FE-01

The usage of antibiotics and anti-inflammatories in calf-rearing units in Finland

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Objectives: The usage of antibiotics (AB) in meat production is of concern in many countries. In Finland, meat production is mainly based on bull calves originating from dairy farms. Bull calves are transported to the rearing farms at the age of 10–30 days. Respiratory diseases are common in calf-rearing units. Approximately half of the calves are grown in specialized calf-rearing units selling calves to finishing units at the age of 5–6 months. Rest of the units are integrated, finishing their calves on their own farm. Bulls are slaughtered at the age of 18 months.The aim of the study was to find out the amount and type of antibiotics and non-steroidal anti-inflammatories (NSAIDs) used in different types of calf-rearing units.

Materials and methods: A total of 73 randomly selected calf-rearing units from Finland participated in the study. Calves (n= 27 692) were transported to these units between January and October 2016 and followed up 180 days. All the medication data and reason for medication were collected from the farms. Bookkeeping was in electronic form in 44% of the farms and on the paper form in 56% of the farms. The mean age of the calf on arrival to the unit was 23 days (SD 9.1). After 5 months feeding, calves either stayed on the same farm (28 farms, n=3 745 calves) or from specialized calf-rearing units calves were sold to another farm for finishing (45 farms, n=23 946 calves). Four out of fifth calves (79%) were milk breed (n= 21 766) and 21% milk-meat crossbred (n= 5926). The majority of the calves (88.5%) were bull calves. Medications used for dehorning were excluded from the data.

Results: During 180 day-period, 35 390 AB courses were given to 27 692 calves, in average 1.3 AB courses per calf. In 90% of the cases, reason for treatment was respiratory disease. The most common AB treatment was parenteral oxytetracycline, followed by macrolide and benzylpenicillin; 65%, 23% and 6%, respectively. Total of 28 045 NSAID treatments were administered. Most commonly used NSAIDs were meloxicam (54%) and carprofen (42%). In treatment courses, NSAID was used together with AB in 66%, NSAID alone in 7% and AB only in 26% of the cases. In specialized calf-rearing units and in the units with integrated milk feeding and finishing 67% and 37% of the calves were medicated at least once, respectively. The percentage of all medications per number of raised calves by the unit varied in specialized calf-rearing between 4–280% (mean 81%) and in integrated units 0–141% (mean 42%).

Conclusions: The total numbers of AB courses were high. The type of AB was selected according to Finnish guidelines for treatment of respiratory diseases. NSAIDs were commonly used with ABs as recommended. AB treatment was more common in specialized calf-rearing units where infection pressure might be higher due to bigger farm sizes and greater amount of young susceptible animals in the farm.

Keywords: antibiotic, anti-inflammatories, calf, calf-rearing.

FE-02

The metaphylactic use of tildipirosin for the control of Bovine Respiratory Disease in pre-weaned high-risk calves housed in individual hutches

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Objectives: Bovine respiratory disease (BRD) is one of the major causes of morbidity and mortality during the pre-weaning period. It delays growth of pre-weaned heifers, which can lead to long term impact on fertility and productivity. In the modern dairy industry, many calves are reared in heifer raising facilities, where calves are acquired from different sources and are transported for long periods of time. Transportation is a stressful event and is a known risk factor for BRD. Therefore, the use of metaphylaxis can be indicated for transported calves. However, information on the effect of tildipirosin for the control of BRD on morbidity and mortality for high risk calves housed in individual hutches is scarce. Hence, the objective of this study was to evaluate the efficacy of two metaphylactic strategies using tildipirosin for calves transported within the first week of life.

Materials & methods: A total of 2,100 clinically healthy Jersey and Jersey-cross calves were enrolled in the study. Calves were transported from 12 different dairies located in Minnesota to a calf raising facility located in New Mexico, where they were housed in individual hutches until weaning (56 days of life). Three days after arrival, calves were randomly allocated into three treatment groups. Calves in META1 group received a single subcutaneous (SQ) injection of tildipirosin (Zuprevo™, Merck Animal Health) at enrollment at 4mg/kg. Calves in group META2 received one SQ injection of tildipirosin at enrollment (4mg/kg) and a subsequent SQ tildipirosin injection 17 days later. Calves in CON remained as untreated controls. Average age at enrollment was 7.8 days. BRD was diagnosed based on a scoring system that assesses six clinical signs (cough, eye discharge, abnormal respiration, nasal discharge, ear droop or head tilt, and rectal temperature ≥ 102.5°F). Body weight measurements were assessed at enrollment and at weaning to calculate the average daily gain. Mortality data was gathered from the farms' database. At enrollment and weaning, ultrasonography of the lungs was assessed for random subset of 200 calves per treatment. Blood was collected at enrollment, 10 and 27 days later, and at weaning, for a random subset of 100 calves per treatment

