

Graduate Student Paper Competition: ADSA-ASAS Northeast Section

46 Evaluation of supplemental dried bovine colostrum in milk replacer fed dairy calves. V. Biemann*, T. J. DeVries, S. J. LeBlanc, K. Lissemore, and K. E. Leslie, *University of Guelph, Guelph, Ontario, Canada.*

Supplementing neonatal calves with immunoglobulins (Ig) in the diet may enhance local immunity in the gut. The goal of this study was to evaluate feeding supplemental IgG on health and growth in pre-weaned dairy calves. Calves (61 bulls and 59 heifers) housed in individual pens in a calf barn were randomly assigned to receive 0 (control), 5g, or 10g of IgG per feeding from dried bovine colostrum, added twice daily for 14 d into a 22% protein 17% fat milk replacer, adjusted to provide similar total protein and fat intakes among groups. Serum samples were collected at d 1 of age to determine passive transfer and again at 11-14 d of age. Mean IgG levels at d 1 were 23 ± 8.4 g/L and were similar among groups ($P = 0.36$); serum IgG at 2 weeks of age was 17 ± 6.0 g/L and were similar among groups ($P=0.33$). Calves were weighed weekly and intakes were measured daily until weaning at 45 d of age. Average daily gain (ADG) over the 6 week period was 0.63, 0.67 and 0.65 kg/d in the control, 5g, and 10 g groups, respectively ($P = 0.45$). Fecal scores (0 - 3) were recorded weekly for 6 weeks with fecal samples collected at 7-13 d, 14-20 d and 21-28 d of age. The prevalence of scours (fecal score ≥ 2) at 7-13 d was 36%, 34%, and 32% ($P=0.95$) in the control, 5g, and 10 g groups, respectively, and at 14-20 d was 39%, 30% and 35% ($P = 0.75$). BioX™ test strips were used to measure fecal shedding of *Cryptosporidium parvum*, rotavirus, coronavirus and *E. coli* K99. The prevalence of shedding of *C. parvum* at 7-13 d was 28%, 33% and 25% ($P = 0.76$) in the control, 5g, and 10 g groups, respectively, and at 14-20 d was 35%, 23% and 22%, respectively ($P = 0.35$). At 21-28 d the prevalence of fecal shedding of rotavirus was 14%, 18%, 14% ($P = 0.84$) in the control, 5g, and 10 g groups, respectively. Under the conditions of this pilot study, no associations were detected between treatment groups in ADG, fecal scores and the prevalence of pathogens being shed in pre-weaned calves. Consistent numerical differences may indicate the need for further research to determine if the addition of Ig plays a role in providing a local immunological effect under conditions of greater exposure.

Key Words: dried bovine colostrum, IgG, calves

47 Feeding anionic salts in the prefresh period, the addition of sodium bicarbonate to colostrum replacer and their effects on IgG absorption in the neonate. K. M. Morrill*, S. P. Marston, N. L. Whitehouse, and P. S. Erickson, *University of New Hampshire, Durham.*

The objective of this experiment was to determine if feeding anionic salts to Holstein cows pre-partum affected their calf's ability to obtain passive transfer, and if adding sodium bicarbonate to colostrum replacer would increase the efficiency of IgG absorption in these calves. Forty Holstein cows and their calves were assigned to a 2×2 factorial arrangement of treatments in a randomized complete block design based on expected date of calving. Three weeks prior to projected due date, cows were placed on one of two diets: a ration without anionic salts (+77 meq/kg), or a ration with anionic salts (-100 meq/kg). Urine pH and DMI were lower for cows receiving anionic salts, as compared to cows not receiving anionic salts. At calving, calves received a commercially available colostrum replacer with or without supplemental sodium bicarbonate (19.75 g/dose). One dose of colostrum replacer was fed within 45 minutes of birth and one half dose was fed at 6 h of age for a total of

