Comparison of Transmission of Anaplasma marginale Infection using Needle-free and Standard Needle Injection

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Introduction

Iatrogenic transmission of Anaplasma marginale, associated with livestock management procedures, is a concern for veterinarians and producers worldwide. The purpose of this study was to compare transmission of A. marginale infection from an infected steer to uninfected steers following needle-free versus conventional needle injection.

Materials and Methods

Twenty-six Holstein steers were purchased and confirmed negative for A. marginale infection by cELISA and a new ribosomal RNA RT-PCR. One animal was splenectomized and inoculated with a Virginia isolate of A. marginale to serve as a parasitemic carrier animal. The remaining twenty-five steers were blocked by bodyweight and randomly assigned to one of 3 groups: Group A (needle-free injection, n=10), Group B (needle injection, n=10), and Group C (no injection, n=5). A 2ml intramuscular injection of sterile saline was alternated between the parasitemic calf and respective non-parasitemic calves in Group A utilizing the Felton Needle-free Injection System (Intervet Inc. of Intervet International). Similarly, calves in Group B were injected following the parasitemic calf using a conventional 16 gauge, 1” needle. The remaining five calves in Group C served as non-injected controls.

Results

Preliminary results at 35 days post injection indicate that 5/10 calves in Group B tested positive for A. marginale by both cELISA and PCR assays, while all animals in Groups A and C tested negative on one or both diagnostic assays.

Significance

Preliminary findings suggest needle-free injection has a lower likelihood of iatrogenic transmission of A. marginale than conventional needle injection. These results have important implications for implementing biosecurity programs in production systems.
Administration of an SRP Salmonella Newport Vaccine Improves Milk Production and Somatic Cell Count in dairy Cows with no Clinical Signs of Salmonellosis

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Introduction

Salmonella is a common cause of disease in animals and humans. Many Salmonella infections are asymptomatic and many dairy herds do not know that they have Salmonella present until clinical cases present. Lack of recognition of subclinical salmonellosis or asymptomatic Salmonella infection by practitioners and producers can lead to oversight in management decisions for the infected herd, allowing the propagation of the pathogen within the herd. A novel vaccine against siderophore receptors and porin proteins (SRP® technology) has been adapted for control of Salmonella Newport in cattle. Many dairy producers utilize this vaccine on a routine basis for control of salmonellosis. However, there are no peer-reviewed papers on the efficacy of SRP Salmonella Newport vaccine for controlling Salmonella, or what impact this vaccine has on the health and production of dairy cows.

Materials and Methods

Holstein dairy cows and heifers (153 hd) in a commercial dairy operation were utilized to determine the effects of a commercially available SRP Salmonella enterica serotype Newport vaccine. Cows were randomly assigned to one of two treatments: SRP Salmonella Newport vaccine (Agrilabs Ltd) or placebo. Cows and heifers were vaccinated 46-90 days pre-freshening and again 14-21 days pre-freshening. Milk production was monitored by an electronic recording system that weighs milk on a continuous basis. Milk weights were recorded electronically. Fecal samples were collected on the day of first vaccination, 7 to 14 DIM and 28 to 35 DIM. Fecal samples were transported directly to the Kansas State University Veterinary Diagnostic Laboratory (KVDL). Salmonella serogroup isolation and identification was conducted at the KVDL. Salmonella isolates were sent to NVSL for serotyping. Blood samples were collected on the day of first vaccination, 7 to 14 DIM and 28 to 35 DIM. The serum samples were frozen and all samples were sent to Epitopix, LLC (Willmar, MN) for ELISA serum antibody testing. Milk samples for somatic cell counts (SCC) were taken on 1 DIM, 30 to 60 DIM and 60 to 90 DIM. All samples were delivered to the DHIA lab in Manhattan, KS, to measure somatic cell count (SCC) of the milk. Mixed-models methodologies were used to analyze the data. Where repeated measures were taken, first-order autoregressive covariance matrices were used to account for within-animal dependency over time. Continuous outcomes and categorical responses were modeled using linear and logistic regression techniques, respectively. Parity was forced into the models as a random variable and parity adjusted least-square means were computed. For repeated measures, the main effects of vaccination and day and their interaction were included in initial models.

