

Recent Research into Animal Welfare Issues Concerning Routine Surgical Procedures Associated with Cattle Production Systems

Natalie Adby

Castration and dehorning are routine surgical procedures carried out at calf marking. Although they are acknowledged to be painful (Faulkner & Weary, 2000; Mellor *et al.*, 2002), they are considered necessary for economic, safety and quality-control reasons (Irwin, 2004; Irwin & Walker, 1998). In New South Wales, castration by surgical-cut, surgical-pull or Burdizzo emasculation, involving the use of a device that non-invasively crushes and destroys blood vessels supplying the testicles, is performed without veterinary supervision, analgesia or anaesthesia in animals up to six months old (Irwin, 2004). Similarly, hot-iron, knife, spoon and tube disbudding and cup or scoop dehorning do not require veterinary supervision or anaesthesia in stock under the age of 12 months (Irwin & Walker, 1998). Growing public concern regarding the welfare of production animals requires that alleviation of the pain and distress associated with castration and dehorning be addressed.

Schwartzkopf-Genswein *et al.* (2005) investigated the responses of 29 Holstein calves to dehorning and castration. Using sound, repeated measures methodology, the calves' physiological (i.e., heart rate and plasma cortisol concentration) and behavioural (i.e., vocalising, kicking, struggling, falling and tail-flicking) responses to control, sham and actual procedures were recorded. External variables, including handling stress and separation anxiety, were controlled. Dehorning and castration elicited significantly elevated physiological and behavioural distress responses compared to control and sham procedures. Hot-iron dehorning induced a more immediate response (less than four hours), while surgical castration evoked a prolonged response (24 to 48 hours).

Schwartzkopf-Genswein *et al.*'s 2005 findings strongly indicate that pain is a major cause of distress in animals undergoing castration and dehorning. Results suggest that appropriately timed administration of analgesia or anaesthesia may be required to manage this pain humanely. Slight inconsistencies between physiological and behavioural results in this study highlight the importance of utilising all available measures of distress when undertaking such research (Schwartzkopf-Genswein *et al.*, 2005).

A key argument against routine use of analgesia and anaesthesia when performing surgical procedures on calves is the perceived unsustainability of associated costs incurred by the cattle industry. In response to this, Stafford *et al.* (2005) undertook a financial-impact analysis of New

Zealand cattle farmers, individually and nationally, regarding use of analgesia during calf castration.

Taking into account 2002 national farm production statistics, farm labour, medicinal and veterinary costs, Stafford *et al.* (2005) compared four scenarios: the status quo; local anaesthesia administered by farmers; local anaesthesia and systemic analgesia administered by farmers; and castration by veterinarians. Predictably, the cost of castration rose with increased implementation of analgesia and veterinary intervention. Importantly, however, expenses attributed to analgesia-assisted castration, even when involving veterinary intervention, remained relatively low compared to total farm costs. Additionally, the major portion of veterinary intervention expenses were attributed to labour, travel and call-out costs, not supply of analgesia.

Stafford *et al.*'s 2005 findings help to disclaim cattle industry concerns that use of analgesia during routine surgical procedures on calves is an unsustainable financial burden. To be effectively incorporated into current cattle production systems, however, management and legislative issues would need to be addressed. These include cushioning financial inconveniences to farmers associated with planning husbandry activities around veterinarian availability (Stafford *et al.*, 2005) and potentially relaxing aspects of current legislation covering administration of medicine.

An alternative approach to addressing animal welfare concerns regarding castration and dehorning, is investigation of techniques potentially associated with decreased animal distress and discomfort. Vickers *et al.* (2005) compared behavioural responses of calves to hot-iron and caustic paste dehorning using sedation (xylazine), with and without local anaesthesia (lidocaine). Calves dehorned with hot-iron, sedation and local anaesthesia showed significantly more pain-related behaviour (i.e., head rubs, head shakes and transitions) in the initial four hours than those chemically dehorned and sedated. No significant effect was found of dehorning method upon frequency of observed distress behaviours during the period five to twelve hours post dehorning.

Vickers *et al.* (2005) claim that their findings indicate that chemical dehorning is less painful than hot-iron dehorning. Theoretical and methodological inconsistencies in the study, however, raise questions regarding the validity of this assumption.

