ISSN 0370-2731/2000 *Proceedings of the New Zealand Society of Animal Production* **60:** 234-236

Behavioural response of calves to amputation dehorning with or without local anaesthesia

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ABSTRACT

This study tested the hypothesis that the expression of some specific behaviours of calves following amputation dehorning is modified by use of local anaesthesia such that their behaviour is similar to calves which were not dehorned, during the period of action of local anaesthesia. The hypothesis was not supported and the behaviour of calves given local anaesthesia was similar to animals dehorned without anaesthesia during the two hours after amputation dehorning and not similar to animals which were not dehorned. It is possible that the behaviours which were monitored (feeding, rumination, grooming, lying down, ear-flicks, head-shakes, tail-shakes) were not relevant to the pain experienced by calves after dehorning. However, there were significant differences between the behaviour of control animals and those that were dehorned. The physical change caused by dehorning and the bleeding that occur afterwards may influence these behaviours so that the additional effect of the pain caused by amputation does not modify it further.

Keywords: dehorning; behaviour; anaesthesia

INTRODUCTION

Dehorning cattle is a common farm practice. It is carried out to reduce the danger of injury to cattle and humans and to reduce bruising during transport and pre-slaughter. The process is usually carried out on dairy calves during the first few weeks of life when disbudding is done by cautery, but many calves are not dehorned until later when amputation dehorning is carried out. Amputation dehorning of beef calves using a scoop is common practice on many New Zealand farms.

Dehorning by amputation involves tissue destruction and causes pain and distress. Many calves are dehorned without any pain alleviation and observers often comment on the minimal change in behaviour following the rapid removal of small horns by amputation. The use of local anaesthesia to prevent the experience of pain during the process of dehorning and for a couple of hours afterwards is recommended as the plasma cortisol response suggests that acute pain caused by amputation dehorning is significantly reduced in the two hours after dehorning (Petrie *et al.*, 1996; McMeekan *et al.*, 1997, 1998; Sylvester *et al.*, 1998b).

The behaviour of calves given local anaesthesia before amputation dehorning was found to be similar to the behaviour of calves dehorned without pain relief by McMeekan *et al.*, (1999) when observations began two hours after treatment. This study was carried out to investigate the behaviour of calves from immediately after dehorning until 8 hours afterwards by continuous observation. The hypothesis being tested was that the behaviour of cattle following amputation dehorning is modified by use of local anaesthesia such that their behaviour, during the period of action of local anaesthetic, is similar to calves that were not dehorned.

MATERIALS AND METHODS

Animals: Forty-eight Friesian bull calves of about 6 weeks of age held on Massey Dairy Farm number 4 were used in the trial. These calves were due to be dehorned as part of farm management practice. They were housed in an open shed, fed colostrum once daily and had *ad libitum* access to calf pellets, straw and water. The calves were in four groups each of about 16 animals.

During the trial, three calves were placed in each of four small pens the evening before treatment and had access to pellets, straw and water. On the day of the trial the calves were treated and their behaviour was monitored using video cameras for 8 hours from immediately after treatment.

Each day four pens (12 calves) were monitored and the trial was carried out over 4 days in September 1997.

Treatments: The calves were subjected to one of four treatments (control, local anaesthetic control, local anaesthetic followed by amputation dehorning, amputation dehorning). The treatment for each calf was randomly allocated.

Control (n = 12, C); calves were caught in the small pen, held by two persons and their horn bud massaged briefly.

Local anaesthetic control (n = 12, LAC); calves were caught in the small pen, held by two persons and 5ml of 2% lignocaine (Lopaine, Ethical Agents Ltd, Auckland) was injected around each cornual nerve (Weaver, 1986) 20 minutes prior to the calf having its horn buds massaged.

Local anaesthetic plus scoop dehorning (n = 12, LADH); the horns were removed by scoop dehorner (see below) 20 minutes after the calves had received local anaesthetic as described above, is similar to calves which were not dehorned.

Amputation dehorning (n = 12, DH); the horns were removed with a dehorning scoop (Barnes Dehorners, Stones, USA) as described by Petrie *et al.* (1996).

