Effect of Cattle Health on Performance During the Stocker and Feedlot Periods

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Introduction

There are numerous reasons why disease, namely bovine respiratory disease (BRD), impacts performance in stocker and feedlot cattle. It is often said that "sick cattle don't eat" and this manifestation is caused by a complicated interaction of stress hormones, infectious pathogens, and products of inflammation that affect the appetite of cattle. Furthermore, feed and water restriction during the marketing and transportation process negatively alters rumen microbiota and the metabolic and hydration status of cattle, leading to compromised digestion and physiological impairment upon arrival. Perhaps the more relevant question as it pertains to cattle production in Florida is "what can I do to improve the health, and therefore performance of my calves after they enter the stocker or feedlot arena". The goal of this presentation is to outline practical, research-based findings to help cow-calf producers understand factors that are most likely to influence the health and performance of their cattle post-weaning.

Preconditioning

Preconditioning is a comprehensive management practice first identified in the 1960s designed to reduce the incidence and susceptibility to BRD during the stocker and feedlot segments of the beef production system. The negative effects of stress are mitigated through preconditioning management; however, this management practice must occur during a critical time period before marketing and transport to a stocker operation or feedlot occurs. Although the specific requirements of different preconditioning programs may vary, typical requirements include weaning calves on their origin ranch for a specified time (i.e. $\geq$ 45 days), vaccinating against clostridial and respiratory (IBR, BVDV type 1 & 2, PI3V, BRSV) pathogens, treatment with anthelmintic, castration, dehorning, and training to consume feed from a bunk and water from a trough before being marketed or transported to a stocker or feedlot facility (Cole, 1985; Duff and Galyean, 2007). Each of these preconditioning requirements functions to reduce stress and disease risk in preparation for the stocker or feedlot environment. For example, in the preconditioned calf, weaning stress is reduced and overcome on the ranch of origin before shipping and commingling occurs. This mitigates the additive effect of multiple stressors by shifting stress occurrences earlier (ie. weaning stress on the ranch of origin rather than during transport to a feedlot with concurrent stressors). Not surprisingly, preconditioned cattle perform better than high-risk cattle; during a 56 day receiving period ADG of 2.6 was reported for preconditioned calves vs. 1.9 lb for high risk calves (Richeson et al., 2012). In the same study, the BRD morbidity rate was 7 and 70% for preconditioned and auction market cattle, respectively. Because of improved health and performance, preconditioned cattle are typically more valuable. Net return for preconditioned vs. non-preconditioned steers selling in a Kansas auction market from 1999 to 2004 was estimated between $14.28 (winter) and $31.84 (fall)/animal depending on market conditions, calf weight and condition (Dhuyvetter et al., 2005). Whereas, the estimated $40 to $60/animal value of preconditioned cattle in the feedlot is considerably greater than the estimated net return from marketing preconditioned calves (Dhuyvetter et al., 2005). So why is it that so few cow calf producers take advantage of preconditioning and the improved value that it holds? The small average herd size, particularly in the Southeastern U.S. is problematic because risk associated with preconditioning is increased. Some producers may have attempted preconditioning in the past, only to find disappointment in the lack of premium price offered at sale. Buyers determine value and if preconditioned cattle must be comingled after purchase the value of preconditioning is greatly diminished.

Vaccinating High-Risk Beef Cattle

One of the major components of preconditioning is vaccination and there are numerous reasons why vaccination during preconditioning, rather than upon feedlot arrival, is clearly advantageous. First, the timing of vaccination during a preconditioning program is appropriate relative to subsequent stress and natural challenge during transition of calves to a stocker or feedlot facility. Vaccine efficacy hinges upon a robust immune response to the antigens contained in the vaccine and the immune system requires several days to weeks to respond adequately. Furthermore, stress may alter the immune system's ability to respond to a vaccine and stress is reduced when vaccination is implemented at the ranch origin vs. feedlot arrival. Although the current recommendation of feedlot consulting veterinarians is nearly unanimous in favor of vaccination against respiratory viruses during initial processing of high-risk cattle, there is little research to support this recommendation. Previous field studies have evaluated the timing of vaccination, effects of revaccination, or compared different vaccine products; however, a negative control treatment is rarely used. A recent study was conducted in which high-risk calves were vaccinated with a MLV respiratory vaccine on day 0, 14 or non-vaccinated control group during a 42-day receiving period. Although overall BRD morbidity was not different, the relapse rate was increased for the non-vaccinated cattle and suggests at least some degree of respiratory vaccine efficiency occurred in this trial. Average daily gain was reduced transiently for either vaccinated group, which may be explained by vaccine-induced stimulation of the acute phase response, which is both catabolic and metabolically demanding (Arthington et al., 2013). On the contrary, vaccine administration (intranasal vs intramuscular vs unvaccinated control) was evaluated in newly received beef calves and no differences in BRD health outcomes were observed. In another study evaluating the timing of MLV vaccine (day 0 or 14 from arrival) in high-risk calves, cattle administered the delayed procedure had slight improvement in health and performance.

