

## Significance

A commercially available trivalent IN vaccine has the potential to reduce the lung lesions associated with BRD and improve growth in young dairy cattle. Although these findings were significant, herd factors play a role in determining whether or not significant changes in

average daily gain will be seen. Also, IN vaccination did not eliminate the risk of disease in the current study; therefore this practice should not be viewed as a “magic bullet”. Best management practices regarding calf nutrition, housing strategies, ventilation, and appropriate vaccination protocols should be integrated to provide the optimal environment for the growing dairy calf.

# Characterizing the BRD sickness response – opportunities for improved disease detection

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## Introduction

Bovine respiratory disease (BRD) is the most prevalent and costly illness in feedlot cattle. A limiting factor in efforts to reduce BRD is the poor accuracy of the usual diagnostic approach, pen rider detection of animals with depression, anorexia, respiratory changes, and temperature elevation (DART). The relationship between DART-identified individuals and those with definitive BRD only has an estimated specificity and sensitivity of 63% and 62%, respectively. Limited monitoring (e.g. 2x/d), human presence, and handling may contribute to DART's poor accuracy. Continuous, automated monitoring of fever and anorexia is more effective than DART for BRD detection. Both fever and anorexia are part of the generalized sickness response, a collection of physiological and behavioral changes associated with inflammation. This response also includes a reduction in grooming behavior, but this behavior has not been studied in the context of BRD and may be another candidate for improved, automated detection. Our objective was to further characterize the BRD sickness response, especially those components that may be monitored automatically. We hypothesized that BRD-challenged cattle would have fever, anorexia, and less grooming in comparison to healthy controls, and that the magnitude of these changes would reflect the extent of gross lung lesions (%LUNG).

## Materials and Methods

In Study 1, individually-housed steers (740 lb; 336 kg) were dual-challenged with a respiratory virus

on d 0 and bacteria on day 5 (BRD, n = 9) or sterile solution (Healthy, n = 5), and monitored for 13 days, recording dry matter intake (DMI; daily, per 24-hour), and grooming behavior (brush use and self-licking; live observations for 20 min/day on d 4, 6-11, and 13 after viral challenge). In Study 2, steers (673 lb; 306 kg) were given a respiratory virus or bacteria (n = 20), housed with a grooming brush, and monitored for between 5 to 15 days, depending on challenge pathogen, including day of and the 2 days before peak clinical illness in the analysis. Bunk attendance (every 5 min, video), and self-licking (day of peak illness only, continuously, video) were monitored 24 hours/day, while brush use (continuously, video) was recorded 13 hours/day. The steers were necropsied around peak clinical illness. In both studies, clinical signs (daily, in-chute exam) and rectal temperature (Study 1, days 3 to 10, Study 2 all days; every 5 minutes between 0100-0700, indwelling logger) were measured. In Study 1, data were analyzed by treatment using a repeated measures mixed model while in Study 2, data were used to describe whether steers with higher %LUNG had more marked changes compared to those with lower %LUNG (range = 0.5-55% affected; mixed model), and whether a linear relationship could describe a significant amount of variation in each (R<sup>2</sup>; regression model).

## Results

In Study 1, clinical signs occurred between days 2 and 11, peaking on day 5. When compared to Healthy animals, BRD steers had lower DMI days 2 to 10 (88% less on peak day 5, *P* < 0.01), a fever on days 3 to 7 (el-

evated by 35.8° F (2.1° C) at peak day 3,  $P < 0.01$ ), and overall less grooming (58% less,  $P = 0.02$ ). In Study 2, on the day of peak illness, steers with greater %LUNG had an increased sickness response, including less bunk attendance ( $P < 0.01$ ;  $R^2 = 0.22$ ;  $P = 0.04$ ), brush use ( $P = 0.04$ ;  $R^2 = 0.22$ ;  $P = 0.01$ ), and self-licking ( $P = 0.04$ ;  $R^2 = 0.26$ ;  $P = 0.02$ ) than those with lower %LUNG. Rectal temperature was higher among those with greater %LUNG ( $P = 0.05$ ), but  $R^2$  was not significant.

### Significance

The BRD sickness response, lower DMI, occurred as early as 2 days after viral challenge. Changes in

DMI/bunk attendance and grooming were both more persistent and had a clearer relationship with %LUNG than fever, indicating they are better candidates for automated monitoring and BRD detection. Brush grooming behavior appeared to be a good measure of illness and has the potential to be automatically monitored in a cost-effective fashion. Future studies will determine if brush-directed grooming can indeed be continuously monitored to detect BRD.

## Comparison of a remote early disease identification (REDI) system to metaphylaxis and conventional management for control of bovine respiratory disease in high risk beef calves

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### Introduction

Antimicrobial treatment of an entire cohort on arrival is common when the group is deemed high risk for bovine respiratory disease (BRD). Early and accurate BRD diagnosis could alter population disease dynamics and provide an alternative BRD control method. The research objective was to compare health and performance outcomes of high risk calves managed through conventional means (metaphylaxis and human observation) to cattle managed using a remote, early disease identification (REDI) system.

### Materials and Methods

A randomized controlled pen level trial with 3 approximately 60 day replicates was conducted comparing health and performance after BRD control through conventional (CV) or REDI system (RD) management. For each replicate, cattle at high BRD risk arrived in a single group and were randomly allocated to a CV or RD pen. Calves in CV pens were metaphylactically treated at arrival and identified and treated for BRD via human observations. Calves in RD pens received no metaphylaxis and all BRD identification was based solely on REDI.

### Results

Cattle faced substantial disease challenge during 30 day trials, yet no differences ( $P > 0.10$ ) in performance (ADG: CV  $2.6 \pm 0.3$ ; RD  $2.7 \pm 0.3$ ; feed:gain: CV  $8.9 \pm 0.4$ , RD  $8.6 \pm 0.4$ ) or BRD incidence (CV  $62.4\% \pm 12.4$ ; RD  $56.5\% \pm 13.0$ ) were observed among CV and RD groups. The lack of statistical differences may have been related to the small sample size ( $n = 3$  pens per treatment group); however, the average DOF to first treatment was significantly ( $P < 0.05$ ) lower for RD pens ( $8.5 \pm 1.2$ ) compared to CV pens ( $16.2 \pm 1.2$ ). Average doses of antimicrobials used per head was lower ( $P = 0.04$ ) in RD pens ( $0.8 \pm 0.23$ ) compared to CV pens ( $1.8 \pm 0.23$ ) when all antimicrobial doses were considered (metaphylaxis, 1st, 2nd, and 3rd treatments).

### Significance

Appropriate antimicrobial stewardship is a critical concept in food animal medicine, and the REDI system promotes strategic antimicrobial management by treating BRD cattle at appropriate times. In this initial pilot work health and performance were not different between REDI and conventional BRD management systems.