The effect of local anaesthetic was tested by pricking the area around the horn bud with a needle. If the calf responded a further dose of local anaesthetic was given and the area re-tested 20 minutes later. If the calf did not respond it was concluded that local anaesthesia was effective.

Measurement of behaviours: The monitoring of behaviours began immediately after treatment using a videotape and the tapes were read later by an observer who was ignorant of the treatment each calf received. The behaviour of each calf was videotaped for eight hours. Nine behaviours were recorded from the screened videotapes on

pre-prepared data sheets. All the behaviours were counted or measured on an hourly basis.

The behaviours monitored were, lying down (the number of times a calf lay down), eating straw (time each calf spent eating straw was measured in minutes), eating pellets (time each calf spent eating pellets was measured in minutes), rumination (the number of rumination bouts), tail shakes (when a tail moved to the left or the right it was counted a single tail shake), ear flicks (ear-flicks occur when an individual ear moved laterally or medially which was counted as an ear- flick or when both ears moved simultaneously the simultaneous movements were also counted a one ear-flick), head shakes (each individual shake of the head was counted), self grooming (each bout of grooming was counted) and scratching (each bout of scratching on the pen wall or equipment was counted).

It was assumed that most of the data did not fulfil the presuppositions of normal distribution and so nonparametric statistical methods were applied. Significant differences between the four treatment groups (C, LAC, LADH, DH) were determined using the Mann-Whitney U-test and p values less than 0.05 were considered significant.

These procedures were carried out gaining approval by the Massey University Animal Ethics Committee.

RESULTS

The monitoring of calf behaviour was carried out successfully with few technical problems. There was no problem with excessive bleeding.

There were no significant differences between the C and LAC calves except the latter had significantly more ear flicks and did more scratching over the eight-hour period (Table 1). All of the behaviours of LADH calves and many of those of DH calves were significantly different from C and LAC calves during the 2-hour and/or the eight-hour periods (Table 1).

TABLE 1. The behaviour of calves (mean(range)) during the two and eight hours after amputation dehorning with or without administration of local anaesthesia

Treatment	Control	Local Anaesthetic (LA) Control	Dehorning after LA	Dehorning
Behaviour				
Lying Down	(number of times animals lay down)			
2 hours	2.4 (0-5)	2.8(1-5)	5.3(1-17)c	3.0(0-7)
8 hours	8.3(4-12)	9.9(5-15)	12.0(6-25)c	9.4(4-17)
Grooming	(number of bouts of grooming)			
2 hours	8.9(1-19)	9.5(2-16)	10.2(4-35)cl	10.2(1-27)
8 hours	32.6(8-66)	34.1(23-70)	30.6(16-57)d	19.3(1-53)cl
Scratching	(number of bouts of scratching against pen walls or fittings			
2 hours	1.6(0-17)	2.9(1-34)	2.92(1-7)d	1.1(0-6)c
8 hours	8.3(0-5)	11.2(0-12)c	4.2(0-5)c	2.1(0-2)cl
Head shakes	(number of bouts of head shaking)			
2 hours	2.3(0-6)	5.8(0-17)	33.2(0-200)	29.3(2-92)cl
8 hours	7.1(2-19)	15.1(1-69)	59.1(7-362)cl	48.2(3-136)c
Ear flicks	(number of individual ear flicks)			
2 hours	1.4(0-4)	4.0(0-18)	21.1(0-132)c	32.8(0-196)cl
8 hours	4.1(0-10)	10.3(2-21)c	58.9(3-408)cl	79.8(4-386)cl
Tail shakes	(number of individual tail shakes)			
2 hours	20.0(6-42)	60.0(0-318)	324.0 (0-2400)cl	305.9 (6-978)cl
8 hours	144.8 (48-348)	254.0 (60-858)	950.3 (126-4194)cl	888.8 (24-2478)cl
Rumination	(number of bouts of rumination)			
2 hours	0.5(0-1)	0.8(0-2)	0.5(0-2)	0.1(0-1)cl
8 hours	3.3(0-7)	3.3(0-6)	1.6(0-4)cl	0.9(0-2)cl
Straw feed	(minutes feeding on straw)			
2 hours	4.3(0-7)	2.7(0-8)	2.7(0-17)d	0.8(0-5)cl
8 hours	9.6(0-24)	5.3(0-17)	3.6(0-17)c	4.5(0-21)c
Pellet feed	(minutes spent feeding on pellets)			
2 hours	6.9(0-28)	4.6(0-14)	5.2(1-17)cl	2.8(0-7)
8 hours	29.3(10-53)	26.5(16-37)	16.5(1-36)	11.1(2-31)c