Tissue damage associated with heat burns is primarily restricted to the duration and location of administration, while damage inflicted by caustic burns worsens with increased tissue contact time (Yano *et al.*, cited in

Vickers *et al.*, 2005). It is possible that the twelve-hour observation window in Vickers *et al.*'s (2005) study was of inadequate length to properly assess the long-term pain associated with chemical dehorning. They note themselves that 'The number of head shakes in calves treated with caustic paste appeared to increase at 12 h...' (p. 1458).

Morisse *et al.* (1995) found that chemically dehorned four-week-old calves showed greater plasma cortisol responses than eight-week-old hot-iron disbudded calves. Additionally, Stafford *et al.* (2005) note that chemical dehorning is associated with multiple adverse consequences, including accidental burning of eyes, burning of suckling cow udders and multiple treatment applications. Evidently, further peer-reviewed research into the animal welfare benefits of chemical dehorning is required.

Methodological concerns regarding the Vickers *et al.* (2005) study include small sample sizes (i.e., groups of ten or less), compounded by loss of data through video malfunction, the use of observed behaviour alone as the pain-associated response variable and possible confounding of results by uncontrolled external factors (e.g., calf separation anxiety).

Petherick's review article (2005) notes that immunisation against gonadotrophin-releasing hormone (GnRH) and GnRH agonists are being explored as alternatives to surgical castration. Although these methods require repeated administration and are less reliable than current practices, future research is warranted because of the potential animal welfare benefits associated.

Pain associated with calf castration and dehorning is an important welfare issue for Australian production animals. Research outlined in this paper has provided valuable information regarding associated animal distress, the financial impact of analgesia and the development of alternative procedures. Further research into less invasive procedures and an Australian financial impact study paralleling Stafford *et al.*'s 2005 study would prove valuable resources for furthering cattle welfare. Ultimately embracing non-invasive measures, such as breeding for polled cattle, would be desirable.

References

- Faulkner, P.M. and Weary, D.M. (2000) Reducing pain after dehorning in dairy calves. *J. Dairy Sci.*, *83*, 2037-2041.
- Irwin, J. (2004) *Castrating Calves: Agfact AO.2.6*. NSW Department of Primary Industries, the State of New South Wales, Australia.
- Irwin, J. and Walker, B. (1998) *Dehorning Calves: Agfact AO.2.4*. NSW Department of Primary Industries, the State of New South Wales, Australia.
- Mellor, D.J., Stafford, K.J., Todd, S.E., Lowe, T.E., Gregory, N.G., Bruce, R.A. and Ward, R.N. (2002) A comparison of catecholamine and cortisol responses of young lambs and calves to painful husbandry procedures. *Aust. Vet. J.*, *80*, 228-233.
- Morisse, J.P., Cotte, J.P. and Huonnic, D. (1995) Effect of dehorning on behaviour and plasma cortisol responses in young calves. *Appl. Anim. Behav. Sci.*, *43*, 239-247.
- Petherick, J.C. (2005) Animal welfare issues associated with extensive livestock production: the northern Australian beef cattle industry. *Appl. Anim. Behav. Sci.*, *92*, 211-234.
- Schwartzkopf-Genswein, K.S., Booth-McLean, M.E., McAllister, T.A. and Mears, G.J. (2005) Physiological and behavioural changes in Holstein calves during and after dehorning or castration. *Can. J. Anim. Sci.*, *85*, 131-138.
- Stafford, K.J. and Mellor, D.J. (2005) Dehorning and disbudding distress and its alleviation in calves. *Vet. J.*, *169*, 337-349.
- Stafford, K.J., Mellor, D.J., Dooley, A.E., Smeaton, D. and McDermott, A. (2005) The cost of alleviating the pain caused by the castration of beef calves. *Proc. N.Z. Soc. Anim. Prod.*, *65*, 123-126.
- Vickers, K.J., Niel, L., Kiehlbauch, L.M. and Weary, D.M. (2005) Calf response to caustic paste and hot-iron dehorning using sedation with and without local anaesthetic. *J. Dairy Sci.*, *88*, 1454-1459.