Results

Average daily milk yield was greater in cows vaccinated with the SRP Salmonella Newport vaccine (88.8 lb/d) relative to the cows vaccinated with the placebo (86.3 lb/d; P < 0.01). Salmonella was recovered from 14% of cows; all isolates were S. Agona. There was no detectable difference in Salmonella shedding in cows vaccinated with SRP technology relative to cows vaccinated with the placebo at any of the three fecal sampling times during the study. Numerically, SCC were lower for cows vaccinated with SRP technology at all sampling times but only the SCC samples taken at 30-60 DIM were significantly lower for cows vaccinated with SRP technology relative to control cows (P = 0.01). Vaccination with SRP had no detectable effect on cow morbidity during the study.

Significance

Vaccinating the dairy cows with Salmonella Newport SRP vaccine increased milk production for the first 90 DIM. Vaccination with SRP technology had no detectable effect on recovery of Salmonella Agona but did have a positive impact by decreasing somatic cell counts. These improvements in milk quantity and quality may lead to improved profitability of for dairy producers.
The Effect of Season, Walking Surface and Sire Identification on Thin Soles in Dairy Cattle

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Introduction

Thin soles have become a major economic problem in large total confinement dairies in the United States. The cause appears to be multifactorial and relates to factors that result in an increase in sole horn wear. Factors such as the distance cows have to walk on concrete to be milked, poor cow comfort, claw horn moisture content and horn quality, heat stress and overtrimming have been implicated. The purpose of this study was to: a) investigate the incidence of thin soles over a period of 12 months from two herds in relation to month of year b) determine the incidence of thin soles in first lactation cows in Herd 1 for the 9 months prior and 9 months following installation of rubber on walk ways and c) determine any sire effect on thin soles for first lactation cows in Herd 1.

Materials and Methods

Approximately 3221 lactating cows (Herd 1)(April 2003 to March 2004) and 2100 lactating cows (Herd 2) (April 2005 to March 2006) were studied. Both herds are situated in different states in the country but with similar ambient temperature and humidity conditions in the summer. Cows in both herds were housed in free stalls and cooled during the summer months with sprinklers. Walking surfaces consisted of grooved concrete. In Herd 1 rubber was installed on walkways, transit lanes and around feed bunks. Thin-soled cows were identified by professionally trained hoof trimmers based on a soft flexible sole on thumb pressure during daily examination of animals presented with clinical lameness.

Results

The incidence of thin soles for the 12-month period was 30.1% for Herd 1 and 7% for Herd 2. The highest incidence occurred between August and December with peak incidence during November and December for Herd 1. This was significantly higher (p=0.001) compared to the rest of the year. For Herd 2 the peak incidence occurred during August and September. For 1st lactation cows in Herd 1 the frequency of all lameness for the 9 months prior to installation of rubber was 66.9%. Following rubber installation the frequency of lameness was 21.8%. The frequency of thin soles for 1st lactation cows was 32.6% prior to installation of rubber and 4% following rubber installation. Sire identification was available on only 349 first parity cows in Herd 1. Sire variance for clinical lameness from a logistic model that included month of calving effect (PROC GLIMMIX, SAS, 2005) was positive but smaller than its standard error.

Significance

The higher incidence of thin soles during the summer could be associated with a higher claw horn moisture content resulting in softer and more flexible horn with a more rapid rate of wear. The seasonality observed also suggests that heat stress contributed to lameness either through alterations in cow comfort (that is, more standing and less lying time), influences on rates of laminitis (by virtue of increased rates of rumen acidosis) or both. Distance walked and nutritional influences were not studied but may have also contributed to thin soles as a consequence of increased sole wear rumen acidosis and laminitis. Differences in the incidence of thin soles in herds may be due to differences in the claw horn change recorded. Both sole flexibility and sole/white line separation in the abaxial toe region (Zones 1 & 2) are common physical changes associated with thin soles. In some instances white line separation is the preferred terminology, which complicates incidence and prevalence studies. Sole flexibility should be used as the basis for diagnosis and recording of thin soles.
Antibody Responses and Clinical Outcome Following Naturally Occurring Cases of Clinical Mastitis Compared Among J5 Vaccinates and Controls

