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Comparative efficacy of enrofloxacin and tulathromycin for treatment of preweaning respiratory disease in dairy heifers

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ABSTRACT

Preweaning respiratory disease continues to have a substantial effect on the current and future productivity of dairy replacement animals. Establishing an effective treatment plan for the preweaned calf may have a significant effect on well-being and lifetime productivity by limiting any early development of chronic disease. The primary objective of this study was to examine the efficacy of treatment with tulathromycin (TUL) or enrofloxacin (ENR) on the risk of re-treatment, with a secondary objective of investigating the effect of disease and subsequent treatment choice on average daily gain (ADG). A total of 1,141 Holstein heifers from 4 farms were observed and systematically scored for evidence of respiratory disease from birth through weaning or the time of death. At the time of diagnosis, calves were randomly and blindly allocated into 2 treatment groups. The overall incidence of respiratory disease was 60.9%. In the univariable analysis, the incidence of re-treatment between 7 and 10 d of initial therapy for calves treated with ENR was greater than that in calves treated with TUL (27.6 vs. 21.2%). After adjusting for farm ID, clinical score at first treatment, and weight at first treatment, the odds of re-treatment were 1.5 times higher for calves treated with ENR than with TUL. The percentage of calves that required more than one re-treatment was higher for calves that received ENR compared with those that received TUL (9.3 vs. 4.1%). We observed no difference in ADG between calves treated with ENR or TUL, and no difference in ADG between calves that were treated for respiratory disease and those that were not treated for respiratory disease. Appropriate drug therapy for preweaning respiratory disease may have an important role in reducing the odds of re-treatment during the preweaning period.

Key words: bovine, preweaning, respiratory disease, treatment

INTRODUCTION

The effect of bovine respiratory disease (**BRD**) on the preweaned heifer has been poorly characterized by existing scientific literature. According to the 2007 National Animal Health Monitoring Survey (NAHMS), the incidence of respiratory disease in the preweaning period was 12.4% and represented 22.5% of the mortality losses in the same period (NAHMS, 2010). These data are consistent with previous NAHMS studies from 1991, 1996, and 2002, which demonstrated respiratory disease caused mortality in 21.3, 24.5, and 21.3% of deaths, respectively (Gorden and Plummer, 2010). In 1990, a report estimated the total cost, including prevention, of preweaned calf respiratory disease to be approximately $14.71 per calf per year (Kaneene and Hurd, 1990). A complicated disease that may be initiated by a variety of stressors, including dystocia, environment, and housing and management factors, dairy calf pneumonia may affect the future productivity of the dairy animal (Waltner-Toews et al., 1986; Svensson et al., 2003; Lago et al., 2006; Lombard et al., 2007). Often following an initial viral infection, dairy calves may be infected with one or more bacterial pathogens, including *Mannheimia haemolytica*, *Pasteurella multocida*, *Histophilus somni*, and *Mycoplasma* spp. These organisms represent the primary bacterial causes of the BRD complex.

Early and accurate diagnosis of BRD is paramount to ensuring treatment success and reduced losses due to excessive morbidity and mortality. Appropriate diagnostic criteria should be objective and repeatable, utilizing several clinical parameters, including rectal temperature, nasal and eye discharge, ear position, and the presence or absence of a cough (Lago et al., 2006). The use of an objective screening program during the preweaning phase may allow identification of up to 85% of active cases and contribute to reducing the number of calves weaned with active respiratory infections (McGuirk, 2008). Several antibiotic treatments are avail-

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able for use in the replacement heifer industry but little published work exists comparing the efficacy of these products in this class of animal. Inappropriate choice and application of therapy may lead to the development of a chronic respiratory disease, further dampening the future productivity of these animals. The effects of BRD in the preweaned calf on the long-term productivity and survival of the calf have not been fully described. In Colorado beef calves, respiratory disease during the neonatal period accounted for a 16.5-kg reduction in weaning weight (Wittum et al., 1994). Additional beef feedlot studies have attributed a reduction in ADG and carcass yield characteristics to respiratory disease in the feeding period (Smith, 1998; Babcock et al., 2009; Schneider et al., 2009). Disease associated with BRD in the early feeding period may prolong the number of days on feed and increase the number of therapeutic interventions required before harvest (Babcock et al., 2009). It is assumed that preweaned dairy calves suffering from respiratory disease experience a reduction in ADG, decreased weaning weight, increased mortality risk, and decreased productivity and survival following weaning, as seen in heifers treated for clinical respiratory disease following antiinfective treatment at weaning (Stanton et al., 2012). Heifers experiencing 4 or more cases of BRD before first calving may have lower odds of completing the first lactation than those not experiencing BRD (Bach, 2011).