group to determine evidence of inflammation. Haptoglobin, serum-amyloid A, complete blood cell counts, and other biomarkers were analyzed using commercial kits. The data was analyzed using multivariate logistic regression, Cox Proportional Hazards models, repeated measures ANOVA, and multivariate linear regression models. The variables age in days at enrollment, body weight at enrollment, dam's parity, season, and rectal temperature at enrollment, and source of calf was included as a random effect.

Results: The BRD incidence was 11.37%, 10.8% and 9.39% for calves enrolled in the CON, META1 and META2, respectively (P = 0.44). Time to BRD diagnosis was not affected by metaphylaxis (P = 0.45). Lung lesions was found in 25.1%, 24.9%, and 24.9% of calves enrolled in CON, META1, and META2 groups, respectively (P = 0.99). Mortality tended to be greater for CON calves in comparison to META2 calves (1.55% vs 0.57%, P = 0.05), but did not differ between calves enrolled in CON and META1 groups (1.55% vs 1.17%, P = 0.48). Weight gain was not affected by metaphylaxis. The average daily gain for calves enrolled in CON, META1, and META2 was 516.7, 517.7 and 524.6 g, respectively (P = 0.25). Blood analysis revealed that some of the markers of inflammation assessed were lower for META2 calves compared to CON calves. At 27 days after enrollment, calves enrolled in the META 2 treatment group had decreased concentrations of haptoglobin and aspartate aminotransferase, and decreased neutrophil to lymphocyte ratio compared to CON calves (P < 0.05). Additionally, CON calves had increased concentration of globulins and lower albumin to globulin ratio than META2 calves at the end of the weaning period (P < 0.05).

Conclusions: In conclusion, metaphylaxis with tildipirosin did not decrease the incidence of BRD in pre-weaned calves that were transported within the first week of life. Weight gain was not influenced by metaphylaxis. However, metaphylaxis with two injections of tildipirosin at enrollment and 17 days later tended to reduce mortality and significantly decreased circulating biomarkers of systemic inflammation.

Keywords: High-risk calves, tildipirosin, metaphylactic treatment, BRD.

FE-03

Effect of implant treatments to suckling beef steers on growth performance for 200 days and on lifetime growth performance and carcass traits

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Objectives: The goals of the study were 1) to evaluate the impact of implant treatments administered to suckling beef steers on growth performance over 200 days following treatment, and 2) to determine if suckling calf implant treatments impacted growth performance during grower and feedlot phases when the same implant treatments were equally applied to all cattle, and to assess calfhood implant effects on carcass traits.

Materials and Methods: Growth by spring-born, primarily Angus beef steer calves (n = 261; initial BW = 63 ± 5.1 kg) implanted with Synovex® One Grass (SOG; 150 mg trenbolone acetate, 21 mg estradiol benzoate), Synovex® C (SYNC; 100 mg progesterone, 10 mg estradiol benzoate), or nothing (CON; negative control) was assessed over 200 d in a study with a randomized block design with two pasture management groups. Treatment groups were equally represented in each pasture management group, and individual calf was the experimental unit. Calves remained together with their dams throughout the suckling phase and did not have access to creep feed. After weaning calves were placed in pens in a drylot and fed long hay for 3 d, then were transitioned to a forage-based total mixed ration. At 200 d after suckling calf implant treatments were administered steers were assigned to two drylot pens, each containing proportionately the same number of calves from each treatment group as were enrolled into the study to begin an 85-d backgrounding phase; all cattle received Synovex® Choice at the start of this phase. Upon completion of the backgrounding phase steers entered a commercial feedlot and were fed an average of 193 d, then were harvested and carcass data collected; all steers received a Synovex® One Feedlot at initiation of the feedlot phase. Steer bodyweights were measured at the start and end of suckling, backgrounding, and finishing phases.