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Introduction

Mechanism(s) of J5 vaccine immunity, including the relative importance of J5-specific antibodies, have never been conclusively determined. This study evaluated the association of a two-dose J5 vaccination program with production of anti-J5 antibodies and measures of outcome for naturally occurring clinical mastitis (CM).

Materials and Methods

Three Holstein dairy herds were studied. Milk production was approximately 25,000 pounds per cow per lactation and contagious mastitis was well controlled. Cows that met inclusion criteria were randomly assigned as J5 vaccinates or controls. The vaccine was administered subcutaneously in the supramammary region at dryoff, and again 21-28 d before the calving due date. Milk samples were aseptically collected for microbiological culture at onset of any cases of CM. Blood samples were collected from all cows at drying off, 1 - 7 DIM following calving, and once between 17 – 77 d following the end of treatment for all CM cases. This study used a subset of cows, from the 2 herds with 97% accuracy of cows' daily milk weights recorded electronically, and with CM cases defined as either Severe or Mild. Comparing mean milk production for the 14 d before onset of CM to that of the 21 d after end of treatment, Mild cases were defined as those that had > 100% of pre-mastitic production. Severe cases had < 85% of pre-mastitic milk production, or were culled or died < 30 d after onset of CM and < 150 DIM when culled or died. Antibody against J5 was measured by ELISA at Michigan State University.

Results

There were 51 CM cases selected for antibody testing, 32 Severe (17 controls, 15 vaccinates) and 19 Mild (7 controls, 12 vaccinates) cases. 28 Severe cases had milk production < 85% of pre-mastitic production after CM and the other 4 Severe cases were culled. Post-calving IgG1 (P < 0.01) and IgG2 (P < 0.05) against J5 were higher in vaccinates. All 3 classes of J5-specific antibody were not different between vaccinates and controls 17-77 d following CM. J5-specific IgM and ratios of IgG1:IgG2 were not significantly different among controls and vaccinates at any time point. Logistic regression (85.7% Concordant pairs) showed that as DIM at onset increased, severity was more common, especially among J5 vaccinates (interaction of DIM x vaccination) (P < 0.03). Linear regression showed that less milk production was lost for cases with onset earlier in lactation (P < 0.0001), in J5 vaccinates only among cows infected with E. coli (interaction, P = 0.02), and with post-calving (P = 0.06) and post-mastitic (P = 0.01) IgG1 values in moderate ranges compared with extreme high or low values. 83% of J5 vaccinates had post-calving IgG1 in the beneficial range, while 63% of controls did, a nearly significant difference (P = 0.06, Fisher’s Exact Test). The hazard of being culled for all reasons was less for J5 vaccinates (44%) than for controls (64%), and vaccinates were especially less likely to be culled during early lactation (P < 0.05, time to event analysis). These cull rates are high because all Severe cases were included in this subset of cows. Hazard of culling with mastitis as the reason was also significantly less for vaccinates (4%) vs. controls (23%) (P < 0.03). Hazards of dying were not different among vaccinates and controls. Pathogens isolated did not differ between Severe and Mild cases.

Significance

J5 vaccination was associated with protection against effects of CM, especially in early lactation cases with E. coli. Following CM, controls were similar to vaccinates in increased antibody production, but vaccinates were protected by more IgG1 and IgG2 (memory immunity) against J5 before the disease. Antibody class (isotype) switching from IgM to IgG1 and IgG2 appears to be an important mechanism of J5 protection. Vaccine protection decreased as lactation progressed. The optimum J5 vaccination schedule for the most cost-effective protection (better immunological memory) against clinical mastitis should be further investigated.
Prevalence, Etiology and Self Cure Rates of Subclinical Intramammary Infections in Fresh Cows

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Introduction

Identifying and eliminating subclinical intramammary infections (IMI) present at the time of calving could result in milk quality, cow health and production benefits throughout the future lactation. A multi-site, multi-herd, controlled field study aims to validate the efficacy, and to quantify the cost-benefit of incorporating on-farm culture systems into both clinical and subclinical mastitis monitoring and treatment programs. The objective of this manuscript is to present preliminary results describing the prevalence, etiology and self cure rates of subclinical IMI in fresh cows and quarters.