198 g IgG. Calves received milk replacer at 12, 24, 36 and 48 h. Blood samples were taken from calves prior to feeding at 0, 6, 12, 24 and 48 h and analyzed for serum IgG concentration. Calves born from dams receiving anionic salts had similar serum IgG concentrations (14.4 vs. 15.1 g/L) and 24 h apparent efficiency of absorption (28.2 vs. 29.2%) to calves born from dams that did not receive anionic salts. Calves receiving supplemental sodium bicarbonate added to colostrum replacer had higher serum IgG concentrations at 12 (14.4 vs. 12.0 g/L), 24 (16.3 vs. 13.2 g/L) and 48 h (14.6 vs. 11.2 g/L) and higher 24 h apparent efficiency of absorption (31.2 vs. 26.1%) as compared to calves that did not receive supplemental sodium bicarbonate in colostrum replacer. Of the forty calves on the study, 90% obtained successful passive transfer (serum IgG concentration > 10 mg/ml).

Key Words: anionic salts, sodium bicarbonate, colostrum replacer

48 Intramammary infections in pasture-based dairy cows supplemented with barium selenate before calving. A. Ceballos*¹, J. Kruze², I. R. Dohoo¹, J. Sanchez³, H. W. Barkema⁴, J. J. Wichtel¹, and F. Wittwer⁵, ¹Centre for Veterinary Epidemiologic Research, University of Prince Edward Island, Charlottetown, Prince Edward Island, Canada, ²Institute of Microbiology, Universidad Austral de Chile, Valdivia, Chile, ³Canadian Food and Inspection Agency, Charlottetown, Prince Edward Island, Canada, ⁴Department of Production Animal Health, University of Calgary, Calgary, Alberta, Canada, ⁵Institute of Veterinary Clinical Sciences, Universidad Austral de Chile, Valdivia, Chile.

Sub-optimal selenium (Se) intake has been associated to several diseases (eg. mastitis). The objective was to evaluate the effect of single Se supplementation before calving on the incidence risk of intramammary infection (IMI) and incidence rate of new IMI, and on milk somatic cell count (SCC) in pasture-based dairy cows. Forty-nine Holstein-Friesian cows were fed a suboptimal Se diet (<0.05 ppm DM). Cows were divided in two groups; supplemented cows ($n=24$) received a single injection of barium selenate (1 mL/50 kg BW; Depose[®], Novartis, NZ) approx. 60 days prior to calving, control group ($n=25$) remained unsupplemented. Duplicate foremilk samples were collected within 6 days after calving, and every 2 weeks until drying-off for bacteriological culture. Composite milk samples were collected monthly to evaluate SCC. Se status was established through the blood glutathione peroxidase (GPx) activity from samples collected at the beginning of the trial, and 30, 90, 180 and 270 DIM. Data were analyzed using linear, logistic, and Poisson mixed models. The mean of blood GPx activity was higher for supplemented cows than for unsupplemented ones ($P<0.05$). In total 4136 milk samples were submitted for culturing, 17 (0.4%) were culture-positive at calving, and 1028 (24.9%) were positive during lactation. *Cor. bovis*, *CNS*, and *Staph. aureus* were mostly isolated pathogens. A trend towards a higher risk of IMI during lactation was observed in supplemented cows (OR: 2.52; 95% IC: 0.78, 8.11) ($P=0.12$). The OR for specific-pathogen IMI was not affected by Se supplementation ($P>0.05$). The overall IR of new IMI per quarter-time (14-day interval) at risk was not affected by Se supplementation (IR: 1.40; 95% CI: 0.90, 2.17) ($P=0.14$). The geometric mean of SCC increased from 29,260 cells/mL (30 DIM) to 148,240 cells/mL at drying-off ($P<0.05$), not affected by Se supplementation itself ($P>0.05$). These results indicated that Se supplementation before calving in pasture-based dairy cows resulted in higher blood activity of GPx. Nevertheless, the difference in Se status was not associated with significant changes either IMI or SCC pattern.

