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Case Study: Control of respiratory disease in male Holstein calves with tildipirosin and effect on health and growth from 0 to 4 months of age

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ABSTRACT

In trial 1, phase 1, 48 male Holstein calves initially 2 to 4 d of age were transported 3.5 h to the research facility. Calves were randomly selected to either receive a s.c. injection of Zuprevo (Merck Animal Health, Summit, NJ; 4 mg of tildipirosin/kg of BW; TIL) the day after arrival (d 0) and again at weaning (d 42) or receive no injections (CON). Calves were fed 0.66 kg of milk replacer DM daily for 39 d and then 0.33 kg daily for 3 d. A starter was fed free choice for the 56 d of phase 1. In trial 1, phase 2, the same calves from phase 1 grouped by CON and TIL were moved to group pens (4 pens per treatment, 4 calves per pen) for the next 56 d. The starter was blended with 5% chopped grass hay and fed free choice. Trial 2 was similar to trial 1, phase 2 and used 48 two-month-old male Holstein calves. Calves were randomly selected to receive either a s.c. injection of Zuprevo (4 mg of tildipirosin/kg of BW; TIL) on d 0 or no injections (CON). In trial 1, phase 1, preweaning ADG and BCS change; postweaning starter intake and hip width change; overall starter intake, ADG, and hip width change; final hip width; and final BCS were greater for TIL than CON. During phase 2 of trial 1 and trial 2, calf ADG and hip width change were greater for TIL than CON. Overall, in transported Holstein calves, TIL improved ADG and structural growth by approximately 13%.

Key words: dairy calf, antibiotics, pneumonia, medication

INTRODUCTION

Respiratory infections are of significant concern in dairy calves >1 mo of age (Svensson et al., 2003) and are the primary cause of mortality after weaning (USDA-APHIS, 2009). Stanton et al. (2010) reported improvements in calf growth with metaphylactic treatment of relatively healthy calves with tulathromycin (**TUL**). Stanton et al. (2010, 2012, 2013) also reported that metaphylactic use of TUL in commingled dairy calves reduced the incidence of diarrhea, otitis media, and bovine respiratory disease complex compared with either metaphylactic treatment with oxytetracycline or no antibiotic treatment.

Tildipirosin (**TIL**) is an antibiotic approved for control of respiratory disease in cattle at high risk of developing bovine respiratory disease, and it may remain in lung tissue for up to 28 d (Menge et al., 2012). Tulathromycin and TIL are reported to have good efficacy to reduce issues with respiratory pathogens in dairy calves less than 3 mo of age (Amrine et al., 2014; Confer et al., 2016; Bartram et al., 2016). Amrine et al. (2014) and Bartram et al. (2016) reported that calf ADG after *Mannheimia haemolytica* or *Mycoplasma bovis* challenges were greater in calves treated with both TIL and TUL compared with non-antibiotic-treated calves. Although government agencies encourage less use of antibiotics in livestock (Weese et al., 2015), proper metaphylactic use of antibiotics in livestock might lower the overall use of antibiotics and reduce the risk of antibiotic resistance (Weese, 2006). Additionally, metaphylactic antibiotic treatments of dairy calves are implemented on many farms (USDA-APHIS, 1999).

Therefore, with the successful use of TUL and TIL to reduce respiratory sickness common in pre- and postweaned dairy calves and improved growth in calves treated with TUL in some studies, research was implemented to test the metaphylactic use of TIL in pre- and postweaned dairy calves.

MATERIALS AND METHODS

Calves were cared for by acceptable practices as described in the *Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching* (FASS, 2010). In phase 1 of trial 1, 48 male Holstein calves initially 2 to 4 d of age from a single dairy farm were transported 3.5 h to the Nurture Research Center in southwest Ohio. Upon arrival, calves were randomly selected to either receive a s.c. injection of Zuprevo (Merck Animal Health, Summit, NJ; 4 mg of tildipirosin/kg of BW; TIL) the day after arrival (d 0) and again at weaning (d 42) or receive no injections (**CON**). Calves were housed in 1.2 m × 2.4 m individual pens with a coarse rock, tile-drained floor bedded with straw in a curtain-sided, naturally ventilated barn with no

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Table 1. Analyzed nutrient composition of diets fed

