Effects of three dehorning techniques on behavior and wound healing in feedlot cattle

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ABSTRACT: Crossbred horned steers and heifers (n = 40; BW = 311.8 ± 4.7 kg) were used to determine the effect of dehorning methods on pain, cattle behavior, and wound healing. Cattle were blocked by weight and randomly assigned to 1 of 4 treatments: 1) control (CON), 2) banded using high tension elastic rubber (BAND), 3) mechanically removed (MECH), or 4) tipped (TIP). Vocalization and behavior were recorded during the dehorning process. Wound healing scores, attitude, gait and posture, appetite, and lying were recorded daily. Vocalization scores were highest for MECH cattle and BAND cattle vocalized more than TIP and CON (P < 0.05). Attitude (P = 0.06), gait and posture (P = 0.06), and lying scores (P < 0.05) were higher for BAND cattle in the days following procedures compared to MECH, TIP, and CON cattle. Cattle in the BAND treatment tended (P < 0.13) to have higher appetite scores than the other methods. Wound healing scores (horn bud and bleeding) were higher for BAND cattle than MECH, TIP, and CON cattle (P < 0.05). These data indicate that MECH is a painful procedure for cattle at the time of the procedure. Banding to remove horns from cattle is not recommended based on the data and observations from this study.

Key words: animal welfare, behavior, cattle, dehorning, feedlot, pain

INTRODUCTION

It is a common practice to remove the horns of cattle when they arrive at feeding facilities. Routine animal husbandry techniques such as castration and dehorning have been used in dairy and beef production systems to improve the performance of cattle and decrease amount injuries to other cattle and animal handlers (Garry, 2004; Stafford and Mellor, 2009). There is an increase in bruising on carcasses of cattle that have been housed in pens that had horned cattle in them (Ramsay et al., 1976; Wythes et al., 1979). In addition to carcass trim, horned feeder cattle receive discounted prices (Barham and Troxel, 2007), giving producers the incentive to dehorn cattle before marketing them.

Dehorning by amputation or mechanical means is a painful procedure that results in behavioral responses such as tail flicking, head shaking, and lying with head down (Sylvester et al., 2004). Also there is a marked increase in cortisol levels up to 9 h after mechanical dehorning with a Barnes scoop dehorner (Sylvester et al., 1998). In addition to painful distress, there also have been some perceived performance losses and reduction of weight gain associated with these practices (Smith et al., 1996); however, research conducted in Australia argues that there is no difference in weight gain between dehorned and control cattle (Loxton et al., 1982). Animal well-being is becoming more of a concern in today’s society. Dehorning is a cattle production practice of high concern for beef producers, veterinarians, academics, and animal welfare advocates among other animal welfare concerns (Phillips et al., 2009).

Few papers have been published to observe the difference in the different techniques to remove or reduce the horns of beef cattle. This study was conducted to provide some baseline data on behavior and wound healing in cattle dehorned with these common animal husbandry techniques.
MATERIALS AND METHODS

Animals were cared for in accordance with the Guide for the Care and Use of Agricultural Animals in Research and Teaching (FASS, 2010), with the exception of providing anesthesia before performing the dehorning procedures because potential differences in pain response during and following the 3 dehorning methods used herein was a primary response criterion.

Forty crossbred, horned steers and heifers (BW = 311.9 ± 4.7 kg) were identified at a commercial feedyard (Dodge City, KS) and used to determine the effects of dehorning methods on cattle behavior and wound healing. The cattle were blocked by BW into 10 blocks of 4 and randomly assigned to 1 of 4 treatments within the blocks (n = 10 animals per treatment): 1) nondehorned control (CON), 2) banded using high tension elastic rubber (BAND), 3) mechanically removed (MECH), or 4) tipped (TIP) horn. Cattle were moved to a new home pen in which all 40 animals were housed together and were allowed a 14-d alimentation period before the treatments being applied. The pen had an unpaved, dirt floor, which provided approximately 28 m² per animal area. Cattle were allowed ad libitum access to feed and animals had access to approximately 30 cm of feeder space per animal.