Materials and Methods

Fresh cows from 11 Canadian and US herds were enrolled in the first 3 days after calving. Cows were excluded from enrollment if they had fewer than 3 functional teats, signs of clinical mastitis at time of calving, or any other condition requiring treatment with systemic antibiotics. The herdsman performed the California Mastitis Test (CMT) and collected a milk sample from all four quarters using aseptic sampling techniques. The samples were frozen, and later cultured in the laboratory following methodologies recommended by the National Mastitis Council. Intramammary infection in a quarter was defined as isolation of 1 or 2 bacterial pathogen species from a quarter milk sample. A sample was considered contaminated if 3 or more bacterial species were isolated. A cow was considered infected if 1 or more quarters were infected. Bacteriological cure within a quarter was assessed by reculturing all 4 quarters at approximately 14±3 and 21±3 days after enrollment. A cure within the quarter was defined as presence of one or two organisms in the enrollment milk sample, and the absence of the same specified microorganism(s) in both the 14 and 21-day milk samples.

Results

Prevalence and Etiology At this stage of the study data are available to describe culture results for a total of 1028 cows and 4044 quarters. Seventy-two percent of all cows were infected at calving in at least one quarter. Remarkable is that the percentage of first lactation animals infected was 20% higher than that of mature cows. Thirty-seven percent of the quarters from all cows were infected. Infected cows had an average of 2 infected quarters. The pathogen most commonly isolated was coagulase-negative Staphylococcus spp. representing 51% of the infections, followed by Bacillus spp. (16%), Streptococcus uberis (8%), Enterococcus spp. (7%), Escherichia coli (5%), Aerococcus spp. (5%), Enterobacter spp. (2%), Staphylococcus aureus (2%), Klebsiella spp. (1%), Yeast (1%), Streptococcus dysgalactiae (<1%), Corynebacterium bovis (<1%), Arcanobacterium pyogenes (<1%), Citrobacterium spp. (<1%), and Acinobacterium spp. (<1%). The distribution of pathogens isolated was similar between heifers and mature cows. Self Cure Rates Data were analyzed from a total of 366 infected quarters with 442 bacteria. These quarters belong to cows not assigned to antibiotic intramammary treatment study groups. Overall bacteriological self cure rate (SCR) for all quarters was 54%. Self cure rates for coagulase-negative Staphylococcus spp. (37%) and Staphylococcus aureus (38%) infections were very poor. Much higher spontaneous SCR were observed for environmental streptococci (86%) and coliform infections (88%). Bacillus spp. infections showed an intermediate pattern, with 45% of these infections persisting until at least two to three weeks after calving. The parity of the cow did not have an association with the risk for a bacteriological cure within a quarter.

Significance

This preliminary analysis shows that a high prevalence of subclinical IMI infections are present at 1 to 3 DIM, with half of these IMI being due to coagulase-negative Staphylococcus spp. It is remarkable that many of these infections are still present two to three weeks after parturition. Consequently, there is still a significant opportunity for new management tools to be implemented to further reduce IMI at calving.
The Impact of Milk Temperature Monitoring on Milk Quality on Ontario Dairy Farms

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Introduction

The Ontario dairy industry takes great pride in providing high quality milk products to the consuming public. Milk and milk products are an important part of the daily diet of most Ontario residents. Bacterial contamination of raw milk has a major negative impact on milk quality. Even though most milk is pasteurized prior to consumption, raw milk is consumed by some farming families and is used to manufacture some food products. Dairy Farmers of Ontario have required installation of Time Temperature Recorder’s (TTR’s) on all Ontario dairy farms, with the intention of preventing elevated bacteria levels in raw milk under the Canadian Quality Milk Program. The TTR has two sensors, one in the bulk tank that monitors the raw milk temperature and one in the pipeline to monitor wash water temperature during the wash cycle. The objective of this study was to evaluate the impact of TTR’s on the bacterial content of raw milk and the loss of (dumped) bulk tank milk on Ontario dairy farms and to summarize the occurrences of the different TTR alarms.