Key Words: supplementation, selenium, intramammary infection

49 Prevalence, risk factors, and impact of postpartum uterine diseases in dairy cows. J. Dubuc*, T. F. Duffield, K. E. Leslie, J. S. Walton, and S. J. LeBlanc, ¹*Population Medicine, University of Guelph, Guelph, Ontario, Canada*, ²*Animal and Poultry Science, University of Guelph, Guelph, Ontario, Canada*.

The objectives of this study were to determine the prevalence, to identify risk factors for, and to quantify the impact on pregnancy risk of postpartum metritis and endometritis in dairy cows. Data were available for 1273 Holstein cows from 3 herds. Calving history, periparturient disease incidence, and body condition score at calving were recorded. During the week prior to expected calving, serum NEFA were measured. At 4, 11, and 18 (\pm 3.5) DIM, serum BHB, NEFA and haptoglobin were measured. Metritis (MET) was defined as both rectal temperature \geq 39.5 C and a foul-smelling discharge occurring \leq 11 DIM; clinical endometritis (CE) as mucopurulent or purulent discharge in the vagina (Metricheck device); and subclinical endometritis (SCE) as \geq 9% neutrophils (cytobrush technique). All cows were examined for CE and SCE at 35 DIM. The probability of MET, CE, and SCE were analyzed using multivariable logistic regression models; their incidences were 9%, 17%, and 18%, respectively. Cows experiencing retained placenta had greater risk of developing uterine diseases (OR: MET=11.0; CE=2.2; SCE=2.6; $P < 0.01$). Cows having serum haptoglobin level \geq 1.0 g/L during the first week postpartum were 2.8 times more likely to develop MET ($P < 0.03$). Cows experiencing MET were 2.8 and 2.4 times more likely to develop CE and SCE ($P < 0.01$). Cows experiencing CE were 3.0 times more likely to be diagnosed with SCE ($P < 0.01$), but among animals with CE, only 42% were diagnosed with SCE at the same time. Cows experiencing at least one of MET, CE, or SCE were 2.1 times less likely to become pregnant at first breeding ($P = 0.02$). Compared to unaffected cows, pregnancy at first AI was lower in cows with CE (21 vs. 28%, $P = 0.04$) or with SCE (15 vs. 26%, $P < 0.01$). Although MET, CE, and SCE are strongly associated with each other they appear to be somewhat distinct manifestations of the interactions between uterine pathogens and the immune response of the cow.

Key Words: dairy cow, uterine disease, metritis

50 Effects of level of concentrate supplementation on milk production and ruminal pH in lactating cows on pasture. G. R. Clevenger*, L. R. Tager, and K. M. Krause, *West Virginia University, Morgantown*.

Six ruminally cannulated lactating Holstein dairy cows were used in Latin rectangle design to evaluate the effects of varying levels of concentrate supplementation on milk production and ruminal fermentation. Cows were allowed access to 14 kg DM/cow/d of pasture containing: 31.2% ADF, 44.5% NDF, 15.7% CP and 2.9% fat. Cows were fed a concentrate supplement consisting of (DM basis): 75.18% ground corn grain, 18.02% soybean meal, 3.0% sugarcane molasses, 2.0% hydrolyzed feather meal, 0.6% limestone, 0.5% salt, 0.4% vitamin premix, and 0.3% calcium diphosphate. The treatments were: C4 (4 kg concentrate/d), C8 (8 kg concentrate/d) and C12 (12 kg concentrate/d), on a DM basis. Cows were fed twice daily after milking. Concentrate DM intake was greater in C8 (6.4 kg; $P = 0.04$) and C12 (8.4 kg; $P < 0.003$) compared to C4 (3.5 kg), with no difference between C8 and C12. Milk yield was lower in C4 (19.9 kg/day) compared with C12 (22.7 kg/day; $P < 0.02$). Daily fat and lactose production were less in C4 (0.66 kg and 0.85 kg, respectively) compared to C8 (0.8 kg; $P < 0.03$ and 0.98 kg; $P = 0.03$, respectively) and C12 (0.82 kg; $P = 0.02$