Commingled dairy calves may represent an efficient vehicle for the spread of respiratory pathogens within a herd. In a large study, Swedish calves housed in a large group automated-feeding system were at 2.2 times greater odds of respiratory disease in the first 90 d of life compared with those in individual housing (Svensson et al., 2003). Other studies also indicated that individually housed calves may have reduced incidence and risk of respiratory disease than those housed in group environments (Hanekamp et al., 1994; Lago et al., 2006).

Tulathromycin (**TUL**; Draxxin, Pfizer Animal Health, New York, NY) and enrofloxacin (**ENR**; Baytril 100, Bayer Animal Health, Shawnee Mission, KS) are widely used in the beef and dairy replacement industry for the treatment of respiratory disease, but little clinical research exists directly comparing the use of these products in preweaned dairy calves. A previous study examining treatment options in feedlot respiratory disease at 2 feedlots in the western United States showed a higher therapeutic success following treatment with TUL (87.9 and 80%) over ENR (70.2 and 62.5%) with significant results ($P = 0.009$ and $P = 0.031$, respectively; Robb et al., 2007). There is little published research analyzing the effect and efficacy of various treatment options in preweaned dairy heifers. Isolates of *M. haemolytica*, *P. multocida*, and *H. somni* submitted to diagnostic labs from 2000 to 2009 indicate a gradual decrease in the susceptibility of the primary respiratory organisms to the major antibiotics available for treatment, demonstrating the necessity for current research (Portis et al., 2012).

The primary objective of this randomized and blinded field trial was to examine the efficacy of treatment of clinically identified preweaning calf pneumonia with TUL or ENR on the likelihood of re-treatment. A secondary objective was to examine the effect of treatment for respiratory disease with TUL or ENR on preweaning ADG. The null hypothesis of this study was that re-treatment rates and ADG would not differ between heifers treated with either TUL or ENR.

MATERIALS AND METHODS

This study was conducted at 4 commercial dairy facilities with on-site heifer development programs. One facility was located in Georgia, and the other 3 facilities were located in New York State. One facility (farm D) in New York State raised additional replacement females from birth through breeding for a separate dairy operation. A sample size of 285 calves per treatment group was estimated to provide a power of 80% to detect a 10% difference in treatment efficacy with $\alpha = 0.05$. Enrollment in the study occurred between December 2011 and July 2012. Bull calves were excluded from enrollment in this study. This study was approved by the University of Georgia College of Veterinary Medicine Clinical Research Committee.

Calf Management

Heifers reared on farm A in Georgia received approximately 3.8 L of pasteurized frozen colostrum by esophageal feeder within 2 h of birth. Heifers were vaccinated at 7 d of age with a modified live intranasal vaccine containing bovine respiratory syncytial virus, infectious bovine rhinotracheitis virus, and parainfluenza-3 virus (Inforce 3, Pfizer Animal Health). For the first 7 to 14 d following birth, heifers were housed in individual hutches and fed 2.8 L of 28:20 milk replacer (Cornerstone, Purina Mills, Gray Summit, MO) mixed to 13 to 14% total solids as measured by a Brix refractometer (PA202x, Misco, Cleveland, OH) twice each day. Between 7 and 14 d of age, heifers were grouped by age into a pen of 18 to 25 calves and moved into group housing in an open-sided barn where milk feeding was provided by an automated feeding system (CF1000, DeLaval, Kansas City, MO). Straw bedding was provided in each pen. Beginning in February 2012, half of the heifers were randomly allo-