Results: Total 200-d BW gain for SYNC (178.7 kg) and SOG (183.4 kg) were greater (P < 0.01) than CON (166.4 kg), but not different from each other (P = 0.16). Similarly, 200-d average daily gain for SYNC (0.89 kg/d) and SOG (0.92 kg/d) were greater (P < 0.01) than CON (0.83 kg/d), but not different from each other (P = 0.16). Cumulative 285-d gain for SYNC (271.2 kg) and SOG (279.5 kg) were different from each other, and greater than CON (256.7 kg; P < 0.05). Total gain over the 193-d finishing period by CON (331.1 kg), SYNC (335.4 kg), and SOG (330.8 kg) were not different (P > 0.05). Thus, implant treatments given to suckling calves did not negatively impact feedlot performance of cattle. From initial implanting to harvest (485 d), SYNC steers gained 16.9 kg more than CON (P = 0.0530), and SOG steers gained 20.4 kg more than CON (P = 0.0202). Carcasses from SYNC weighed 11.5 kg more than CON (P = 0.0554), and SOG carcasses weighed 15.4 kg more than CON (P = 0.0107). Marbling score, ribeye area, backfat thickness, distributions to USDA Quality Grades, and distributions to USDA Yield Grades were unaffected by suckling calf implant treatments. There was no impact of treatments on morbidity or mortality, and there were no observed adverse drug effects attributable to experimental treatments.

Conclusion: Under conditions of this study, a single dose of SOG resulted in average daily gain over a 200-d grazing period of 0.92 kg/d, significantly greater than for steers that remained untreated (0.83 kg/d). Likewise, cattle treated with a single dose of SYNC gained significantly faster than non-treated controls (0.89 kg/d) over 200 d. Implants in suckling calves, with or without trenbolone acetate, increased BW gain, and did not affect performance during backgrounding or feedlot phases.

Keywords: Cattle, suckling, implant, growth rate, average daily gain.

FE-04

Risk factors for antibiotics use and spread of *Mycoplasma bovis* in veal calves feedlots

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Bovine respiratory disease (BRD) is the most antimicrobial-consuming disease in veal calves production. The presence of *Mycoplasma (M.) bovis,* as one of BRD causative agents, in a feeding lot could contribute to a wider use of antimicrobials as *M. bovis* is known to be persistent and resistant to most antimicrobial families. Controlling some risk factors for introduction or spread of this particular infectious agent may help to also reduce antibiotic (AB) use.

Objectives: Two cross-sectional studies were set up to assess the effect of lot size and feeding systems on *M. bovis* infection spreading and on AB use. We also assess the effect of *M. bovis* spreading as a risk factor for increased AB use.

Material & methods: Twenty-six feedlots were monitored from the "all-in" entry of calves until 3 consecutive weeks without any collective antimicrobial treatment. The spread of *M. bovis* was estimated through seroconversion tested using the BioK302 ELISA kit from BioX Diagnostics, on 10 to 15 calves' sera randomly sampled in each feedlot, at the entry and at the end of the observation period. All oral and injectable AB used meanwhile were recorded. The feedlots were selected according to their feeding system, either individual bucket (n=7) or automatic milk feeders with shared nipples (n=19), and their size, less (n=9) or more (n=17) than 50 calves. For both seroconversion and AB use, statistical analyses were conducted using multivariable generalized linear model with fattening farms as random effect. In both models, we initially included the following variables: feeding system, lot size, age, weight of calves and seropositivity to *M. bovis* at introduction and first order interaction between each variable. Use of AB and seroconversion rate to *M. bovis* were respectively included in the models for seroconversion and use of AB.

Results: The lots were monitored for 42 to 81 days. *M. bovis* infection spread increased with lot size (odd ratio (OR) of 2.9 [1.4; 5.8] per two-fold increase in lot size). The proportion of seroconverted calves was lower in bucket-fed lots compared to automatic feeding lots with a shared nipple (OR = 0.03 [0.003; 0.41]). Analysis of the association with the presence of a seropositive calf at entry was inconclusive. AB use was enhanced in larger feedlots with an increase of 1.5 treatments per two-fold increase of lot-size. For same-sized lots, the use of bucket could decrease AB consumption by up to 1.03 (-2.18;0.14) treatments per calf compared to automatic feeding. Lastly, no association between seroconversion to *M. bovis* and AB use was evidenced.