Horn diameter at the base of the horn ranged from 5.08 to 7.62 cm and horn length before dehorning ranged from 10.16 to 20.32 cm. Dehorning procedures were conducted by a licensed veterinarian. Excessive bleeding for cattle in the MECH treatment was controlled using removal of the cornual artery and heat cauterization. The MECH method was conducted using a keystone dehorner; horn tissue was completely removed and secured in place with a small metal clip. This process is intended to occlude blood supply to the horn-producing tissue resulting in necrosis of the horn and subsequent passive elimination of the horn.

The data collected over the course of the trial for each individual animal and the individual daily animal scores were averaged by week for each of the 4 wk. Variables were analyzed using a general linear model procedure (SAS version 9.3; SAS Inst. Inc., Cary, NC). The independent variables that were evaluated included vocalization, attitude, gait and posture, appetite, and lying; daily observation was completed in approximately 1 h. The investigator was not masked with respect to treatment because treatment method was visually obvious for all treatments. Assessments were recorded daily for 28 d following treatment application. Wound healing was also monitored and recorded daily over the 28-d period following dehorning. Depression scores were assigned as follows: 0 = bright, alert, and responsive, 1 = quiet but rouses only when pen is approached, 2 = quiet but rouses only when pen was entered, and 3 = did not move when pen was entered or had to be touched to get up. Cattle that scored 3 were evaluated by the attending veterinarian and treated according to veterinary diagnosis. Gait and posture scores were assigned as follows: 0 = normal, 1 = reluctant to move and stiff gait, 2 = mild incoordination when stimulated and hunched posture, and 3 = obvious ataxia or head tilt, hunching and dragging of 1 or more limbs. Appetite scores were assigned as follows: 0 = normal, full flanks, 1 = slightly hollow flanks, 2 = hollow flanks, and 3 = emaciated. Lying scores were assigned as follows: 0 = lying normal, head up, and ruminating, 1 = lying with head down, 2 = lying with full or partial extension of hind legs, and 3 = lying in lateral position. Wound healing or the horn bud score was assigned as follows: 0 = no wound present (completely healed), 1 = minor redness around the wound, 2 = inflamed around the wound with seepage, and 3 = inflamed around the wound with major drainage. Digital pictures were taken weekly to document the healing process of the dehorning wounds. When an animal scored a 2 or 3 for wound healing, the wound was cleaned and debrided. If required, the animal caregivers or the attending veterinarian prescribed an antibiotic and therapeutic regime.

The BAND method was performed using a Callicrate Bander (No-Bull Enterprises, St. Francis, KS). A length of surgical tubing roughly 30 cm in length is loosely wrapped around the base of the horn, tightened using the Callicrate Bander, and secured in place with a small metal clip. This process is intended to occlude blood supply to the horn-producing tissue resulting in necrosis of the horn and subsequent passive elimination of the horn.

Cattle were dehorned by their respective treatment assignment on Day 0 of the trial. Chute behavior and vocalization were observed by a single investigator and recorded for all study animals during the dehorning process. Vocalization scores were assigned as follows: 0 = no vocalization, 1 = low-volume, short-duration (<1 sec) vocalization, and 2 = extended vocalization (>1 sec or greater volume intensity). Cattle were then placed in a feeding pen where all the cattle on the trial were fed together. Cattle were individually weighed on d 0, 7, 14, 21, and 28. The study investigator observed cattle daily at 0800 h for 28 d following treatment for behavioral assessments, which included scores for depression, gait and posture, appetite, and lying; daily observation was completed in approximately 1 h. The investigator was not masked with respect to treatment because treatment method was visually obvious for all treatments. Assessments were recorded daily for 28 d following treatment application. Wound healing was also monitored and recorded daily over the 28-d period following dehorning. Depression scores were assigned as follows: 0 = bright, alert, and responsive, 1 = quiet but rouses only when pen is approached, 2 = quiet but rouses only when pen was entered, and 3 = did not move when pen was entered or had to be touched to get up. Cattle that scored 3 were evaluated by the attending veterinarian and treated according to veterinary diagnosis. Gait and posture scores were assigned as follows: 0 = normal, 1 = reluctant to move and stiff gait, 2 = mild incoordination when stimulated and hunched posture, and 3 = obvious ataxia or head tilt, hunching and dragging of 1 or more limbs. Appetite scores were assigned as follows: 0 = normal, full flanks, 1 = slightly hollow flanks, 2 = hollow flanks, and 3 = emaciated. Lying scores were assigned as follows: 0 = lying normal, head up, and ruminating, 1 = lying with head down, 2 = lying with full or partial extension of hind legs, and 3 = lying in lateral position. Wound healing or the horn bud score was assigned as follows: 0 = no wound present (completely healed), 1 = minor redness around the wound, 2 = inflamed around the wound with seepage, and 3 = inflamed around the wound with major drainage. Digital pictures were taken weekly to document the healing process of the dehorning wounds. When an animal scored a 2 or 3 for wound healing, the wound was cleaned and debrided. If required, the animal caregivers or the attending veterinarian prescribed an antibiotic and therapeutic regime.