Hydration Therapy Research

A recent receiving study conducted at the West Texas A&M University Research Feedlot will be presented. The study objectives were to evaluate the impact of oral hydration therapy during initial processing on calf health and performance and determine the effect of hydration therapy and bovine respiratory disease (BRD) on rumination behavior and rumen pH and temperature. Three truckload blocks of high risk, auction-sourced bull (n=242) and steer (n=55) calves (initial BW=416 ± 42 lb) were used during a 56-day receiving period. Prior to shipment (day -1), a subset (n=20/block) were fitted with a 3-axis accelerometer collar to quantify rumination time and activity index, and administered a data logging bolus to record rumen pH and temperature. At arrival (day 0), calves were randomized to receive 0.57 L water/100 lb BW from a modified oral drenching apparatus (H2O) or no water administration (CON) and sorted into treatment pens (n=15/treatment; 10 animals/pen). Standard arrival processing procedures were implemented and bulls were surgically castrated and administered meloxicam on day 0; whereas, modified-live virus respiratory vaccination was delayed until day 28. Treatment-blinded technicians evaluated calves daily and assigned a clinical illness score (CIS) for BRD; those with CIS $\geq$ 2 and rectal temperature $\geq$ 104°F were considered a BRD case and treated with an antimicrobial. Interim BW was recorded and residual feed was collected every 14 days. Repeated measures data evaluated were analyzed for fixed effects of H2O vs. CON and BRD cases (n=12) vs. non-treated cohorts (n=21; RCON). Final BW (565.6 vs. 547.7 lb) and overall ADG (2.63 vs. 2.36 lb/day) tended (P=0.08) to increase and DMI for day 42 to 56 (16.61 vs. 15.08 lb/day) was greater (P<0.01) for H2O vs. CON. However, BRD-associated mortality was greater (P=0.05) in H2O (8.1%) vs. CON (2.7%). Daily rumen temperature was altered (P=0.04) such that peak rumen temperature occurred earlier for H2O; whereas, CON had increased rumen temperature following delayed vaccination on day 28. Calves diagnosed with BRD had decreased (P<0.01) rumination time between 2000 and 0400 hours, greater (P<0.01) rumen temperature until

delayed vaccination on day 28, greater (P<0.01) hourly rumen temperature between 0900 and 0300, transiently decreased (P=0.04) activity index between day 9 and 32, decreased (P<0.01) activity index between 0800 and 2000, and altered (P<0.01) rumen pH. Increased performance and DMI was observed for H2O; however, health outcomes were not improved. Earlier peak rumen temperature observed in H2O may indicate physiological modification enabling a more pronounced inflammatory response, which is supported by the numerical increase in BRD morbidity observed for H2O. Differences in rumination behavior and activity index between BRD and RCON are potential tools for early detection of BRD. (Tomczak et al., 2018).

Conclusions

Unless a paradigm shift in the U.S. beef production and marketing system occurs, a large number of cattle transitioning to stocker and feedlot segments will remain at high-risk for BRD and transiently poor performance. Reasons include low adoption of preconditioning management at the ranch origin, stressors experienced during the transition process, and a perhaps ubiquitous presence of bovine pathogens in commingled groups of cattle. Cattle health directly affects growth performance because the inflammatory response to infection results in catabolism and anorexia. Cow calf producers that retain ownership or simply want what is best for the health and performance of their calves after marketing should consider preconditioning. Preconditioning addresses nutritional, immunological and psychological factors that ensure the best possible health and performance of cattle as they transition to stocker and feedlot segments of the current beef production system. Research evaluating pharmacological alternatives to control and treat BRD is warranted.