Conclusion: *Bucket feeding in small size lots, i.e. with a maximum of 50 calves in a same room, contribute to limit seroconversion to M. bovis together with consumption of antibiotics.*

Keywords: Respiratory disease, Calves' lot, Antibiotics, Mycoplasma.

FE-05

Genotyping and antimicrobial resistance patterns of *Mannheimia haemolytica, Pasteurella multocida* and *Histophilus somni* isolated from the upper and lower respiratory tract of feedlot cattle

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Background/Objectives: During the last 10 years, the prevalence of *Pasteurellaceae* resistant against drugs typically used for bovine respiratory disease (BRD) control has increased in feedlot cattle. Surprisingly, it is not clear whether this increase in the prevalence of multidrug resistant (MDR) bacteria is due to the spread of one or few multiple MDR clones among cattle during the feeding period (i.e. horizontal spread) or due to the recrudescence of MDR clones already present in the respiratory tract of cattle upon arrival at feedlots. Recently, we reported a high prevalence of MDR *M. haemolytica*, *P. multocida* and *H. somni* isolated from cattle with BP in 4 feedlots in Western Canada. Unfortunately, as we did not genotype these isolates, it was not possible to determine whether a few or a large number of MDR clones were present in these feedlots, supporting either a horizontal spread of MDR clones among cattle or a recrudescence from carriers. Therefore, the objective was to genotype *M. haemolytica*, *P. multocida* and *H. somni* isolates using pulsed field gel electrophoresis (PFGE).

Materials and methods: Newly-received beef-crossed feedlot calves (arrival body-weight ± SD = 282 ± 28 kg) with BRD (n = 210) and pen-matched controls (n = 107) were sampled by deep nasal swabs (DNS) and trans-tracheal aspiration (TTA) at 4 feedlots in Western Canada. *M. haemolytica, P. multocida* and *H. somni* were isolated from DNS and TTA samples and their AMR profiles were determined using broth dilution method. Isolates were then typed by PFGE and grouped into pulsotypes (≥90% similarity).

Results: In total, 195, 277 and 139 isolates of *M. haemolytica*, *P. multocida* and *H. somni*, respectively, were isolated from DNS and TTA samples. A high proportion of *M. haemolytica* (≥ 73%) and *P. multocida* (≥ 78%) isolated from DNS and TTA were resistant against oxytetracycline (OXY) and tulathromycin (TUL). Concerning *H. somni,* there were high levels of resistance against OXY (≥ 52%) and penicillin (PEN; ≥52%) in both DNS and TTA samples. None or few isolates were resistant to florfenicol (FEE), enrofloxacin (ENR) and ceftiofur (CEF). *M. haemolytica* isolates were distributed among 20 pulsotypes and 26 singlets. However, the majority of isolates (54%) belonged to a single pulsotype, which displayed resistance to TUL and OXY. This pulsotype was isolated from 29

different pens across all 4 feedlots. *P. multocida* isolates were distributed among 9 pulsotypes and 11 singlets with the majority of isolates (67%) belonging to one pulsotype that displayed resistance to TUL and OXY. This pulsotype was present in 33 pens across all 4 feedlots. *H. somni* isolates were distributed among 13 pulsotypes and 28 singlets that were either susceptible to all antimicrobials tested or resistant to PEN and OXY. No single dominant pulsotype was observed for *H. somni.*

Conclusions: The genotyping and antimicrobial susceptibility testing of *Pasteurellaceae* isolated from cattle recently placed at 4 feedlots showed that MDR clones of *M. haemolytica* and *P. multocida* can be shared among a large number of cattle within and between feedlots. As cattle were very likely from multiple origins, this finding suggests a horizontal transmission of these clones among cattle shortly after arrival at the feedlots.

Keywords: BRD, AMR, Shipping fever, Antibiotics, Macrolides.

FE-06

Comparison of body temperature measurement using the GUARDIAN® device in feedlots and its possible applications in the early diagnosis of bovine respiratory disease

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Objective: The objective of the present study was to test the new GUARDIAN® radiofrequency body temperature measuring device for beef calves, to compare the temperature detected depending on whether the device is housed in the vagina or in the rumen and to assess possible applications in the early diagnosis of bovine respiratory disease (BRD).