The data collected over the course of the trial for each individual animal and the individual daily animal scores were averaged by week for each of the 4 wk. Variables were analyzed using a general linear model procedure (SAS version 9.3; SAS Inst. Inc., Cary, NC). The independent variables that were evaluated included vocalization, attitude, gait and posture, appetite, lying, and horn bud and wound healing. Behavior scores were analyzed as repeated measures. Least squares means were considered different with P < 0.05 and were considered a trend with P < 0.10.
RESULTS

The banding technique success over the 4 wk time period was poor to inconclusive during the trial. Bands applied to at least 1 of the horns on 4 animals in the BAND treatment group (4/10) fell off before the horn being eliminated; all of these failures occurred in the first 4 d posttreatment. During the trial only 3 (3/20) horns that had been banded detached from the calf during the 28 d period, leaving 13 out of the 20 horns at the end of the 4 wk trial with the bands still attached to them and the horn still attached to the calf.

Cattle treated with MECH and BAND had a greater vocalization scores during the dehorning process than either CON or TIP \((P < 0.01; \text{Fig. 1})\). Cattle with the MECH treatment had the most extended vocalization, indicating the greatest discomfort during the procedure. The BAND group had lower vocalization scores than the MECH at the time of dehorning but greater vocalization postprocedure, indicating some lingering discomfort from the presence of the band. The cattle treated with TIP and CON did not have different vocalization scores and both groups had significantly lower vocalization scores than both the MECH and BAND groups. Lack of vocalization of the TIP cattle during the procedure reflects the goal of simply removing noninnervated horn tissue to reduce the damage caused to other cattle during agonistic behavior throughout the feeding period but also reducing stress on the calf during and after the dehorning procedure.

There was no treatment \(\times\) time interaction for depression score \((P = 0.80; \text{Fig. 2})\); therefore, only the main effect of treatment is presented. Cattle from the BAND group tended to have higher depression scores than cattle from other treatment groups \((P < 0.10)\); however, there were no differences in depression scores among cattle dehorned using TIP, MECH, or CON. The greater depression scores for BAND and lack of a treatment \(\times\) time interaction confirm that the discomfort indicated by greater vocalization scores for BAND during and immediately following the BAND procedure was sustained throughout the study.

The scores for abnormal gait and posture among cattle were similar to the trend seen in the depression scoring. There was no treatment \(\times\) time effect for any

![Figure 1](image1.png)

**Figure 1.** Vocalization scores on d of treatment in the chute by treatment (effect of dehorning method, \(P < 0.01\); \(^a\)\(^c\)Means without a common superscript differ, \(P < 0.05\)).

![Figure 2](image2.png)

**Figure 2.** Depression score across the duration of the study by treatment (effect of dehorning method, \(P = 0.06\); \(^a\)\(^b\)Means without a common superscript differ, \(P < 0.10\)).

![Figure 3](image3.png)

**Figure 3.** Gait and posture score across the duration of the study by treatment (effect of dehorning method, \(P = 0.06\); \(^a\)\(^b\)Means without a common superscript differ, \(P < 0.10\)).

