

## New Zealand Society of Animal Production online archive

This paper is from the New Zealand Society for Animal Production online archive. NZSAP holds a regular annual conference in June or July each year for the presentation of technical and applied topics in animal production. NZSAP plays an important role as a forum fostering research in all areas of animal production including production systems, nutrition, meat science, animal welfare, wool science, animal breeding and genetics.

An invitation is extended to all those involved in the field of animal production to apply for membership of the New Zealand Society of Animal Production at our website [www.nzsap.org.nz](http://www.nzsap.org.nz)

[View All Proceedings](#)

[Next Conference](#)

[Join NZSAP](#)

The New Zealand Society of Animal Production in publishing the conference proceedings is engaged in disseminating information, not rendering professional advice or services. The views expressed herein do not necessarily represent the views of the New Zealand Society of Animal Production and the New Zealand Society of Animal Production expressly disclaims any form of liability with respect to anything done or omitted to be done in reliance upon the contents of these proceedings.

This work is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](http://creativecommons.org/licenses/by-nc-nd/4.0/).



You are free to:

**Share**— copy and redistribute the material in any medium or format

Under the following terms:

**Attribution** — You must give [appropriate credit](#), provide a link to the license, and [indicate if changes were made](#). You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

**NonCommercial** — You may not use the material for [commercial purposes](#).

**NoDerivatives** — If you [remix, transform, or build upon](#) the material, you may not distribute the modified material.

<http://creativecommons.org.nz/licences/licences-explained/>

## BRIEF COMMUNICATION: Effect of disbudding on pain sensitivity and weight-gain of dairy goat kids

MN Hempstead<sup>a,b</sup>, M Stewart<sup>c</sup>, JR Waas<sup>b</sup> and MA Sutherland<sup>a</sup>

<sup>a</sup>AgResearch Ltd., Ruakura Research Centre, Hamilton, New Zealand, <sup>b</sup>School of Science, The University of Waikato, Private Bag 3105, Hamilton 3240, New Zealand; <sup>c</sup>InterAg, Ruakura Research Centre, Hamilton, New Zealand.

Corresponding author. Email: Mhairi.Sutherland@agresearch.co.nz

**Keywords:** Goat kids; disbudding, pain sensitivity; weight-gain

### Introduction

Cautery disbudding is a painful husbandry procedure commonly carried out on dairy cow and goat farms worldwide. Disbudding can cause third-degree burns, subcutaneous tissue damage, inflammation, bacterial infection and in some cases death (Sanford 1989, Thompson *et al.* 2005, Wright *et al.* 1983). Physiological (e.g., cortisol,  $\beta$ -endorphins) and behavioural (e.g., head shaking) changes indicative of pain have been described in response to cautery disbudding in kids (Alvarez *et al.* 2015, Greenwood & Shutt 1990, Ingvast-Larsson *et al.* 2011), but still little is known regarding the acute and long-term effects of cautery disbudding on goat kid welfare. Therefore, the aim of this study was to evaluate the effects of cautery disbudding on the acute pain response and weight-gain in goat kids. This study was part of a larger project investigating alternative methods of disbudding in goat kids.

### Materials and methods

#### Animals and housing

This study was conducted between July 28, and August 31, 2016, on 140 Saanen male (n=113) and female (n=27) goat kids (5.0±0.04 kg) aged 2 to 7 days (mean±SEM, 4.0±0.15 days) on a private commercial dairy goat farm in New Zealand. The study was approved by the Ruakura Animal Ethics Committee (Protocol No 13907).

Kids were housed with others not enrolled in the study and kept within large pens (9.2x3.0 m; approx. 50 kids per pen); the ground was covered with pine shavings (15 cm deep). The number of experimental kids per pen differed over the study period. Kids had access to milk *ad libitum* via a milk feeder, and fresh water in a trough. The daily temperature within the goat barn ranged between 22.5 and 4.5 °C (mean±SEM, 14.3±0.10°C).

#### Experimental design

At least one kid per treatment group was treated per experimental day. Kids were allocated to treatment groups (n=70/treatment) balanced for sex and age. Kids were either (i) cautery-disbudded using a gas-powered cautery iron (CAUT) or (ii) sham-disbudded by massaging each horn bud (SHAM). Prior to administration of the treatments, the hair covering the horn buds was removed using clippers to easily locate the horn buds. Pain relief was not administered. Following handling or disbudding, kids were placed into a holding pen (within their home pen; 2.5x1.5 m) until post-treatment measurements concluded.

