Graduate Student Poster Competition: National ADSA Production PhD Poster

M196 Effects of condensed tannins supplementation on ruminal fermentation and lactational performance of dairy cows when fed high or low forage diet. C. M. Dschaak*, C. M. Williams, M. S. Holt, J.-S. Eun, and A. J. Young, *Department of Animal, Dairy, and Veterinary Sciences, Utah State University*, *Logan*.

A lactating dairy trial was conducted to determine the influence of water-soluble Quebracho extract containing approximately 75% condensed tannins (CT; DM basis) with 99% solubility (Chemtan Company Inc., Exeter, NH) on intake, digestibility, ruminal fermentation, and lactational performance of dairy cows. The cows were fed high forage (HF) or low forage (LF) diet with forage to concentrate ratio of 59:41 and 41:59 on DM basis, respectively. Eight lactating Holstein cows (DIM = 62 ± 8.8) were used, and 4 cows were surgically fitted with ruminal cannulas. The design of the experiment was a double 4 × 4 Latin square with a 2 × 2 factorial arrangement of treatments, and each period lasted 21 d (14 d of treatment adaptation and 7 d of data collection). Four dietary treatments were tested: HF without CT (HF−CT), HF with CT (HF+CT), LF without CT (LF–CT), and LF with CT (LF+CT). The Quebracho extract was added to the HF+CT and the LF+CT diets at a rate of 3% of dietary DM. Data were analyzed using the MIXED procedure of SAS. Supplementing CT on HF diet decreased DM intake, but not on LF diet. Digestibilities of DM and nutrients were not affected by CT supplementation on HF and LF diets. Milk yield was not influence by CT supplementation, but milk true protein decreased by supplementing CT in HF diet. Milk urea N concentration decreased with CT supplementation regardless of diet type, whereas efficiency of N use for milk N production was not affected by CT supplementation. Supplementing CT decreased total VFA production in HF and LF diets. Molar proportions of acetate ($P = 0.07$) and butyrate ($P = 0.06$) tended to increase by CT supplementation. Acetate to propionate ratio decreased with CT supplementation in HF diet, while conversely increasing the ratio in LF diet with CT supplementation. Ruminal ammonia-N concentration did not differ across treatments. Supplementing Quebracho extract in lactating dairy diets can improve dietary use of N as indicated by lower milk urea N, therefore N excretion can be reduced.

Key Words: condensed tannins, lactating dairy cows, milk urea nitrogen

M197 Relationships between prepartum energy intake and reproductive parameters in Holstein cows. F. C. Cardoso*, M. R. Murphy, and J. K. Drackley, *University of Illinois*, *Urbana*.

A meta-analysis was conducted to determine the effect of prepartum energy intake on days to first artificial insemination (DTFAI), days to conception (DTC), and number of artificial inseminations per conception (NAIC). The database was developed from 6 different experiments completed in our group from 1993 to 2006. Net energy lactation (NE_L) values in the diets varied from 1.21 Mcal/kg to 1.73 Mcal/kg DM. A total of 304 cows (281 multiparous and 23 primiparous) were included in the analyses. Prepartum dry matter intake (DMI) was recorded daily in all experiments. The NE_L intake ($NE_L I$) was calculated from the cow's respective dietary NE_L and average prepartum DMI. Full models were reduced by removing terms that did not contribute significantly to the model. Such terms included body condition score at calving ($P = 0.81$), season of the year at first artificial insemination ($P = 0.40$), and parity ($P = 0.62$). The DTFAI (n = 258) was lower for cows with higher $NE_L I$ ($P = 0.057$) and was not influenced ($P = 0.39$) by postpartal health problems (DISE). In this analysis, DTC (n = 212) was not influenced by $NE_L I$ ($P = 0.66$) or DISE ($P = 0.20$). Similarly, NAIC (n = 212) was not influenced by $NE_L I$ ($P = 0.50$) or DISE ($P = 0.45$). Inferences related to DTC and NAIC should be reevaluated when these results can be incorporated with those of similar experiments, to increase sample size. Based on the variances of DTFAI, DTC and NAIC in these experiments, the suggested number of cows needed to detect a 10% difference in these variables at a 95% confidence level are 88, 257, and 294, respectively. In conclusion, prepartum NE_L intake affected DTFAI.

Key Words: transition cow, energy intake, reproduction

M198 Effectiveness of an herbal remedy compared to control or traditional therapy in dry off treatments. K. A. E. Mullen*, K. L. Anderson, and S. P. Washburn, *North Carolina State University*, *Raleigh*.