and 1.03 kg; $P = 0.01$, respectively), but % milk fat was similar for C4, C8 and C12 (3.4%, 3.7%, and 3.7%, respectively) as was % milk protein (2.8%, 2.8%, and 2.8% for C4, C8, and C12, respectively). Continuous ruminal pH data was collected during the last 4 days of sampling. Daily mean ruminal pH was similar for C4, C8, and C12 (6.37, 6.27, and 6.27, respectively) as was daily minimum pH (5.86, 5.75, and 5.74 for C4, C8, and C12, respectively). Time spent below pH 5.8 increased linearly ($P = 0.007$; 27.1, 71.2, and 162.4 min/d for C4, C8, and C12, respectively) and daily number of bouts of pH below 5.8 tended ($P = 0.09$) to increase linearly with increasing level of supplementation (1.0, 4.4, and 7.5 bouts/d for C4, C8, and C12, respectively). Although increasing levels of supplementation will increase milk production of cows on pasture it might also affect ruminal fermentation.

Key Words: pasture, supplementation, ruminal pH

51 Use of in vitro and in vivo tests to characterize gastrointestinal nematode anthelmintic resistance on sheep and goat farms in the mid-Atlantic U.S. E. K. Crook*¹, D. J. O'Brien¹, N. C. Whitley², R. M. Kaplan³, and J. M. Burke⁴, ¹*Delaware State University, Dover*, ²*North Carolina A&T State University, Greensboro*, ³*University of Georgia, Athens*, ⁴*USDA, ARS, Booneville, AR*.

DrenchRite[®] Larval Development Assays (LDA) and fecal egg count reduction tests (FECRT) were used to evaluate anthelmintic resistance of gastrointestinal nematodes in 4 sheep (Farms A, B, D, and E) and 5 goat (C, F, G, H, and I) farms in the mid-Atlantic U.S. Fecal samples were collected rectally from individual animals and pooled for LDA to determine potential gastrointestinal nematode resistance to benzimidazole (BZ), moxidectin (MOX), ivermectin (IVM), and levamisole (LEV). To validate results, at the time of fecal collection for LDA, FECRT were conducted on each farm using anthelmintics determined based upon prior anthelmintic use by individual farms. Anthelmintics tested included BZ (n = 5 farms), MOX (n = 6 farms), IVM (n = 3 farms), and LEV (n = 5 farms) with a minimum of 10 animals per anthelmintic and 10 untreated control animals included in each test. An anthelmintic was considered effective for FECRT when gastrointestinal nematode fecal egg counts were reduced by $\geq 95\%$ 7 to 14 d after treatment. Based on LDA results, all farms (5/5) tested were resistant to BZ. A low level of resistance to MOX was noted for 2/5 goat (Farms G and F) and 1/4 sheep farms (Farm B) and resistance to MOX was found on 1/5 goat (Farm I) and 2/4 sheep farms (Farms A and E). All goat farms (5/5) and 3/4 sheep farms tested were resistant to IVM (Farms A, B, and E). The LDA further indicated that while all goat farms tested were susceptible to LEV, 1/4 sheep farms (Farm G) had suspected resistance to LEV. The FECRT validated results of LDA with the exception of one farm (H) in which BZ susceptibility by LDA was not confirmed with results from the FECRT. Overall, similar to what has been seen in other areas of the U.S., anthelmintic resistance is a problem in sheep and goat farms in the Mid-Atlantic region of the U.S. with FECRT and LDA both supporting this conclusion.

Key Words: FECRT, LDA, small ruminant

52 Effects of cinnamaldehyde, eugenol, and capsicum on rumen fermentation in continuous culture. L. R. Tager* and K. M. Krause, *West Virginia University, Morgantown*.