#### Pressure algometry

Pain sensitivity was measured based on the protocol described by Heinrich *et al.* (2010). Pain sensitivity was measured 15 min before, and approximately 1 h following, disbudding or sham-disbudding using a digital pressure algometer (Force one FDIX 50, Wagner Instruments, Greenwich, CT, USA). The algometer was equipped with a circular rubber head (1 cm diameter), which was placed at one site directly behind the horn bud (away from the muzzle). The amount of pressure a kid tolerated before it moved its head was measured in kilograms of force (kgf) over the area of the rubber tip and was referred to as the mechanical nociceptive threshold (MNT). Downwards pressure was applied at a steady rate of approximately 1 kgf/s until the kid moved its head. The algometer automatically read the highest level of pressure applied, and was then reset before the next measurement was taken.

#### Weight-gain

Kids were weighed using a hanging digital scale (Kamer, Shoof, Cambridge, NZ) attached to a calf weigh cradle modified for kids. Weight was measured on the day of treatment, two days after treatment and then weekly for two weeks.

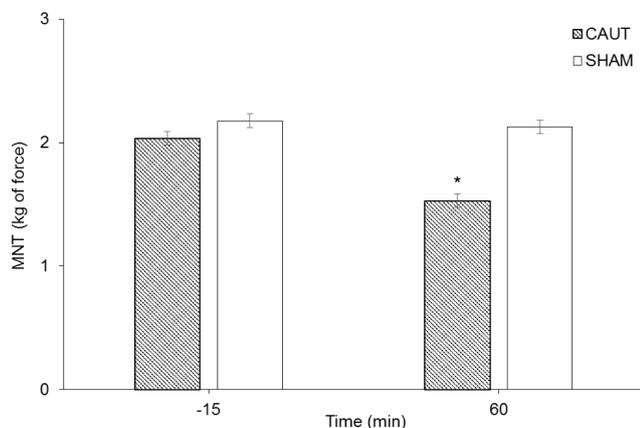
#### Statistical analysis

MNT and weight-gain data were analysed independently using an ANOVA in GenStat (Version 17, VSN International, Hemel Hempstead, UK). The models for both MNT and weight-gain included the fixed effects of treatment, time and their interaction and the random effects of treatment date and kid. The model had a repeated structure on time allowing incorporation of heterogeneity of variances across time. Differences in mean MNT and weight-gain were compared by Fisher's least significant differences test. Mean values were provided with approximate standard error of the difference. The level of significance was set at  $P \leq 0.05$ .

### Results

A treatment-by-time interaction for pain sensitivity ( $F_{1,129}=74.9$ ;  $P < 0.001$ ) was identified (Figure 1). CAUT and SHAM kids had similar MNT values 15 min before treatment ( $P=0.11$ ). At 1 h after treatment, less force was tolerated by CAUT kids compared with pre-treatment values ( $P < 0.01$ ). SHAM kids tolerated the same amount of pressure before as after treatment ( $P=0.55$ ). There was no effect of treatment ( $P=0.69$ ) or a treatment-by-time

**Figure 1** Mean ( $\pm$  SED) mechanical nociceptive threshold (MNT; kg of force), as measured by pressure algometry for goat kids that were either cautery disbudded (CAUT;  $n = 70$ ) or sham-handled (SHAM;  $n = 70$ ) at 15 min before treatment and 1 h after treatment. \* indicates differences from measurements 15 min before treatment at  $P < 0.01$ .



interaction on weight-gain ( $P=0.52$ ), however there was an effect of time ( $F_{2,94}=195.0$ ;  $P<0.001$ ). All kids had an average daily gain over two weeks of 0.15 kg ( $P\leq 0.05$ ).