c = significantly different from control
l = significantly different from local anaesthetic control
d = significantly different from dehorning

DISCUSSION

The results do not support the hypothesis that the use of local anaesthesia results in the behaviour of dehorned animals remaining similar to that of control animals during the period of action of local anaesthesia. The LADH animals spent less time feeding, had fewer rumination bouts and were more restless (lay down more frequently) than the control animals and also had more head shakes, ear flicks, tail shakes than them. In addition the behaviour of the LADH calves was very similar to the DH calves except they spent more time eating straw and did more scratching in the two-hour period (Table 1). That the behaviour of DH and LADH calves is similar during the complete 8 hours is expected as this mirrors the overall plasma cortisol response (Sylvester *et al.* 1998a,b; Petrie *et al.*, 1996; McMeekan *et al.*, 1997, 1998, 1999).

The similarities in behaviour of LADH and DH calves during the two hours after dehorning is unexpected as during this time the local anaesthetic is effective, an observation supported by the plasma cortisol responses of calves which were lowered to control levels by local anaesthesia during this period (Petrie *et al.*, 1996; McMeekan *et al.*, 1997,1998). These results suggest that the dehorning of calves result in significantly modified behaviour that is not influenced by local anaesthesia. The modified behaviour may be due to bleeding and the irritation caused by it rather

than the pain *per se* or the irritation due to bleeding may be sufficient to override any additional behavioural changes stimulated by the pain of dehorning.

In other studies, local anaesthesia did not significantly change the behaviours induced during the first four hours after disbudding by cautery (Morisse *et al.*, 1995), nor did it influence the behaviour of calves dehorned by amputation (McMeekan *et al.*, 1999). However Graf and Senn (1999) found that calves disbudded by cautery without local anaesthesia showed more head shaking and less head pushing in the hour after dehorning than calves given local anaesthesia and that the calves given local anaesthesia also fed more in the 2 hours after dehorning (Graf and Senn, 1999) as did the calves in this study. It may be that there are behaviour differences in the first hour after dehorning/ disbudding between calves given or not given local anaesthesia and that these differences are diluted during the second hour when the effect of the local anaesthetic is wearing off such that they become non-significant.

It is possible that the behaviours monitored and the methods used in this study were not sufficient to identify subtle changes in calf behaviour. These behaviours do not fulfil the second of the five principles, developed by Dinniss *et al.* (1999), which are necessary in order to use behaviour to assess welfare namely that Abehaviour elicited by treatment can be validated as measures of noxious sensory experience if effective local anaesthesia returns levels close to those seen in control animals.

Amputation dehorning is a painful experience and it was expected that effective local anaesthesia would modify the behaviour presumed to have been stimulated by the pain and distress. That it did not do so suggests that there may be less variation in behavioural response to serious injury than expected and that behaviours may be inadequate to assess and compare the pain caused by any specific insult.

The quantitative methodology used in this study was ineffective in identifying differences in the behaviour of animals given pain relief and those not given it. An alternative qualitative assessment of animal behaviour by a number of observers, as demonstrated by Wemelsfelder (1999), may be necessary to compare the experience of cattle under conditions of acute pain as occurs during dehorning.

ACKNOWLEDGEMENTS

We would like to thank Karen Spanne from Norway and Clarissa Brown-Douglas for help with this project. The staff at Massey Dairy Farm number 4 were extremely cooperative. The research was supported financially by the MAF POLICY and we would like to thank Dr. David Bayvel for his support.

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