Material & methods: A one-week pilot study was conducted to assess the performance of GUARDIAN®, an externally applied telemetric device for intra-vaginal or reticulo-ruminal use. It is a T-shaped cylindrical device, 9 cm long and 2.8 cm in diameter. This device takes measurements of body temperature in a serial way, once every hour, sending this information to mobile devices, including an alert system in case of fever detection and storage of the data in its own database. The device consists of a temperature sensor on an electronic board, with a timer for sending the data every hour, a battery that lasts longer than the feeding cycle and an antenna for transmitting data. All this is included in a waterproof and biocompatible wrap-around material. Given the long-lasting characteristics of the material, it is reusable and only requires an external antenna to receive the signals, housed in the pen.

The GUARDIAN® device was applied both vaginally and ruminally to five cross-bred beef calves at two different sites (three in the province of Avila and two in Toledo) to assess their functionality, possible undesirable effects (expulsion or interruption of rumination) and to evaluate applications in the early diagnosis of BRD. Calves from Avila were between 10 and 12 months old, while those from Toledo province were between 4 and 6 months old.

Results: All devices were functional regardless of the route of application, and no undesirable effects were detected (rumination was not interrupted in any of them and none of the devices were expelled).

All animals showed daily temperature peaks above 40°C when the devices were housed in the rumen, coinciding with the maximum of rumination activity. In contrast, daily temperature fluctuations emitted by vaginal-housed devices in healthy animals were minimal, coinciding with previous studies in healthy animals (SD=0.16 ºC). All the animals that showed temperatures above 40ºC by a vaginal GUARDIAN® were later explored and showed symptoms compatible with BRD and rectal temperature equal to or higher than 40ºC.

Conclusions: GUARDIAN® showed optimal performance without any undesirable effects and detected sick animals satisfactorily and early, especially those devices placed in the vagina.

Keywords: Radiofrecuency device, BRD.

FE-07

Highthroughput Antibody and Cellular Immune Response Profiling Against Respiratory Pathogens in Calves following a Preconditioning Protocol

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Objectives: Pre-conditionning of calves before entry in fattening units has been promoted as a good approach to reduce antibiotics treatment against bovine respiratory diseases (BRD). Enhancing immunity to respiratory pathogens by vaccination before the risk period may help reduce the prevalence of BRD. The purpose of our study is to evaluate antibody and cell-mediated response against the main repiratory agents in a case/control study in order to evaluate the effects of the pre-conditionning program on immunity to BRD.

Materials and methods: Two groups of calves (n=20) were allocated randomly to each treatment. Pre-conditionned (PREC) calves were weaned and grouped in loose housing approximately 50 days before entry in the fattening unit. They received a balanced diet and were vaccinated twice at 4 weeks interval with an inactivated vaccine against BRSV, BPI3 and *Mannheimia haemolytica.* During that time, control (CON) calves were kept with their dams on pasture without any change. After weaning, they were directly transported to the fattening unit where the vaccination program with the same vaccine was implemented. Blood samples were collected at recruitment in the protocol, and then at the date of entry, and 30 and 60 days after entry, to cover the period of highest BRD incidence in this breeding system. Antibody response against BRSV, BPI3 and *Mannheimia haemolytica* was assessed by ELISA (BioX diagnostics). Whole blood cell stimulation was

prepared with the same pathogens, to assess cellular reponses, and with lipoplysaccharide (LPS) and concanavaline A to measure the levels of innate and adaptive responses, respectively. Cytokine production was measured using a custom bovine cytokines Milliplex assay (MERCK-Millipore).

Results: At the time of inclusion, no difference between the groups was noticed. The average daily gain (ADG), zinc and glutathion-peroxydase plasma concentration were higher in PREC compared to CON (+ 440g /d; + 3pmol / L; + 118U / g Hb) at the time of entry in the fattening unit. Further, specific antibodies for BPI3, BRSV, and *Mannheimia haemolytica* were higher in PREC compared to CON, as was IFNg production in response to *Mannheimia haemolytica*. Immune traits were correlated with several parameters like trace minerals or weight gain despite the low number of evaluated animals and the possibility of confusing factors.

Conclusions: High-throughput profiling of the immune response in young bulls around the entry in fattening units highlight the benefit and limits of pre-conditionning, and opens up promising prospects for the management of BRD in cattle, and improvement of farming conditions.

Keywords: BRD, vaccine, preconditioning, young bulls.