Dry cow therapy, administered at the end of lactation, is aimed at eliminating current and preventing future intramammary bacterial infections. Dry cow therapy conventionally uses antibiotics. Certified organic dairies are restricted from antibiotic use and thus must use an alternative or no dry cow therapy. The current study used 150 Holstein, Jersey, and crossbred cattle to compare an herbal treatment (Phyto-Mast) to conventional (Quartermaster and Orbeseal) or no dry cow therapy. Each treatment (conventional, Phyto-Mast, or none) was balanced by breed, age, and due date and included 40 cows and 10 heifers. Milk weights and somatic cell scores (SCS) from the first test date in the first month postpartum were compared among treatment groups; no significant difference was observed between treatments. SCS average from the previous lactation was also recorded. Mean milk production was 22.7 ± 1.2 kg for conventional cows (CC), 14.7 ± 1.9 kg for conventional heifers (CH), 21.1 ± 1.0 kg for no treatment cows (NC), 14.5 ± 1.1 kg for no treatment heifers (NH), 22.9 ± 1.1 kg for Phyto-Mast cows (PC) and 17.1 ± 1.43 kg for Phyto-Mast heifers (PH). Milk production at the first test day postpartum was similar among multiparous cows, but the first-calf heifers in the Phyto-Mast group tended to have higher milk production at the first test than heifers in other groups. SCS were 1.89 ± 0.23 for CC, 3.33 ± 0.83 for CH, 2.15 ± 0.38 for NC, 3.73 ± 0.37 for NH, 2.17 ± 0.32 for PC, and 3.73 ± 0.85 for PH. SCS averages from the previous lactation were 3.74 ± 2.9 for CC, 3.63 ± 2.93 for NC, and 2.94 ± 2.72 for PC. Differences from previous lactation SCS for cows were not significant and remained similar across treatment groups at the start of the subsequent lactation. Also, SCS among first lactation heifers did not differ in early lactation but tended to be higher than for older cows. Neither lack of treatment nor the use of an herbal treatment differed from a conventional dry treatment for milk production or SCS at the start of lactation. More information on specific mastitic organisms in cows of various treatment groups is needed before definitive conclusions can be made.

Key Words: dry cow therapy, mastitis, organic dairy

M199 Serum pregnancy-associated glycoprotein (PAG) and progesterone concentrations after induction of pregnancy loss at day 39 of gestation in lactating dairy cows. J. O. Giordano*[1], J. N. Guenther[1], G. Lopes Jr.[1], M. F. McGrath[2], and P. M. Fricke[1], [1]*University of Wisconsin*, *Madison*, [2]*Monsanto Agricultural Company*, *St. Louis, MO*.

Pregnancy status was evaluated in lactating crossbred (75% Holstein, 25% Jersey) dairy cows (n = 29) by ultrasonography 39 d after TAI, and pregnant cows were randomly assigned to one of 3 treatments: 1)

control cows (CON, n = 10) received an injection of saline (5 mL, i.m.); 2) PGF cows (PGF, n = 10) received an injection of $PGF_{2\alpha}$ (25 mg, i.m.); and 3) infusion cows (INF, n = 9) received an intrauterine infusion of 120 mL hypertonic saline (25%, v/v) into the uterine horn containing the embryo. Blood samples were collected every 12 h for 6.5 d after treatment and daily from 6.5 to 10 d after treatment to assess serum PAG and progesterone (P4) concentrations. Uterine contents were evaluated using ultrasonography every 12 h to determine embryo presence and viability. All embryos from CON cows remained viable based on embryonic heart beat throughout the experiment. Time from treatment to cessation of embryonic heart beat was greater ($P < 0.001$) for PGF than for INF cows (36.0 ± 1.3 vs. 0.3 ± 1.4 h, respectively), and time from treatment to conceptus expulsion was greater ($P < 0.001$) for INF than for PGF cows (7.1 ± 0.8 vs. 1.9 ± 0.7 d, respectively). There was a treatment by day interaction ($P < 0.001$) for serum P4 concentrations in which P4 concentrations were greater for CON and INF than for PGF cows (8.7 ± 0.6, 8.1 ± 0.6, and 0.9 ± 0.6 ng/ml, respectively). Beginning 12 h after treatment, PGF cows had lower P4 concentrations than CON and INF cows. There was a treatment by day interaction ($P < 0.001$) for serum PAG concentrations in which mean PAG was greater for CON (3.5 ± 0.3 ng/ml) than for PGF (1.4 ± 0.3 ng/ml) and INF (1.4 ± 0.3 ng/ml) cows. Serum PAG concentrations differed among CON cows and PGF and INF cows beginning 60 h after treatment. We conclude that although timing of conceptus expulsion occurred 5.2 d later for INF than for PGF cows, serum PAG concentrations for INF and PGF cows decreased at a similar rate from the onset of treatment

Key Words: PAG, pregnancy loss, embryo

M200 Prepartum 2,4-thiazolidinedione alters gene expression of peroxisome proliferator-activated receptor gamma and leptin in the adipose tissue of dairy cows. K. M. Schoenberg*, K. L. Perfield, S. L. Giesy, Y. R. Boisclair, and T. R. Overton, *Cornell University*, *Ithaca, NY*.

