# Research Summaries 1

## A randomized controlled clinical trial to evaluate the effect of an intranasal respiratory vaccine on calf health, ultrasonographic lung consolidation, and growth in Holstein dairy calves

**T. L. Ollivett,** *DVM, DACVIM*[1]; **K. E. Leslie,** *DVM, MSc*[1]; **T. Duffield,** *DVM, DVSc*[1]; **D. V. Nydam,** *DVM, PhD*[2]; **J. Hewson,** *DVM, PhD, DACVIM*[3]; **J. Caswell,** *DVM, PhD, DACVP*[4]; **D.F. Kelton,** *DVM, MVPM, MS, PhD*[1]
[1]*Dept of Pop Med, Ontario Veterinary College, University of Guelph, Guelph, ON, N1G 2W1 Canada*
[2]*Dept of Pop Med and Diagnostic Sciences, Cornell University, College of Veterinary Medicine, Ithaca, NY 14853*
[3]*Dept of Clinical Studies, Ontario Veterinary College, University of Guelph, Guelph, ON, N1G 2W1 Canada*
[4]*Dept of Pathobiology, Ontario Veterinary College, University of Guelph, Guelph, ON, N1G 2W1 Canada*

### Introduction

Although passive transfer of antibodies to the newborn calf provides many great benefits, high levels of maternal antibodies may limit the ability of the calf to respond to parenterally administered vaccines against the respiratory viruses associated with bovine respiratory disease (BRD). Experimental challenge studies have demonstrated varying levels of efficacy of vaccines administered via the intranasal route. Unfortunately, direct identification of lung lesions associated with BRD requires euthanasia and often limits the size of study populations. As an alternative, thoracic ultrasonography (US) can be performed quickly and provides an accurate antemortem assessment of lung health. Therefore, the purpose of this randomized controlled clinical trial was to evaluate the effect of an intranasal vaccine on calf health, ultrasonographic lung lesions, and growth in young Holstein calves.

### Materials and Methods

A total of 468 calves from 3 herds were enrolled and randomized into 3 treatment groups (positive control, PC, n = 211; intranasal vaccine, IN, n = 215; negative control, NC, n = 42) for an 8 to 12 week follow up period. The PC consisted of 1 dose of commercially available multivalent injectable BRSV, IBR, $PI_3$, and BVD modified live virus (MLV) vaccine administered subcutaneously at 6 weeks of age. The IN consisted of a commercially available BRSV, IBR, and $PI_3$ MLV vaccine was administered twice intranasally (first dose: 3 to 6 d of age; second dose: 6 weeks of age). The NC, sterile saline, was administered intranasally and subcutaneously twice (first dose: 3 to 6 d of age; second dose: 6 weeks of age). Herds were visited weekly. Clinical illness associated with bovine respiratory disease was assessed using systematic respiratory scoring; and thoracic ultrasonography (US) was used to identify calves with lung lesions. Data were analyzed using descriptive and inferential methods.

### Results

An incidental finding was that rib fractures were identified in 6% of calves. There was a low but significant correlation between rib fractures and calving ease. Overall, 54% of the calves had at least 1 episode of an abnormal respiratory score (ILL). After controlling for the effects of herd, sex, and scours using multivariable logistic regression, vaccination protocol did not affect the odds of ILL. Similarly, 54% of the calves had at least 1 episode of lung consolidation $\geq 3$ cm (CON). After controlling for herd, dystocia, and rib fractures using multivariable logistic regression, vaccine protocol significantly affected the odds of CON. The odds of CON in PC were 1.63 times the odds of CON in IN, and 0.38 times the odds of CON in NC. The odds of CON in IN were 0.23 times the odds of CON in NC. The outcomes ILL and CON were positively correlated (r = 0.39); however, the measure of agreement was only fair (kappa = 0.38). Multivariable linear regression revealed a significant interaction between vaccine protocol and Herd on average daily gain (ADG). In Herd 2, IN increased ADG as compared to PC. In contrast, in Herd 1, IN decreased ADG. None of the protocols affected ADG at Herd 3. There was no difference in overall mortality rates between protocols and no adverse events were associated with the any of the protocols.

### 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

**R. L. Toaff-Rosenstein,** *VMD*[1]; **L. J. Gershwin,** *DVM, PhD*[2]; **A. J. Zanella,** *DVM, PhD*[3]; **C. B. Tucker,** *PhD*[1]
[1]*Dept. of Animal Science, University of California, Davis, CA 95616*
[2]*Dept. of Pathology, Microbiology and Immunity, University of California, Davis, CA 95616*
[3]*Dept. of Preventative Veterinary Medicine and Animal Health, University of São Paulo, Brazil 16015*

### 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 ($R^2$; 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-