	Trial 1			Trial 2	
Feed, % DM basis unless otherwise indicated	**Milk replacer**	**Starter**	**Hay**	**Starter**	**Hay**
DM, % as fed	96.3	88.6	87.1	87.3	86.1
CP	25.5	19.3	12.6	20.3	9.1
Fat	18.7	3.6	1.9	4.1	21.6
ADF	—	31.9	44.8	7.9	43.4
NDF	—	46.3	68.1	16.1	67.9
Sugar	—	5.3	3.5	5.1	9.4
Starch	—	8.0	1.4	40.4	1.3
Ash	5.5	6.7	9.9	5.7	8.9
Calcium	0.67	1.01	0.47	0.74	0.37
Phosphorus	0.64	0.56	0.32	0.53	0.29

added heat for 56 d. A milk replacer was fed at 0.66 kg of DM daily for 39 d and then 0.33 kg of DM daily for 3 d. The milk replacer manufactured with whey, whey protein concentrate, and animal fat (25% CP, 18% fat; Table 1) was reconstituted to 14% solids with warm water and fed at 0630 and 1400 h daily. A low-starch, pelleted starter similar to the one fed by Hill et al. (2016) and water were fed free choice for the 56 d of phase 1. Every other bag of milk replacer and starter was sampled and composited for nutrient analysis (Table 1). Management practices including vaccinations and medical treatments during the trial were based on the recommendations of the herd veterinarian.

The day after arrival at approximately noon, the calves were weighed (d 0, initial BW). At this time, blood was sampled intravenously, serum was separated by centrifugation at 3,000 × *g* (VWR, Batavia, IL) at 20°C for 15 min, and serum protein concentration was estimated using an optical refractometer (ATAGO U.S.A. Inc., Bellevue, WA).

Feces were scored daily using a 1-to-5 scale with 1 being normal and 5 being watery (modified from Kertz and Chester-Jones, 2004). Calves with fecal scores of 3 or greater (considered abnormal fecal scores) received oral electrolytes that were not counted as medical treatments. During the first 28 d, the first abnormal feces (fecal score of 3 or greater) per calf was sampled and mixed. An aliquot was tested for *Cryptosporidium*, *Rotavirus*, *Coronavirus*, or K99 *Escherichia coli* using lateral immunochromatography strips (Biox Diagnostics, Jemelle, Belgium). Antibiotic medical treatments were recorded daily. Baytril 100 (Bayer Healthcare, Shawnee Mission, KS; 5 mL subcutaneously) was administered for coughing, nasal discharges, labored breathing, and rectal temperatures >39.4°C. Navel infections were treated with 5 mL of penicillin G procaine (300,000 units/mL; Agri Laboratories LTD, St. Joseph, MO) intramuscularly daily for 7 d. On d 28, 42, and 56, an experienced technician used a stethoscope to listen for abnormal sounds associated with breathing (right, anterior side of the calf) to further assist in identification of respiratory disease.

Calves received an intranasal tissue sensitive respiratory disease vaccine (TSV-2, Zoetis, Exton, PA) and s.c. injections of vitamins A, D, and E (Vital E - A + D, Stuart Products, Bedford, TX) and Se (MU-SE, Merck Animal Health) upon arrival. Calves received an injection of Bovashield Gold 5 (Zoetis) at d 7 and again at d 28. Calves were castrated and dehorned at 36 d of age.

Calves were weighed initially and weekly thereafter. Body condition score (1 being thin and 5 being obese, modified from Wildman et al., 1982) and hip width using a caliper were measured initially and every 2 wk thereafter.

In phase 2 of trial 1, the same calves from phase 1 grouped by CON and TIL were moved to group pens (6 pens per treatment with 4 calves per pen) for the next 56 d. The pens had 6.5 m^2 of outside pen space and 1.35 m^2 of inside pen space per calf. Inside pen space was bedded with straw, and there was no added heat. The same starter fed in phase 1 was blended with 5% chopped grass hay (Table 1) and fed with water free choice. Every other bag of starter and every bale of hay was sampled and composited for nutrient analysis. Calves were weighed, scored for body condition, and measured for hip width initially and at 28 and 56 d of phase 2.

The average ambient temperature in trial 1, phase 1 was 10°C with a range from −4 to 28°C. The average relative humidity was 75% with a range from 20 to 100%. The average ambient temperature in trial 1, phase 2 was 21°C with a range from 4 to 33°C. The average relative humidity was 70% with a range from 20 to 100%.

In trial 2 (56 d in length), 48 Holstein calves that were 2 mo of age (71.2 ± 1.73 kg of BW) were randomly selected to either receive a s.c. injection of tildipirosin (TIL; Zuprevo, Merck Animal Health) at 4 mg/kg of BW or receive no injection (CON). Calves had been previously transported 3.5 h and managed as in phase 1 of trial 1. Calves had been weaned for 2 wk when trial 2 began. Feeding and