Materials and Methods

Two study groups were compared in this study, a TTR and a Non-TTR group of herds. The TTR study group consisted of 497 herds that had a TTR installed for at least one year prior to the study. The Non-TTR group of 514 herds did not yet have a TTR installed during the study period. The study period was from April 2005 to March 2006. Multiple linear regression models were constructed to determine the effect of TTR installation on measures of milk quality. Firstly, the Bactoscan bacteria values within the TTR study group in the year prior to TTR installation, Sept. 2003 to Sept. 2004, were compared to the Bactoscan levels within the study period. The study period was from April 2005 to March 2006. Multiple linear regression models were constructed to determine the effect of TTR installation on measures of milk quality. Firstly, the Bactoscan bacteria values within the TTR study group in the year prior to TTR installation, Sept. 2003 to Sept. 2004, were compared to the Bactoscan levels within the study period. Secondly, the TTR group was compared to the Non-TTR herds during the study period. Bactoscan levels during the year prior to TTR installations were compared within the TTR and Non-TTR study groups to determine if there was a difference in raw milk bacteria levels prior to the study. Lastly, the occurrence of milk pick-ups in Ontario <50% of the expected volume for each farm was retrieved from DFO for all the TTR and Non-TTR herds for the period of one year and linear regression was performed to determine the effect of the TTR installation on the loss of (dumped) bulk tank milk. In addition, one year of alarm data was gathered from 200 farms within Eastern and Southwestern Ontario. The alarm data was categorized into the different alarm types and the season of year in which the alarm occurred. Alarm prevalence’s were determined.

Results

The presence of a TTR was significantly associated with a decrease in bacteria levels in raw milk compared to farms without TTR’s. In addition, there was a significant decrease in Bactoscan levels after TTR installation compared to the year prior to TTR installations on the same farms. Also, there was no significant difference between Bactoscan levels in the year prior to TTR installations within the two study groups. The higher risk of dumped milk data suggested that the producers within the TTR group were discarding more of their raw milk compared to the Non-TTR study group, and also that more bulk tank milk was being lost within the cooler months of the year. The most commonly occurring TTR alarms were the pipeline and bulk tank washing alarms, the slow cooling alarm and the high blend temperature alarm. In addition, the washing alarms were more prevalent in the cooler months of the year and the cooling alarms were more predominant in the warmer months.

Significance

The TTR study group had a significantly lower level of bacteria in raw milk samples, compared to prior to TTR installation and also compared to the Non-TTR study group. Therefore, the installation of the TTR’s was a positive step towards the improvement of bacteria levels in raw bulk tank milk and the production of high quality milk products in Ontario.
Comparison of 3M Petrifilm Staph Express Count Plates, and 3M Petrifilm Rapid Coliform Count Plates with Standard Bacteriology of Bovine Milk

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Introduction

Isolation and identification of mastitis pathogens is a fundamental step in milk quality control programs. There is a need for an inexpensive and rapid bacteriologic test that allows veterinarians as well as dairy producers to make real-time decisions to better manage udder health in their herds. Petrifilm plates may fill this gap. Petrifilm plates are ready-to-use culture media that are used primarily in the food industry. The objectives were 1) Evaluate the test characteristics of the Petrifilm Staph express Count Plates (STX) for identification of S. aureus from milk. Milk samples were taken from cows a) in the first 30 days in milk, b) with high somatic cell count (SCC) during lactation, c) with clinical mastitis. 2) Evaluate the test characteristics of the Petrifilm Rapid Coliform Count Plates (RCC) for identification of coliforms from cases of clinical mastitis.