A 12-unit continuous culture system was used in a complete randomized design to study the effects of cinnamaldehyde (CIN), eugenol

(EUG), and capsicum (CAP) fed with a 45:55 forage:concentrate ratio (DM basis) ration on rumen fermentation. Treatments, including a control (CON), were replicated 3 times over 10 days with 7 days equilibration and 3 days sampling. Essential oils were supplemented at a dosage of 500 mg/L rumen fluid per d. Inoculum was obtained from 2 ruminally cannulated, lactating Holstein dairy cows receiving a 45:55 forage:concentrate ratio (DM basis). Dry matter digestibility did not differ among treatments ($P = 0.97$). Organic matter digestibility tended to be lowest in CIN (36.4%; $P = 0.06$). Digestibility of NDF was highest (37.8%; $P = 0.04$), and ADF digestibility tended to be highest (46.1%; $P = 0.08$), in CAP. Crude protein digestibility was lower in CIN and EUG (44.7% and 49.4%) than in CAP and CON (64.4% and 60.8%; $P = 0.01$). Bacterial nitrogen flow was lower in CIN and EUG (1.1 and 1.2 g/d) than CAP and CON (1.6 and 1.6 g/d; $P < 0.01$). Efficiency of

microbial protein synthesis in CIN tended to be lower (34.6 g bacterial N/kg digested OM; $P = 0.06$) than CON and CAP (40.2 and 39.8 g bacterial N/kg digested OM). Effluent ammonia N tended to be higher in CIN than CON (3.7 vs. 2.5 mg/dL; $P = 0.06$). Total VFA production was unaffected by EO ($P = 0.16$). Supplementation with EUG caused lower production of propionate (103.9 mM/d; $P < 0.01$), higher production of butyrate (59.3 mM/d; $P < 0.01$), and the highest acetate:propionate (1.6; $P = 0.02$) compared to other treatments. Isovalerate production tended to be highest in CAP (1.5 mM/d; $P = 0.10$). Fermenters with CIN or EUG had higher mean pH than CAP and CON (5.9 vs. 5.7; $P < 0.01$), spent fewer hr/d (2.0 and 0.9 vs. 9.6 and 10.5; $P < 0.01$), and had smaller area under the curve (0.1 and 0.1 vs. 0.9 and 1.0; $P < 0.01$) at $\text{pH} < 5.6$. Supplementation with CIN or EUG at high dosages may be unfavorable to rumen efficiency.

Key Words: dairy nutrition, essential oil, continuous culture

Graduate Student Paper Competition-CSAS Oral Competition: CSAS Graduate Student Competition 1

53 Plant-based diets enriched with linseed oil or marine algae and organic selenium modify sperm fertility parameters in broiler breeders over the reproductive cycle. C. Coss^{*1,2}, C. Brèque^{1,2}, R. Gervais², C. Lessard^{1,2}, D. Venne³, M. R. Lefrançois², P. Y. Chouinard², G. Vandenberg², and J. L. Bailey^{1,2}, ¹Centre de recherche en biologie de la reproduction, Québec, QC, Canada, ²Département des sciences animales, Université Laval, Québec, QC, Canada, ³Couvoir Scott Ltée, Scott Junction, QC, Canada.