Thiazolidinediones (TZD) are potent ligands for peroxisome proliferator-activated gamma (PPARγ). Administration of TZD has been shown to alter lipid metabolism and energy status in transition dairy cows. The objective of this experiment was to determine the effect of prepartum TZD administration on mRNA expression of PPARγ, leptin, fatty acid synthase (FAS), and lipoprotein lipase (LPL) in adipose tissue. Holstein cows entering second or greater lactation were administered 0 (n = 6), 2.0 (n = 5), or 4.0 (n = 4) mg TZD/kg BW by intrajugular infusion once daily from 21 d before expected parturition until parturition. Adipose tissue was collected on d −7 before expected parturition. After 14 d of TZD administration, PPARγ expression was increased ($P = 0.01$) by 24% (2.0 mg TZD/kg BW) and 10% (4.0 mg TZD/kg BW) over control cows. Increased expression of PPARγ is a marker of improved energy status and is consistent with previous data from this study on improved insulin sensitivity, decreased plasma non-esterified fatty acids, and decreased liver triglycerides with TZD administration. Leptin expression was decreased (−34%) in cows administered the 2.0 mg dose, but increased (+7%) in cows administered the 4.0 mg dose ($P = 0.07$); also corresponding with previous data. There were no significant changes in expression of LPL or FAS. It is likely that these results are confounded by changes in body condition scores and variation in time relative to actual calving dates. However, these results offer additional evidence that TZD treatment alters leptin expression. These data indicate that TZD administration increases PPARγ expression in transition dairy cattle. Further investigation is required to characterize the metabolic changes produced by TZD treatment in transition dairy cattle.

Key Words: transition cow, thiazolidinedione, leptin

M201 Effects of cobalt supplementation and vitamin B_{12} injections on energy metabolism of dairy cows. M. S. Akins*[1], S. J. Bertics[1], M. T. Socha[2], and R. D. Shaver[1], [1]*University of Wisconsin*, *Madison*, [2]*Zinpro Corporation*, *Eden Prairie, MN*.

The objective of this study was to determine metabolic responses of primi- and multiparous dairy cows fed different levels and sources (inorganic and organic) of cobalt or given weekly vitamin B_{12} injections. Forty-five primi- and multiparous cows 60 d prepartum were blocked by parity (1 or > 1) and expected calving date, and then randomly assigned to 1 of 5 treatments in a randomized complete block design. The treatments were: no supplemental Co (Control), 25 mg Co from Co carbonate (CoCarb), 25 mg (LcoGH) or 75 mg (HCoGH) Co from Co glucoheptonate, and Control with weekly 10 mg vitamin B_{12} injections. Cows were on trial until 150 DIM. Cobalt (ppm DM) in the lactating diet was 1.0, 1.9, 2.3, and 5.2 for Control and IB12, CoCarb, LCoGH, and HCoGH, respectively. Far-off, close-up, and lactating diets were 13.8, 15.1, and 18.0% CP and 48.8, 40.2, and 32.9% NDF (DM basis), respectively. Intake was not affected ($P > 0.10$) by treatment and was 19.4 ± 0.5 and 23.1 ± 0.8 kg DM/d for primi- and multiparous cows, respectively. Body weight and condition score and calculated energy balance were not affected by treatment ($P > 0.10$). Plasma glucose, non-esterified fatty acids, and β-hydroxybutyrate were not affected by treatment ($P > 0.10$). Effect of sampling day was significant ($P < 0.001$). Glucose decreased from 60 d prepartum (65 ± 1.1 mg/dL) to 30 DIM (55 ± 1.0 mg/dL), and increased at 90 DIM (60 ± 1.0 mg/dL); however, primiparous cows had a larger decrease at 30 DIM and smaller increase thereafter. Non-esterified fatty acids increased from 60 d prepartum (249 ± 39.8 mmol/L) to 1 DIM (724 ± 40.7 mmol/L), then decreased at 30 DIM (398 ± 40.1 mmol/L), with multiparous cows having a larger increase at 1 DIM. Beta-hydroxybutyrate increased from 60 d prepartum (4.2 ± 0.95 mg/dL) to 30 DIM (15.9 ± 0.95 mg/dL). Addition of Co above requirements or vitamin B_{12} did not improve energy metabolism of dairy cows, because vitamin B_{12} status was likely adequate.