Materials and Methods

In both objectives, the agreement (Kappa) between STX, and RCC, standard bacteriology and the gold standard was evaluated. The effect of the test characteristics of STX, and RCC plates when a diluted sample 1:10 was used, compared to an undiluted sample was determined. As well as, the test characteristics of the STX, RCC plates were evaluated after freezing clinical mastitis milk samples. A sample was considered positive for bacteria (gold standard) if: bacteriology (primary or incubated) was positive for the bacteria or Petrifilm culture was positive for the bacteria and identification of the Petrifilm isolate was confirmed by bacteriology.

Results

1) a) A total of 1203 fresh milk samples were used in the analysis. The sensitivity (Sn) and specificity (Sp) of the STX for non-diluted (ND) and diluted (D) samples were 67.9, 99.1%, and 75.4%, 98.9%, respectively. The agreement (Kappa) between the two tests and the gold standard was 0.750 and 0.797. The D samples had the best agreement although ND samples were also very good. b) 300 fresh milk samples were analysed. The Sn and Sp of the STX for ND and D samples were 77.2%, 98.2%, and 82.5%, 98.8%, respectively. The agreement between the two tests and the gold standard was excellent at 0.804 and 0.852. c) A total of 517 milk samples (319 fresh and 198 frozen) were used in the analysis. The test characteristics of the STX were the highest for D samples fresh samples, with a Sn and Sp of 67.9%, 99.2%, respectively, and kappa of 0.705. For frozen samples, the Sn and Sp were similar for ND samples with a Sn, Sp, and Kappa of 64.9%, 100%, and 0.750, respectively. When bacteriology was compared to the gold standard for fresh clinical mastitis samples with the STX, the agreement was excellent with Kappa =0.941. 2) For the evaluation of the RCC for clinical mastitis, a total of 522 (318 fresh and 204 frozen) samples were analysed. The Sn and Sp of the RCC for ND and D fresh samples was 79.0%, 98.8% and 80.6%, 99.2%, respectively. The agreement between the two tests and the gold standard was excellent at 0.829 and 0.850. The D samples had the best agreement but ND samples were very good. Using frozen samples, the test characteristics and kappa for ND samples was 73.0%, 99.9%, and 0.780. For D samples the results were numerically improved at 73.0%, 99.0% and 0.827. For samples that arrived fresh, were frozen and then replated, the Sn and Sp for non-diluted samples was 67.6%, and 98.6%, with a Kappa of 0.736. Therefore diluted samples were slightly better for fresh and frozen samples but ND was improved for fresh-frozen samples.

Significance

The Petrifilm culture system has potential as an important on-farm diagnostic tool. The results demonstrated that it is comparable with standard bacteriologic culture for the isolation of S. aureus and coliforms. Making udder health treatment decisions based on bacteriologic results will help to reduce risks associated with unnecessary antibiotic treatment, benefiting both the cow and the consumer.
Comparison of Systemic and Intramammary Dry Cow Treatments

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Introduction

The non-lactating (dry) period is an important time for udder health in that infections can be either acquired or cleared. Intramammary dry cow therapy with antibiotics is routinely used. The inclusion of systemic antibiotics with intramammary therapy in a previous study gave better cures during the dry period. The use of tylosin administered in the dry period has been previously proposed because it is able to penetrate udder tissue. The objective of this study was to compare the use of tylosin in the dry period alone, or in combination with intramammary antibiotics, as compared to the use of intramammary treatment alone.