## Discussion

This is the first study to evaluate the effects of cautery disbudding on pain sensitivity and weight-gain in goat kids. Cautery-disbudded kids tolerated less force around the horn bud area 1 h after cautery disbudding compared with before treatment values, indicating that these animals were more sensitive to pressure following treatment. SHAM kids had similar MNT values before and after treatment, which indicates that they were not more sensitive after handling and that kids did not have a learned response to pressure. Behavioural and physiological changes reported in response to cautery disbudding in kids (Alvarez *et al.* 2015, Hempstead *et al.*, 2017) and increased cortisol, heart rate and respiratory rates in disbudded calves (Allen *et al.* 2013, Heinrich *et al.* 2009) support the interpretation that this increase in tissue sensitivity after disbudding is due to pain. Similarly, Heinrich *et al.* (2010) found that pain sensitivity was greater in cautery-disbudded calves compared to calves that were disbudded with pain relief. It would be interesting to establish when sensitivity is reduced in disbudded goat kids.

In the present study, there was no difference in weight-gain between groups, which indicates there was no long-term effect of disbudding on weight-gain. Reduced weight-gain has been observed in calves disbudded without pain relief (Bates *et al.* 2015). Conversely, calves given pain relief prior to dehorning had higher average daily gains 10 days after treatment (Coetzee *et al.* 2012).

Based on our results, cautery disbudding appears to cause heightened pain sensitivity of the horn bud area, which may reflect reduced kid welfare.

## Acknowledgements

The authors gratefully acknowledge assistance from AgResearch staff. We also thank Hannah Josling, Kirsty Lyall, Laura Deeming and the participating DGC farmer. AgResearch gratefully acknowledges that this study was funded by the New Zealand Ministry of Business, Innovation and Employment (MBIE: Contract C10X1307) and the Dairy Goat Cooperative (NZ) Ltd (DGC).

## References

- Allen KA, Coetzee JF, Edwards-Callaway LN, Glynn H, Dockweiler J, Kukanich B, Lin H, Wang C, Fraccaro E, Jones M, Bergamasco L 2013. The effect of timing of oral meloxicam administration on physiological responses in calves after cautery dehorning with local anesthesia. *Journal of Dairy Science* 96: 5194-5205.
- Alvarez L, De Luna JB, Gamboa D, Reyes M, Sánchez A, Terrazas A, Rojas S, Galindo F 2015. Cortisol and pain-related behavior in disbudded goat kids with and without cornual nerve block. *Physiology & Behavior* 138: 58-61.
- Bates AJ, Eder P, Laven RA 2015. Effect of analgesia and anti-inflammatory treatment on weight gain and milk intake of dairy calves after disbudding. *New Zealand Veterinary Journal* 63: 153-157.
- Coetzee JF, Mosher RA, Kukanich B, Gehring R, Robert B, Reinbold JB, White BJ 2012. Pharmacokinetics and effect of intravenous meloxicam in weaned Holstein calves following scoop dehorning without local anesthesia. *BMC Veterinary Research* 8: 1-15.
- Greenwood PL, Shutt DA 1990. Effects of management practices on cortisol, b-endorphin and behaviour in young goats. *Australian Society of Animal Production, Adelaide, Australia* 18: 224-227.
- Heinrich A, Duffield TF, Lissemore KD, Squires EJ, Millman ST 2009. The impact of meloxicam on postsurgical stress associated with cautery dehorning. *Journal of Dairy Science* 92: 540-547.
- Hempstead MN, Waas JR, Stewart M, Cave VM, Sutherland MA 2017. Behavioural response to cautery disbudding in dairy goat kids. *Applied Animal Behaviour Science*. <http://dx.doi.org/10.1016/j.applanim.2017.04.001>.
- Ingvast-Larsson C, Hogberg M, Mengistu U, Olsen L, Bondesson U, Olsson K 2011. Pharmacokinetics of meloxicam in adult goats and its analgesic effect in disbudded kids. *Journal of Veterinary Pharmacology and Therapeutics* 34: 64-69.
- Sanford SE 1989. Meningoencephalitis caused by thermal disbudding in goat kids. *Canadian Veterinary Journal-Revue Veterinaire Canadienne* 30: 832-832.
- Thompson KG, Bateman RS, Morris PJ 2005. Cerebral infarction and meningoencephalitis following hot-iron disbudding of goat kids. *New Zealand Veterinary Journal* 53: 368-370.
- Wright HJ, Adams DS, Trigo FJ 1983. Meningoencephalitis after hot-iron disbudding of goat kids. *Veterinary Medicine & Small Animal Clinician* 78: 599-601.