![Figure 4](image4.png)

**Figure 4.** Appetite score for the duration of the study by treatment (effect of dehorning method, \(P = 0.13\)).
of the groups \((P = 0.81; \text{Fig. 3})\). There was a tendency
for cattle in the BAND group to exhibit greater gait and
posture scores than cattle in other dehorning treatment
groups \((P < 0.10)\).

There was a trend for the BAND group having an
increase in appetite score \((P = 0.13; \text{Fig. 4})\).

There was no treatment × time effect on the lying
scores of the cattle \((P = 0.83)\). Cattle in BAND group
had greater lying scores than cattle dehorned with other
techniques \((P = 0.04; \text{Fig. 5})\), once again indicating a
greater and more sustained discomfort postprocedure.
There were no lying score differences among cattle de-
horned with other methods \((P > 0.10)\).

There was a treatment × time interaction \((P = 0.04; \text{Fig. 6})\)
for horn bud healing score. During the first week
there was a trend observed in horn bud healing scores in
cattle dehorned with different methods \((P = 0.12)\). It was
noted that a few individual calves in the MECH group
showed signs of increased redness around the dehorn-
ing wound. Results during wk 3 and 4 postdehorning
indicate that there was an increased horn bud score for
cattle in the BAND group compared to other groups.
During this time in the trial it was noticed that some of
the banded horns had started to become loosely attached
and the surrounding skin became inflamed. It was also
noted that during this period 3 of the 20 banded horns
came detached.

There was a treatment × time interaction for bleeding
score in this trial \((P = 0.02; \text{Fig. 7})\). During the first week
postdehorning, there was no difference in bleeding score
in cattle regardless of dehorning method used \((P = 0.37)\).
During the third week of the trial there was a difference
\((P < 0.05)\) for wound bleeding for the BAND group vs.
the other treatments. During the third week, 3 of the 20
banded horns became detached from the skull; bleeding
was observed in these detached horns and some of the
horns that were still attached during wk 3.

**DISCUSSION**

Based on evidence of treatment effects on depres-
sion \((P = 0.06)\), abnormal gait and posture \((P = 0.06)\),
and abnormal lying \((P = 0.04)\) as well as treatment ×
time effects on horn bud \((P = 0.04)\) and bleeding \((P =
0.02)\) scores in the latter weeks of the trial, banding
appears to be a relatively painful process that has sus-
tained effects on discomfort postprocedure. Mechanical
dehorning had a more pronounced effect on discomfort
during the dehorning procedure, but the effects were
short lived and vocalization stopped on release of the
animal from the chute. Mechanical dehorning was as-
associated with increased vocalization \((P < 0.01)\) at the
time of the procedure, which may indicate an increase
in pain; this complements previous studies, which found
similar behavioral responses initially seen during me-
chanical amputation (Sylvester et al., 2004). Tipping the
horns had the least amount of pain-associated behavior
observed throughout the trial and was similar to not de-
horning (CON) based on the evaluation of vocalization,
depression, gait and posture, lying, horn bud healing, and
bleeding. No difference was detected in performance
between the different dehorning procedures \( P = 0.81 \); data not presented), and this is supported by previous research (Loxton et al., 1982); however, given the short duration of the study, limited numbers of animals, and the variable nature of the cattle used in the present study, performance was not considered a primary outcome and presentation of the data as such may be misleading. Additional performance studies under commercial conditions but with a greater number of experimental units would be recommended to address potential performance effects of dehorning method.

Considering the results from the behavioral traits evaluated herein coupled with the limited efficacy of the high tension band treatment, it is our recommendation that using bands to dehorn calves is not an effective alternative to mechanical dehorning. It is noted that tipping resulted in the least amount of observable pain in the noncontrol animals; however, based on previous reports (Ramsay et al., 1976; Wythes et al., 1979), the advantages of completely dehorning cattle must be considered. It is recommended that further studies be conducted to evaluate the ultimate impact of presence and size of horns on carcass bruising and animal performance.

LITERATURE CITED


