

# A comparison of three feedlot vaccination programs on the health, growth performance, and carcass characteristics of high-risk heifers procured from auction markets

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## Introduction

*Mannheimia haemolytica* (MH) is the primary bacterium involved with bovine respiratory disease (BRD), and there are differences between how the vaccines which confer immunity against this important pathogen are manufactured. Generally speaking, the bacterin and toxoid components of commercially available MH vaccines are harvested through propagation of whole-cell MH cultures. Nuplura® PH (NUP; Elanco Animal Health, Greenfield, IN) contains both toxoid and cell-associated antigens, but these antigens differ as they are manufactured using recombinant technology and a proprietary purification process. The relative efficacy of vaccine programs incorporating NUP versus products derived from whole-cell MH culture has not been evaluated in a large-pen feedlot setting. The objective of this study was to compare 3 vaccination programs on the health, growth performance, and carcass characteristics of feedlot heifers.

## Materials and Methods

Heifers ( $N = 2,575$ ; BW =  $568 \pm 28.1$  lb [ $258 \pm 12.7$  kg]) at high-risk of developing respiratory disease were procured from auction-markets in the southern United States and transported to a feedlot in southwest Kansas. Date of placement served as a blocking factor ( $n = 10$ ) and origin was equally represented across treatments if multiple auction-markets were represented within a block. Chute-order randomization was used to assign each heifer to 1 of 3 vaccine program treatments during arrival processing ( $n = 10$  reps/treatment). The 3 vaccine programs differed by either vaccine products or timing of the pentavalent viral vaccination. The treatments were: 1) Titanium® 5 and NUP at arrival (TNA; Elanco Animal Health, Greenfield, IN), 2) NUP at arrival with Titanium® 5 delayed until 28 days-on-feed (TND), and 3) Pyramid® 5 and Presponse® SQ (PSQ) at arrival (PRE; Boehringer Ingelheim Vetmedica, St. Joseph, MO). Within a treatment, vaccines were administered as separate injections. Across treatments, all cattle were metaphylactically treated with 2.0 mL (45.4 kg)/cwt tilmicosin and a 3 day post-metaphylactic moratorium was

observed. Endotoxin concentrations were measured in 3 lots of NUP and 3 lots of PSQ. General linear and generalized linear mixed models were used for continuous and categorical outcomes, respectively, with pen serving as the experimental unit. Pairwise comparisons were performed between vaccine programs for all outcomes with a significant ( $P \leq 0.05$ ) overall  $F$ -test. Bayesian latent-class models were used to evaluate the etiology of mortalities (BRD, digestive, atypical interstitial pneumonia (AIP), or other).

## Results

Endotoxin concentrations were significantly lower in NUP than in PSQ ( $P < 0.01$ ), which is produced using whole-cell MH cultures. Vaccine program had no effect on mortality attributable to BRD, digestive disorders, or etiologies classified as “other” (probability of difference  $\leq 0.70$ ). There were fewer AIP mortalities in the TNA treatment group compared to the TND and PRE treatment groups (probability of difference = 0.99 and 1.00, respectively). The probability of difference in AIP mortalities between TND and PRE treatment groups was not different (0.79 probability). Overall mortality, BRD morbidity, and BRD treatment success rates did not differ among the vaccine programs ( $P \geq 0.13$ ). There was no effect of vaccine program on growth performance ( $P \geq 0.34$ ). The percentage of yield grade 4 carcasses was lower in the PRE heifers than the TND heifers ( $P = 0.01$ ); however, there were no other differences in carcass characteristics ( $P \geq 0.14$ ).

## Significance

Additional research is needed to define the biological significance of the reduced endotoxin levels in NUP and identify potential reason for the differences observed in AIP mortalities. Feedlot vaccination programs utilizing Titanium 5® and NUP have similar effects on health outcomes, growth performance, and carcass characteristics as an arrival program utilizing Pyramid 5® and PSQ. Delaying the viral vaccine had no effect on health, growth, or carcass-related outcomes in this study.