Materials and Methods

On a large commercial dairy farm, cows were selected at the end of lactation and randomly assigned to one of 4 groups of dry cow treatment: Group 1 (n=88), cephapirin (Tomorrow®, Fort Dodge) intramammary and teat sealant (Orbeseal®, Pfizer); Group 2 (n=83), tylosin 12 grams intramuscular (Tylosin®, Agripharma) cephapirin intramammary and teat sealant; Group 3 (n=82), tylosin 12 grams intramuscular and teat sealant; Group 4 (n=76) tylosin 12 grams intramuscular only. For this study 329 cows were enrolled at dry-off and followed for a 100 days after calving. Quarter milk samples were collected at dry-off, one and two weeks after calving. Bacterial cure was defined as a positive bacteria culture on blood agar at dry-off and negative to culture on both milk samplings after calving. Somatic cell counts were obtained from DHI test records at dry off, 30 and 60 days after calving. Somatic cell counts were compared using oneway ANOVA and bacteria cure rates were compared using Chi Square. Dairy Comp 305 records used to monitor health records and mastitis events.

Results

Of the 329 cows enrolled in the dry cow treatment trial, 278 had complete records and were included in the results. Somatic cell counts for all 4 treatment groups decreased after calving (Graph 1). The combination of intramammary and systemic antibiotics gave the best response at the first test date after calving(Graph 2) but no differences were detected by the second test date (Graph 3). All treatments had a high cure rate when used in the dry period. Bacterial cures for Gram-positive infections were greater (P>0.01) for the combination of intramammary and systemic antibiotics with a teat sealant, 44 cures of 47 infections (94%) as compared to systemic antibiotic only with 57 cures of 73 infections (78%) (Table 1). There was no difference among the other treatment groups. The combination of intramammary and systemic antibiotics with teat sealant also had the highest projected 305ME production for all the treatments (Graph 4) with an additional 2000 lbs. (1010 kg) of milk. There were no differences in 305ME levels for the other 3 groups.

Significance

The use of systemic tylosin in combination with the intramammary antibiotics increased the effectiveness of the dry period treatment. The apparent good diffusion into the gland by the tylosin, improved the cure rate of Gram-positive infections. There were no differences between the use of tylosin plus teat sealant and intramammary treatment plus teat sealant at dry-off. Adding the teat sealant to the systemic treatment with tylosin at dry-off improved the response of the treatment. Further studies are needed to validate this effect in other dairy herds and evaluate the interaction that may have occurred using the teat sealant with these antibiotic therapies.
Efficacy of Extended Therapy of Staphylococcus aureus with Intramammary Cefuroxime

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Introduction

Staphylococcus aureus is a major pathogen causing intramammary infection in dairy cattle. Antibiotic therapy of S. aureus during lactation results in cure rates of between 4 and 92%. The cure rate is influenced by age of cow, stage of lactation, SCC, duration of infection, front vs. rear glands, number of quarters, bacterial colony counts and resistance to penicillin. Increasing the duration of therapy increases the cure rate. For example, bacteriological cure rates of S. aureus of 6%, 56% and 86% were achieved following 0, 2 or 8 intramammary treatments with the lincosamide pirlimycin. The current study aimed to assess the efficacy of extended therapy of S. aureus with the second generation cephalosporin, cefuroxime.

Materials and Methods

Cows (n=61) from a spring calving dairy herd with an elevated bulk tank SCC were selected on the basis of having a SCC of >200,000 SCC/ml at the first herd test of the lactation. Cows were examined with a California Mastitis Test (CMT) and those glands with a CMT >1 (on a 0 to 3 scale) were aseptically sampled for bacteriological culture. Cows (n=34), from which 1 or more glands were culture positive for S. aureus (total n=55 glands), were blocked by number of glands within cow with S. aureus then ranked by herd test SCC before being assigned randomly within blocks of 3 to no, 3 or 6 intramammary infusions at 12 h intervals with 250 mg cefuroxime sodium (Spectrazol Milking Cow, Schering-Plough Animal Health, Upper Hutt, New Zealand). Enrolled glands were re-sampled at 41 and 48 days after the first treatment. Cure was defined as having occurred where S. aureus was isolated from neither of the both post treatment samples. The probability of cure was modeled with main effect being treatment (0, 3 or 6 tubes) on cure at quarter level (yes/no). Potential confounders including age of the cow (categorized into 6 groups), log10 SCC before treatment commenced (continuous), stage of lactation (continuous; days), production before treatment commenced (continuous; milk solids kg/day), clinical mastitis in that quarter previous to treatment (categorical, yes/no), number of quarters infected with S. aureus/cow (categorical), quarter placement (categorical) and CMT score prior to treatment (categorical) were examined at univariate level. None of these potential confounding variables was significant (i.e. all p>0.2) and so were not included in the final model. To account for the non-independence of gland within cow, the confidence intervals were adjusted by the variance inflation factor (pscale; Proc GENMOD, SAS 9.1). A log link function was used as exponentiation of the coefficients produces relative risks. Effect of treatment on log10 SCC and milks solids (i.e. milk fat + milk protein in kg/cow/day) production 43 days post treatment was analyzed using ANOVA with treatment as the main effect.

