Brief Communication

Mollicutes species and Mycoplasma bovis prevalence and association with health outcomes in beef feeder calves at arrival and initial treatment for bovine respiratory disease

Brad J. White, Gregg Hanzlicek, Michael W. Sanderson, David E. Anderson, Robert L. Larson

Abstract — Mollicutes nasal swab culture status and potential associations with health outcomes were determined in beef feeder calves. Mollicutes culture was positive in 7.6% (22/291) of calves at arrival and in 26.2% (34/130) of calves at first disease treatment. Positive Mollicutes culture at first treatment was associated with increased odds for subsequent retreatment or death.

Résumé — Espèces de Mollicutes, prévalence de Mycoplasma bovis et association avec les résultats de santé chez les veaux d’engraissement à l’arrivée et au traitement initial pour la maladie respiratoire bovine. Le statut des cultures sur écouvillon nasal de Mollicutes et les associations potentielles avec les résultats de santé ont été déterminés chez des veaux d’engraissement. La culture de Mollicutes a été positive chez 7,6 % (22/291) des veaux à l’arrivée et chez 26,2 % (34/130) des veaux au traitement initial. La culture positive de Mollicutes au premier traitement a été associée à des risques supérieurs de traitement répété ou de mort.

The role of Mollicutes and specifically Mycoplasma bovis (MB) as an active agent in cases of bovine respiratory disease (BRD) is poorly defined. Multiple Mycoplasma species have been isolated from apparently healthy calves (1–4) and the status of the organism as a primary or secondary pathogen is unclear. The economic impact of mycoplasmosis, however, has been estimated to be significant in the beef industry due to weight loss and health consequences (5). The purpose of this research was to use culture and polymerase chain reaction (PCR) to determine prevalence of Mollicutes and MB in apparently normal calves at arrival and in field cases of BRD at the time of initial treatment, and to determine associations between nasal Mollicutes culture status and subsequent health and performance outcomes.

Beef feeder calves were purchased, commingled, and transported from the southeastern United States to the Kansas State University Beef Stocker Unit in Manhattan, Kansas. Cattle arrived in 3 independent loads, and upon arrival they were weighed, individually tagged, sorted by weight and gender, and randomly assigned to 1 of 24 pens. Twenty-four hours after arrival, bulls were castrated and all calves received preventative health products including a Clostridial 7-way vaccine, a modified-live viral vaccine, injectable antiparasiticide, and metaphylactic agent. Calves were sampled using a guarded, deep nasal swab at arrival and first treatment for respiratory disease. The entire swab was immediately placed in modified Hayflick culture medium and submitted to a laboratory for Mycoplasma bovis PCR analysis. Generalized linear models were used to evaluate the association between culture status (arrival and first treatment) and feeding period average daily gain (ADG), arrival weight, and the fixed effects of metaphylactic treatment while accounting for the lack of independence of animals using random effects of pen and arrival lot. Differences in the probability of culture positive animals at arrival and first treatment were evaluated with logistic models accounting for gonadal status, metaphylactic treatment, repeated measurement on individual calves, arrival lot, and pen effects. Logistic models were used to determine potential differences in health outcomes (death loss, retreatment) related to animal Mollicutes culture or MB PCR status at arrival or first treatment for BRD. Animal
positive culture at initial BRD treatment were more likely to die [odds ratio (OR) = 3.0; 95% confidence interval (CI): 1.1, 8.4], require a second treatment (OR = 3.3; 95% CI: 1.4, 7.9), or require a third treatment (OR 3.2, 95% CI: 1.2, 8.0) compared to calves with a negative culture at initial treatment. Bacteria from the Mollicutes class, specifically *Mycoplasma bovis*, have been associated with pneumonia in cattle (5–7) and these organisms are frequently identified from chronic respiratory disease cases (8,9). Previous research documents that these organisms may be found in nasal discharges from both healthy and clinically ill animals (2,10); however, the specific causal role of MB in the BRD complex has been difficult to elucidate (11). The current study provides information on the prevalence of this organism at 2 time points (arrival and first treatment for disease) and describes the relationship between culture status at each time point and subsequent health outcome. The calves enrolled in this study represent typical high-risk beef feeder calves in North American stocker operations. The inadvertent exposure of the cattle to BVD through the contaminated vaccine may also have played a role in the high rate of morbidity and mortality experienced in the trial. Due to this potential relationship, findings from our research are applicable in cattle exposed to BVD; however, care should be taken before extrapolating the findings to the cattle population at large.

