Process-control Strategies for Optimal Management of Newly Received Beef Calves

Use of pharmaceutical products for disease control is an important component of both production efficiency and risk mitigation. Metaphylactic therapy typically reduces the incidence of morbidity in those cases in which overall morbidity rates exceed 40 percent. However, as subclinical disease also causes significant production losses, impacts of metaphylactic therapy on performance and feed efficiency should also be considered. Beneficial impacts of antimicrobial products are generally variable due to incomplete product-impact projections and inter-animal as well as herd-level variations in production responses, especially in low-risk calves. Variations in performance outcomes suggest that metaphylactic therapy interacts with animal traits to influence health and production responses.

Temperament, defined as an animal’s behavioral response to handling by humans, is moderately heritable and can be objectively measured as exit velocity from a chute. In addition to demonstrating that exit velocity is negatively correlated with intake and growth performance, we have shown that calves with excitable temperaments have higher cortisol levels and lower specific IgG antibody responses. These results suggest that elevated stress responsiveness of calves with excitable temperaments may impair adaptive immunity. Moreover, data from our laboratory (see figure) suggest that the beneficial responses to ceftiofur treatment (Excede®) of low-risk calves were dependent upon temperament. Metaphylactic treatment did not affect intake or ADG of calves with calm temperaments, whereas metaphylactic treatment of calves with excitable temperaments resulted in higher intakes and ADG during the 28-d study.

Objectives and Approach
The experimental objective is to determine if metaphylactic treatment interacts with temperament to affect physiological, behavioral and immune responses, thereby affecting health and performance of weaned calves. Subjective and objective (exit velocity) measurements of temperament will be obtained, and RFID-based technologies employed to quantify interanimal variation in performance (intake, growth), as well as physiological (core-body temperature, rumen pH) and behavioral traits (meal duration and frequency, physical activity). Serial blood samples will be collected and assayed for cortisol, haptoglobin and specific IgG and IgM antibodies responses. DNA will be collected for discovery and validation of genetic marker panels for temperament and disease resistance.

Outcomes
Innovative approaches to data collection and analysis will be employed to examine possible interactions between selected metaphylactic therapies and interanimal variation in performance, physiological, behavioral, and immune responsive traits. Successful completion of this project will facilitate development of process-control technologies and strategies that integrate individual-animal information (temperament, vaccination history), management practices, and production and antimicrobial costs to improve production efficiency, reduce production risk, enhance animal welfare, and improve product quality.