FE-08

Activity, rumination, and performance of BRD treated calves compared to their own baseline activity and healthy cohorts

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Objectives: The objective of this study was to determine rumination, activity, and performance of cattle treated for BRD with Florfenicol-Flunixin Meglumine combination when compared to their own baseline and healthy cohorts.

Materials & Methods: This experiment was designed as a prospective cohort study in 203 beef calves exposed to naturally-occurring bovine respiratory disease (BRD). Upon arrival, calves were processed with a standard feedlot receiving protocol. All calves were equipped with an ear monitoring tag (Allflex Livestock Intelligence) that captures biometric data. Calves were enrolled at the time of first BRD diagnosis. The case definition for BRD consisted of a clinical score of 1, 2 or 3 and rectal temperature > 104°F. All calves meeting the case definition (N=93) were treated with a fixed combination of Florfenicol–Flunixin Meglumine (Resflor Gold, Merck Animal Health, Madison, NJ, USA). Treated calves were allocated to a separate "sick pen" and followed for 46-days post-diagnosis. The remaining calves not diagnosed with BRD (N=110) were maintained in the original pens. Health, average daily gain (ADG), activity, and rumination parameters were collected on all calves. Data analyses were performed by generalized linear mixed models evaluating the calf as the experimental unit.

Results: No statistical differences were observed in the arrival body weight between calves ultimately categorized as healthy (463.8 lbs, 95% confidence interval [95%CI]; 362.5, 565.2) or sick (461.5 lbs, [95%CI]; 451, 472) (P>0.10). Compared to cattle diagnosed with BRD at least one time, calves never meeting the BRD case definition displayed a heavier final body weight (615.1 lbs [95%CI; 527.4, 702.8] vs 547.7 lbs [524.4, 571.1], respectively) and a greater ADG (3.3 lbs/day, [95%CI; 0.7, 5.9] vs 1.8 lbs/day, [95%CI; 1.4, 2.2], respectively) (P≤0.10). Rumination and activity were also greater (P≤0.10) among healthy calves throughout the study compared to calves treated at least once for BRD.

Additionally, calves treated more than once experienced ongoing reductions in ADG, rumination, and activity parameters (P≤0.10). In calves treated up to three times, the negative impact on ADG was observed as early as the timeframe between enrollment and first BRD treatment compared to calves treated only once or twice (P≤0.10).

The impact of the treatment with Florfenicol–Flunixin Meglumine (Resflor Gold, Merck Animal Health, Madison, NJ, USA) on rumination and activity pre and post administration was also assessed. Post-administration outcomes for both rumination and activity increased compared to pre-treatment levels among calves treated only one time for BRD (P≤0.10). No differences were observed between pre- and post-administration estimates for calves treated twice or three times (P>0.10). No adverse events were observed in this study.

Conclusions: This study showed further evidence that cattle diagnosed and treated for BRD display a negative performance compared to cattle that maintained optimal health. However, cattle that respond favorably to the initial BRD treatment outperform their cohorts that require ongoing therapy. Rumination and activity biometrics were not negatively impacted in this study regardless of the frequency of BRD treatments with Florfenicol–Flunixin Meglumine (Resflor Gold, Merck Animal Health, Madison, NJ, USA) suggesting that this product may not have a negative impact on the animal's gastrointestinal environment.

Keywords: Feedlot, calves, rumination, BRD, monitoring.

FE-09

Reduction in BRD antimicrobial treatments in a US feedlot-based multi-site study using conventional BRD control approach vs. targeted prediction technology

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Objective: The study objective was to determine if cattle health and performance comparing a targeted bovine respiratory disease (BRD) prediction technology (BRD_PT; Whisper® On-Arrival) was superior to a negative control (no metaphylaxis) yet no different than a positive control (conventional BRD metaphylaxis; 100% application).

