I will show you a couple of histograms which illustrate the results.

In the 1<sup>st</sup> histogram we see the time-course of **mean** active pain-related behaviours (REQ score) after castration with the combined and novel clamp methods (**6-8** weeks Texel or Greyface X lambs) in the 2<sup>nd</sup> Histogram we have aligned these results for comparison with those after castration of **one**-week old Greyface-X lambs castrated with standard rubber rings and with rubber rings + Local Anaesthetic from our study of novel small rubber rings Molony et al (2012).





I will now show you a video, made by Brian Eadie, of the *Clampeasy system* being used along with other procedures on older lambs at the Humes' farm, Sundhope Yarrow, in the Scottish Borders.

Your video (~3 min) of lambs being subjected to various procedures at Callum Hume's farm.

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Your video (~2 min) of a large bunch of lambs after castration with *Clampeasy* next to a few lambs castrated with rubber rings. They are in separate pens and the ewes are in the next pen to the right.

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I would like to thank: Cathy Dwyer, Joyce Kent, Brian Eadie, Brian Falconer, Jo Donbavand, Sophie Prater, and other colleagues for their continuing encouragement and assistance with these studies.

The Scottish Government funds the SRUC animal welfare research which made these studies possible.

*“Thank you for your attention,  
we will try to answer any questions”.*