Nasal culture identified Mollicutes species in 7.6% of the calves at arrival and this prevalence is similar to previously reported estimates in beef stocker calves (4). Nasal swabs were selected as the data collection mechanism because they may be predictive of the bacterial pathogen within the lung when taken from a clinically ill animal (12). Some work, however, illustrates only moderate agreement between nasopharyngeal swabs and bronchoalveolar lavage when MB is specifically evaluated (3). Thomas et al (13) and Godinho et al (14) indicated a reasonableness of specificity of nasopharyngeal swabs when compared to bronchoalveolar lavage or postmortem necropsies, respectively.

At the time of first treatment for BRD, 26% of the calves were positive for Mollicutes by culture and 20.6% of these positive cultures were also MB PCR positive. Previous cross-sectional surveys of healthy and clinically ill calves have used PCR to illustrate higher risk of colonization in clinically ill animals (1–3,15). We found that there was no significant association between arrival Mollicutes culture status and Mollicutes culture status at first BRD treatment, but the disparity of prevalence of positive calves between arrival and first treatment could be explained in several ways. One possibility is that calves arrived at the stocker operation with Mollicutes numbers below the detection limit of the culture method thus resulting in culture negative calves. The risk for positive culture at first treatment may have been related to the stress of BRD which allowed Mollicutes to grow to larger numbers and result in culture positive status by the time of first treatment for BRD. Conversely, increased prevalence over time could also be related to disease transmission from positive calves at arrival to negative, susceptible calves during the immediate period after arrival.

Arrival Mollicutes culture status was not significantly associated with initial body weight, calf gender (steer or bull), or health outcomes in this study. Performance is often measured
by ADG in the stocker operation, and an association between arrival culture status and period ADG was identified. The magnitude of the difference was nearly 0.27 kg (0.6 lb) per day or almost 11.8 kg (26 lb) over the 42-day feeding period, which could result in an economically significant difference.

Health outcomes were significantly associated with Mollicutes culture status at initial treatment for BRD. Positive cultures at that time were associated with increased odds that a calf would subsequently be retreated or die. The increased risk of death or retreatment is substantial and provides evidence that the role of Mollicutes in the disease process warrants further investigation and confirmation in future research projects.

These data illustrate the association between presence of Mollicutes and subsequent negative health outcomes, but causality of the relationship is unknown. A higher percent of calves that culture positive for Mollicutes species could subsequently die because either the Mollicutes is contributing to the disease process, or the pre-existing BRD caused a response allowing an overgrowth of the bacteria. Either way, the findings illustrate that the Mollicutes culture could prove to be a useful tool as a prognostic indicator at first treatment for BRD. More research needs to be performed to determine the role of Mollicutes as either a contributing factor or secondary pathogen in the BRD disease process.

Due to the inadvertent utilization of a BVD-contaminated vaccine in this study, the external validity of the findings is limited to populations exposed to BVD virus. Although, this situation will not be present in all groups of cattle, high risk cattle commonly face exposure to multiple viruses which contribute to the BRD complex, and our findings are applicable in these situations. Another limitation of this work is that PCR analysis was only performed on culture positive cases; we may have therefore underestimated true prevalence in the population. Only the culture results illustrated a strong relationship with health outcomes, but this potentially could be explained by the relatively low number of PCR positive cases. Another consideration is that the PCR used only detected MB and not other potentially pathogenic Mollicutes species that may have been associated with culture-positive cases.

This research provides evidence that some calves entered a backgrounding facility with existing Mollicutes colonization, yet the presence of this organism at this time was not associated with subsequent health outcomes. Mollicutes was also identified in calves at initial treatment for BRD, and calves that were culture-positive at initial treatment for BRD were more likely to be retreated and subsequently die. These findings do not provide evidence of causality of Mollicutes in BRD, but the results illustrate an association between finding the organism at the time of first treatment and subsequent health outcomes. Further research is needed to more clearly define the role of Mollicutes in BRD in feeder calves.

Acknowledgments

This research was funded through a grant from CEVA BIOMUNNE Company, Lenexa, Kansas. We thank Marc Epp, Rodney Derstein, and Dale Blasi at the Kansas State University Beef Stocker Unit for their assistance. We also appreciate the help of Jason Nickell and Brad Robert who helped with portions of the project.

References