Materials & Methods: Across 4 US study sites (Texas [2 sites; TX-1, TX-2], Oklahoma [OK], Nebraska[NE]), cattle were

procured from various livestock auction markets, processed with the same product regimen, and randomly allocated to one of four BRD control treatment groups: 1. Negative control (Saline), 2. Positive control (Tildipirosin [Zuprevo®] to 100% of the group), 3. BRD_PT-high (± Tildipirosin; more calves treated), and 4. BRD_PT-low (± Tildipirosin; less calves treated). Within either BRD_PT-managed group (i.e. groups 3 and 4), only calves identified to be at high risk for BRD by the technology were administered the BRD control drug; those at predicted lower risk were left without therapy. Calves were penned by treatment group. Three days after treatment administration, cattle were observed daily by pen riders blinded to treatment group assignment. The same BRD case definition and BRD treatment regimen was implemented across all 4 sites. Cattle were followed to either a short-term timepoint (TX-1, 50 days; NE, 60 days) or to closeout (TX-2, 230 days; OK, 240 days). Health and performance outcomes were collected at all respective timepoints. Carcass metrics were captured on those followed to closeout.

Results: Across all sites, BRD control antibiotic use was reduced by 11% to 43% between the two BRD_PT-managed treatment groups compared to the positive control where 100% of the cattle received antimicrobial therapy. The positive control and both BRD_PT-managed groups significantly (P≤0.05) improved numerous health and performance outcomes compared to the negative control. At one site (OK), the BRD_PT-high group displayed a significant improvement in hot carcass weight (P≤0.05) compared to the positive control. However, no further differences (P>0.05) were observed between either BRD_PT-managed group and the positive control at any of the 4 sites.

Conclusion: Across all 4 sites, the BRD_PT technology (Whisper® On-Arrival) maintained the benefits of a conventional BRD control program yet reduced BRD control antibiotic use by 11% to 43%. This technology has the potential to reduce antibiotic costs to the producer while supporting judicious antimicrobial use.

Keywords: Calves, BRD, prediction, technology, metaphylaxis.

FE-10

Environmental sampling for characterization of *Mannheimia haemolytica* shedding by feedlot cattle

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Objective: Control and prevention of Bovine Respiratory Disease (BRD) is a major reason for treatment of cattle with antimicrobial drugs. However, the prevalence of antimicrobial resistance (AMR) is increasing in *Mannheimia haemolytica* and other BRD pathogens which may limit treatment efficacy. Investigation of AMR impacts on BRD requires recovery and characterization of *M. haemolytica* by costly and time consuming sampling of individual cattle. Identifying group sampling methods that are comparable to individual sampling could facilitate surveillance and research. The objective of this study was to compare detection of *M. haemolytica* in cattle via individual sampling using culture and quantitative real-time PCR (qPCR) of nasopharyngeal swabs (NPS) with detection from group sampling methods - water bow swabs, ropes hung on pens, and pooled DNA from NPS.

Materials and Methods: Cattle housed in10 pens located at 3 commercial feedlots in Texas were sampled at 10-22 days on feed. Ten animals from each pen (n=100) were randomly selected and NPS were obtained using rayon swabs for bacterial culture and DNA extraction. Five 1-cm diameter polyester ropes were hung from each study pen for 24 hours. Water bowls from each pen were swabbed at 3 locations in the bowl: the bottom, the waterline, and the top. qPCR for the leukotoxin D gene of *M. haemolytica* was performed in triplicate using DNA from individual NPS (n=10 animals/pen), pools of NPS (n=3 pools/pen), ropes (n=3/pen), and water bowls (n=3/pen). Individual NPS (n=10 animals/pen), ropes (n=2/pen), and water bowls (n=3/pen) were cultured to identify *M. haemolytica*. Mean Ct for each sample type was compared by Kruskal-Wallis analysis of variance on ranks, with post-hoc Dunn test using Benjamini-Hochberg correction.

Results: *M. haemolytica* was only cultured from individual NPS, with animal within pen prevalence ranging from 0-50% of animals sampled (median=10 %). qPCR identified *M. haemolytica* in 41% of individual NPS (n=41), 60% of pooled NPS samples (n=18), 76% of rope samples (n=23), and 78 % of water bowls (n=14 - only 18 samples had sufficient DNA for testing). Overall, ope samples had a lower mean Ct than water bowls, NPS pools, and individual NPS (26.5 vs 30.1, 31.1, 34.9, respectively; p <0.05). However, when analyzing pens separately, for 7 pens, there was no difference in mean Ct for each of the methods (Kruskal-Wallis, p>0.05).

Conclusions: These results support the use of group sampling to characterize group prevalence of *M. haemolytica* via qPCR. Culture of *M. haemolytica* did not reliably identify the agent in group sampling methods.

Keywords: Real-time PCR, BRD, bacterial culture.