Key Words: cobalt, vitamin B_{12}, dairy cow

M202 Genetic analysis of type traits in the Holstein population of Iran. M. R. Bakhtiarizadeh*, M. M. Shahr Babak, and A. Pakdel, *Tehran University, Karaj, Tehran, Iran.*

The objective of this study was to estimate the genetic parameters for 13 linear type traits, in Holstein population of Iran. Type traits records generated for first lactation Holstein dairy cows from 1991 to 2007 over 220 herds, 13 type traits were analyzed: stature (ST), body depth (BD), rump width (RW), chest width (CW), udder depth (UD), fore udder attachment (FU), udder width (UW), udder height (UH), fore teat placement (FTP), rear teat placement (RTP), suspensory ligament (SL), foot angle (FA) and rear leg, side view (RLS). For the analysis of type traits, herd, year and season of calving, age at Classification, age at calving, effect of classifier and days in milk effects were included in the model. The genetic parameters were estimated by ASREML software. Heritabilities ranged from 0.03 to 0.29. The largest value was for ST, the smallest for FA. The largest positive correlations were between ST

and CW (0.83), FTP and RTP (0.64), FU and UD (0.61). The largest negative correlations were between RLS and FA (−0.56), RLS and UD (−0.48), RLS and SL (−0.46). The genetic parameters estimate for type traits was consistent with other studies in different populations. The phenotypic correlations tended to be weaker than their corresponding genetic correlations although the signs of the correlations were generally the same. ST, BD, RW and CW seem to be strongly genetically correlated in the positive direction. Larger cows (taller, deeper cows with more rump width) tended to have stronger SL and more UH. Within the udder traits, FTP, RTP and SL were positively genetically correlated. The highest genetic correlation was between FU and UD. The highest negative genetic correlations were between UW and UH. Cows with shallow udders possess tighter FU. Animals with genetically stronger, shallower udders with superior udder support tended to have more sickled rear legs. A strong negative genetic correlation existed between FA and RLS indicating that cows with a steep FA tended to have straighter rear legs. The results from this study indicate that considerable genetic variation existed for some type traits within this sample in the Holstein population of Iran.

Key Words: genetic parameters, type traits, genetic correlation

M203 Effects of porcine relaxin on motility characteristics of boar sperm as assessed by computer-assisted sperm analysis (CASA). J. C. Rodriguez-Munoz*, J. M. Feugang, M. Crenshaw, S. T. Willard, and P. L. Ryan, *Mississippi State University, Mississippi State.*

Relaxin is a small peptide found in both female and male reproductive tissue. Relaxin is detected in the seminal plasma of various mammals, but its effect on sperm motility is still unclear. Here, we evaluated the role of porcine relaxin (pRLX) on the motility characteristics of boar spermatozoa during storage (~21°C) using a CASA system (IVOS, Hamilton Thorne, Beverly, MA). Diluted semen from several boars was centrifuged and Nidacon products (Mölndal, Sweden) were used to purify spermatozoa. Motile sperm were selected through a discontinuous percoll gradient, washed twice, counted and diluted with BoviExtend to a final concentration of $75x10^6$ sperm/ml. Samples were incubated for 60 min at 37°C with 0, 25, 50 or 100 ng/ml pRLX. Three µl of each treatment group were loaded into 4-chamber Leja slides for CASA analysis. Experiments were conducted on 3 consecutive days using the same batch of semen. Four independent replicates were used and pRLX effects assessed in triplicate for each treatment. All data were analyzed using ANOVA-2 or −3. The threshold of significance was $P < 0.05$. The ANOVA-3 analysis showed that pRLX and storage time affected the proportion of motile, progressive, and rapid spermatozoa ($P < 0.05$). Similar effects were observed on the amplitude of lateral head displacement (ALH), straightness (STR) and linearity (LIN) ($P < 0.05$). Using ANOVA-2, we found no significant effect of pRLX on proportion of motile cells on d 1 and d 3, but a significant increase on d 2 ($P < 0.05$). The presence of 100 ng/ml pRLX increased the proportion of progressive and rapid spermatozoa on all days, while the ALH was decreased on d 2 and d 3 ($P < 0.05$). There was no effect on beat cross frequency (BCF) at all times ($P > 0.05$). Moreover, 100 ng/ml pRLX significantly increased the STR on all days, while 50 and 100 ng/ml enhanced the LIN on d 2 and d 3 ($P < 0.05$). Overall, our study indicates a beneficial effect of relaxin on motility of boar spermatozoa during storage, in particular the proportion of progressive and rapid spermatozoa. Relaxin positively affects STR, LIN, and ALH which are indices of rapid sperm movement.

Key Words: boar, sperm motility, relaxin