

Evaluation of Castration Technique, Pain Management, and Castration Timing in Young Feedlot Bulls in Alberta

B.K. Wildman, DVM¹; C.M. Pollock, DVM, MVetSc¹; O.C. Schunicht, DVM, BSc¹;

C.W. Booker, DVM, MVetSc¹; P.T. Guichon, DVM¹; G.K. Jim, DVM¹; T.J. Pittman, BScAgr, DVM, PAg¹;

T. Perrett, BScAgr, DVM¹; P.S. Morley, DVM, PhD, Dipl ACVIM²; C.W. Jones, DVM¹; S.R. Lee, BSc, DVM¹

¹Feedlot Health Management Services (FHMS), P.O. Box 140, # 7 - 87 Elizabeth Street, Okotoks, Alberta T1S 2A2

²Colorado State University, 3342 Dudley Way, Fort Collins, Colorado 80526

Abstract

A randomized commercial feedlot study was conducted to evaluate the effect of castration technique (band castration (BC) versus surgical castration (SC)), pain management (anesthesia/analgesia (AA) versus no anesthesia/analgesia (NA)), and castration timing (allocation (D0) versus 70 days post-allocation (D70)) on animal health, feedlot performance, and carcass characteristic variables of young bulls. There were 960 bulls and 48 pens used in a complete block design, with no commingling of animals from different experimental groups in the same pens.

In the preliminary feedlot performance data summary from allocation to D159, ADG (+0.051 lb./day, P=0.188) and DM:G (-0.117, P=0.060) were improved in pens castrated at D0 versus pens castrated at D70; ADG (+0.076 lb./day, P=0.049) and DM:G (-0.069, P=0.264) were improved in pens castrated using BC versus pens castrated using SC; and ADG (+0.025 lb./day, P=0.511) and DM:G (-0.079, P=0.204) were improved in pens castrated with NA versus those castrated with AA. There were no significant interactions detected between castration timing, castration technique, and pain management strategies. There were minimal differences in mortality from D0 to D159 between the pens in each of the castration options (D0 versus D70; BC versus SC; or AA versus NA).

The preliminary data from D0 to D159 are interesting; however, final data from allocation through slaughter are necessary to complete the overall assessment of each castration option. Understanding the relative cost-effectiveness of each castration option will help bridge the gap that currently exists in determining optimal castration management in commercial feedlot settings.

Résumé

Une étude aléatoire a évalué l'effet de la technique de castration (par bande élastique [BC] *versus* castration chirurgicale [SC]), de l'atténuation de la douleur (anesthésie/analgesie [AA] *versus* non-anesthésie/non-

analgésie [NA]) et le moment de la castration (jour d'arrivée au parc, jour 0 [D0], *versus* 70 jours plus tard [D70]), sur la santé, la performance d'engraissement et les caractéristiques de la carcasse de jeunes taureaux d'un parc d'engraissement commercial. L'expérience portait sur 960 taureaux répartis dans 48 enclos, suivant un dispositif en blocs complètement aléatoire, sans possibilité de mélange d'animaux provenant de groupes expérimentaux distincts d'un enclos à l'autre.

Les données de performance d'engraissement préliminaires du jour d'arrivée au jour 159 (D159) ont révélé que : le GMQ (ADG) (+0,051 lb/jour, P=0,188), et le ratio de consommation de matière sèche par rapport au gain (DM:G) (-0,117, P=0,060) étaient meilleurs dans les enclos castrés au jour 0 que dans les enclos castrés au jour 70; que le GMQ (ADG) (+0,076 lb/jour, P=0,049) et le ratio DM:G, (-0,069, P=0,264) étaient meilleurs dans les enclos castrés par bande élastique (BC) que par chirurgie (SC); et que le GMQ (ADG) (+0,025 lb/jour P=0,511) et le DM:G, (-0,079, P=0,204) étaient meilleurs dans les enclos castrés sans anesthésie/analgesie (NA) qu'avec AA. On n'a pas noté d'interaction entre le moment de la castration, la technique de castration et l'atténuation de la douleur. Il y a eu des différences minimales de mortalité du jour 0 au jour 159 entre les enclos de chaque traitement de castration (D0 *versus* D70, BC *versus* SC, ou AA *versus* NA).

Ces résultats préliminaires obtenus entre le jour 0 et le jour 159 sont intéressants. Toutefois, pour compléter l'évaluation globale de chaque option de castration, il sera nécessaire de mener une étude du jour 0 à l'abattage. Comprendre la rentabilité de chaque option de castration nous permettra d'optimiser la gestion de la castration et de répondre ainsi à une préoccupation réelle des parcs d'engraissements commerciaux.

Introduction

Veterinarians and animal scientists have conducted several studies to evaluate the effects of anesthesia/analgesia and/or castration technique on animal and worker safety, castration efficiency/proficiency and animal behavior. However, these research efforts have

more or less been conducted in isolation from commercial feedlot production, creating a disconnect between the findings in these studies and the true implications for commercial feedlots. While the research findings described above are interesting, the relative economic effect of the various options for managing castration in commercial production remain unknown because the necessary data describing the effects of castration method and castration timing on important feedlot production variables to allow for the conduct of proper cost-benefit analyses do not exist. As a result, feedlot producers are left in a situation where decisions regarding castration method and castration timing are made using the best-guess approach.