Results

The least square mean (95% confidence intervals) cure proportions were 0.13 (0.03-0.53), 0.24 (0.10-0.56) and 0.53 (0.32-0.87) for glands treated with 0, 3 or 6 tubes respectively. The cure proportion tended to be higher following treatment with 6 tubes compared to 0 tubes (RR=4.2 (95% CI 0.73-24.4); p=0.07) and for 6 tubes compared to 3 tubes (RR=2.2 (95% CI 0.8-6.0); p=0.11). There was no difference in log10 SCC or milk production at the herd test 43 days post-treatment among the treatment groups (both p>0.3).

Significance

This study demonstrates that increasing the duration of therapy with the second generation cephalosporin, cefuroxime, from 0 to 3 and 6 tubes resulted in a tendency for a higher bacteriological cure rate in glands infected with S. aureus. Similar results have been reported following therapy with the lincosamide, pirlamycin following 0, 2 or 8 treatments. The economics of extended therapy under the low input/low return pastoral production system used in New Zealand remains to be determined.
Cost of Johne’s Disease Control Programs on Michigan Dairy Farms

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Introduction

The NAHMS Dairy 1996 study estimated that 22% of US dairy herds are infected with Johne’s Disease (JD), but other estimates range from 21-93% depending on region and testing method used to identify infected herds. In a recent stratified random survey of dairy farms in Michigan, it was estimated that up to 49% of the state’s dairy herds were infected with JD. Anecdotal reports by private practitioners in Michigan suggest this estimate is extremely conservative. Regardless of the estimate, JD is a prevalent disease on many dairy herds resulting in economic losses due mainly to lost production, increased culling, decreased cull value, and increased replacement costs. The literature estimates annual losses due to JD in US dairy herds range from $22-26 per cow across all cattle in an infected herd. Johne's Control programs are commonly recommended, but very little information is available on the cost to implement these programs. The objective of this study was to quantify the costs of JD control programs implemented on dairy herds over time and determine their impact on herd prevalence.

Materials and Methods

An economic questionnaire was administered to six Michigan dairy herds enrolled in a JD control program annually (2004-2006) to assess costs directly attributable to the control program. The questionnaire consisted of four categories: supplies/testing, management, labor, and capital investment. Costs for each category were calculated and adjusted to 2006 US dollars. Concurrently, JD prevalence on these herds was monitored by annual whole herd fecal culture or serum ELISA testing.

Results

The cost of JD programs on these farms ranged from $24-109 per cow per year with a mean of $63 per cow per year and a median of $58 per cow per year. The majority of the costs fell in the testing and supplies category, followed by labor costs, with costs for management and capital investments being fairly equal when averaged across all herds. Over the same period JD prevalence, as measured by whole herd fecal culture and/or serum ELISA, within these herds dropped 3-30%. There was a trend across these herds for a reduction in the percent of first lactation cows being fecal culture positive (an indication that practices put in place to prevent new JD infections are working). However, there was no apparent association between the amount spent on a control program and the magnitude of decrease in apparent within herd JD prevalence.

Significance

This study provides a rough insight into how much dairy farms are investing into JD control programs. Results also suggest that money spent on a JD control program does reduce within herd prevalence, but a more thorough benefit-cost analysis is needed to determine if JD control programs are cost effective.