There are indications that plant-based diets and organic (org) Se alter fertility in broiler breeders. We hypothesised that supplementing plant-based diets with n-3 fatty acids (FA), org Se, and vitamin (vit) E improves male reproductive parameters. Individually caged, 23 week old Ross broiler breeders were fed 8 diets (n=15/diet). The control diet contained meat meal + 50 IU/kg vit E, while the others were plant-based: 2.3% of soya oil (rich in C18 n-6 FA) + 50 IU/kg vit E, 2.3% of soya oil + 100 IU/kg vit E, 2.3% of soya oil + 100 IU/kg vit E + 0.3 ppm org Se, 2.3% of linseed oil (rich in C18 n-3 FA) + 100 IU/kg vit E, 2.3% of linseed oil + 100 IU/kg vit E + 0.3 ppm org Se, 2.2% soya oil + 1% of marine algae (42% oil, rich in C22 n-3 FA) + 100 IU/kg vit E, and 2.2% soya oil + 1% of marine algae + 100 IU/kg vit E + 0.3 ppm org Se. Diets were isoproteic and isoenergetic. After 7, 13, and 25 weeks of feeding (corresponding to 33, 38, and 50 weeks of age), semen was evaluated. Data were analysed as a completely randomized design using the SAS MIXED procedure. The Sperm Chromatin Structure Assay showed that the DNA Fragmentation Index (DFI), which reflects the % of sperm with weakened chromatin, increased from 33 to 50 weeks of age for the group fed soya oil + 50 IU/kg vit E ($P < 0.05$), while no effect was observed for the other dietary treatments. DFI standard deviation increased with age ($P < 0.05$). Sperm viability (LIVE/DEAD[®] assay by flow cytometry) decreased with age ($P < 0.05$). Computer Assisted Sperm Analysis revealed that various parameters increased with age (motility, progressive motility, elongation; $P < 0.05$), whereas others decreased (straightness, linearity; $P < 0.05$). These results show that aging had an effect on fertility parameters, whereas dietary treatments had little or no effect.

Key Words: broiler breeder, sperm, omega-3

54 The effect of two calving seasons on cow and calf performance in western Canada. L. C. Girardin^{*1}, H. A. Lardner², A. D. Iwaasa³, S. L. Scott⁴, and S. H. Hendrick¹, ¹University of Saskatchewan, Saskatoon, SK, Canada, ²Western Beef Development Centre, Lanigan, SK, Canada, ³Agriculture and Agri-Food Canada - Semiarid Prairie Agricultural Research Centre, Swift Current, SK, Canada, ⁴Agriculture and Agri-Food Canada - Brandon Research Centre, Brandon, MB, Canada.

A 2-yr study was conducted to evaluate the effects of calving season on cow and calf performance. Two calving seasons, Early (March) vs. Late (June), were compared at 3 locations, Lanigan, Saskatchewan (LA), Swift Current (SC), Saskatchewan, and Brandon (BR) Manitoba. One-hundred crossbred cows at LA, 50 crossbred cows at SC and 120 crossbred cows at BR were randomly allocated to 1 of 2 replicated (n=2) calving seasons. Experimental design was a randomized complete block, analyzed using PROC MIXED repeated measures. Cow body weights and condition scores (5-pt scale [1=thin, 5=fat]) were taken at calving, breeding and weaning. Calf body weights were taken at birth, 60 d of age and weaning (205 d). Pregnancy and weaning rates were based on the number of cows exposed at breeding. At BR, cow body weights were not different ($P > 0.05$) between calving seasons, however rump fat of Early-calving cows was greater ($P < 0.05$) than Late-calving cows. Cow body condition at weaning at SC was lower ($P < 0.05$) for Early-calving cows than Late-calving cows. Cow body condition at calving at LA was greater ($P < 0.05$) for Late-calving cows as compared to Early-calving cows. At all locations, birth weights were numerically lower for Early-born calves compared to Late-born calves. Weaning weights were lower ($P < 0.05$) for Late-born calves compared to Early-born calves at all locations (BR, 253 vs. 287 kg(SE=8.58); SC, 239 vs. 270 kg(SE=13.42); LA, 228 vs. 260 kg(SE=7.24)). Calf growth from birth to weaning at BR (SE=0.07), SC (SE=0.06) and LA (SE=0.03) for Early-born and Late-born calves was 1.18, 1.13, 1.09 kg d⁻¹ and 0.99, 0.95, 0.91 kg d⁻¹, respectively. Neither weaning rate nor pregnancy rate was affected by calving season or location. Results indicate that calving season impacts cow performance differently depending on location and may impact calf weaning weights.

Key Words: calving season, beef cattle, reproductive traits