Due to a number of factors associated with commercial feedlot production and consumer preferences in North America, bull calves and yearlings that arrive at commercial feedlots are routinely castrated using a number of different castration techniques. Veterinarians and animal scientists have conducted studies to evaluate the effects of anesthesia/analgesia and/or castration technique on animal and worker safety, castration efficiency/proficiency, and animal behavior. Results of these studies demonstrate that the use of analgesia/analgesia and/or the use of certain techniques is safer, results in improved castration efficiency/proficiency, and reduces negative effects on animal behavior associated with pain mediation. Moreover, it is generally accepted that the younger an animal is castrated, the easier it is to perform the castration procedure and the lower the net effects on the animal.

Castration of bulls has historically occurred at or near the time of feedlot arrival. Recent epidemiologic information (FHMS, in-house data 2002-04) has demonstrated that bulls castrated at or near the time of arrival are 1.5 - 4.0 times more likely to experience morbidity and/or mortality than steer pen mates. From these observations, it has been suggested that delayed castration (approximately 70 days on feed) may be a more cost-effective castration option, but this hypothesis has not been scientifically evaluated.

The purpose of this study was to evaluate the effect of castration technique, pain management, and castration timing on animal health, feedlot performance, and carcass characteristic variables of young bulls in commercial feedlot production in western Canada. The data generated from the study will be used in economic models to determine the relative cost-effectiveness of each castration option studied.

Materials and Methods

The castration options evaluated in this study included castration technique (band castration (BC) versus surgical castration (SC)), pain management

(anesthesia/analgesia (AA) versus no anesthesia/analgesia (NA)), and castration timing (allocation (D0) versus 70 days post-allocation (D70)). Young bulls that entered a commercial feedlot in western Canada were randomized to one of eight experimental groups: BC/AA/D0; BC/AA/D70; BC/NA/D0; BC/NA/D70; SC/AA/D0; SC/AA/D70; SC/NA/D0; and SC/NA/D70. Nine hundred and sixty bulls were allocated to the study and housed by experimental group in research pens with a capacity of 20 animals per pen. There were six pens in each experimental group.

Study animals will be monitored from allocation to slaughter. Average daily gain (ADG) and the dry matter intake to gain ratio (DM:G) will be measured to assess feedlot performance; yield grade and quality grade will be used to assess carcass characteristics; and morbidity and mortality variables will be used to assess animal health.

The performance and carcass characteristic variables will be compared between the experimental groups using general linear modeling techniques to control for replicate effects and evaluate the main castration option effects, including interactions. The animal health variables will be compared between the experimental groups using generalized linear modelling techniques to control for replicate effects and intra-pen clustering of disease and evaluate the main castration option effects, including interactions. The relative economic benefit of each group will be determined using a computer spreadsheet model that simulates all aspects of feedlot production.

Results

At the time of publication, the study was still ongoing. Performance and mortality data were available for all study pens from D0 to terminal implant administration (160 days post-allocation). From D0 to D159, ADG (+0.051 lb/day, $P = 0.188$) and DM:G (-0.117, $P = 0.060$) were improved in pens castrated at D0 versus pens castrated at D70. Similarly, ADG (+0.076 lb/day, $P = 0.049$) and DM:G (-0.069, $P = 0.264$) were improved in pens castrated using BC versus pens castrated using SC. However, ADG (+0.025 lb/day, $P = 0.511$) and DM:G (-0.079, $P = 0.204$) were improved in pens castrated with NA versus pens castrated with AA. There were no significant ($P \geq 0.05$) interactions detected between castration timing, castration technique, and pain management strategies in the feedlot performance analyses.

In terms of animal health from D0 to D159, there were minimal differences in mortality between pens castrated at D0 versus pens castrated at D70 (RR = 1.20, 95% CI = 0.63 - 2.26, $P = 0.581$); pens castrated using BC versus pens castrated using SC (RR = 0.85, 95% CI = 0.44 - 1.65, $P = 0.631$); and pens castrated with AA ver-

sus pens castrated with NA (RR = 1.07, 95% CI = 0.56 - 2.04, $P = 0.848$).

In the interval immediately following castration (D0-D69 for pens castrated at D0 and D70-D160 for animals castrated at D70), ADG (+0.198 lb./day, $P = 0.019$) and DM:G (-0.386, $P = 0.013$) were improved in pens castrated using BC versus pens castrated using SC. However, ADG (+0.071 lb./day, $P = 0.399$) and DM:G (-0.183, $P = 0.240$) were improved in pens castrated with NA versus pens castrated with AA.

Conclusions

From D0 to D159, the preliminary effects on feedlot performance and overall mortality of the various castration timing, castration technique and pain management strategies included in the study show some interesting trends; however, effects that carry through to slaughter will ultimately determine the overall assessment of each strategy. Understanding the relative cost-effectiveness of each castration technique, pain management, and castration timing option studied will help to fill the gap that currently exists with respect to

determining optimal castration management in commercial feedlot production in Alberta.

In this study, animal health, feedlot performance, and carcass characteristics will be used as proxy indicators for evaluating the effect of pain and discomfort in castrated animals. This indirect approach may seem inappropriate to some researchers because the nature of the outcome variables does not focus on direct animal welfare outcomes. Conversely, the outcome variables measured in this study will be very easily interpreted and understood by commercial feedlot producers. As a result, the findings of the study will be directly applicable to decisions regarding optimal castration management in commercial feedlot production in Alberta.

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