Physiology and Endocrinology: Endocrinology and Metabolism

W272 Effects of lactation and pregnancy status on concentrations of insulin and IGF-1, and correlations with metabolic indicators in Holstein dairy cattle. I. M. Thompson*[1], R. L. A. Cerri[1], I. H. Kim[2], A. D. Ealy[1], P. J. Hansen[1], C. R. Staples[1], and W. W. Thatcher[1], [1]*University of Florida*, *Gainesville,*[2]*Chungbuk National University*, *Cheongju, South Korea*.

Objectives were to develop and characterize an experimental platform to evaluate lactation and pregnancy effects for subsequent transcriptome analyses in dairy cattle. Pregnant heifers (n=34) were assigned randomly after calving to a lactating group (L, n=17) and a non-lactating group (NL, n=17). The L was fed a TMR (1.65Mcal NEL/kg, 16.5% CP). The NL was fed a maintenance ration (1.45 Mcal NEL/kg, 12.2% CP). Blood was collected thrice weekly for 8 wk and analyzed for insulin, IGF-1, NEFA, BHBA, glucose, and BUN. Cows were pre-synchronized and enrolled in a timed (T)-AI protocol, but only 10 in the L and 12 in the NL were TAI. On d 17 after GnRH/TAI, cows were slaughtered and reproductive tissues collected. Analysis of variance for main effects, and simple and partial correlations were performed. Mean plasma concentrations of insulin postpartum did not differ between NL and L (1.28 vs. 1.24 ng/mL), but a Pregnancy × Lactation interaction ($P < 0.01$) was detected, because of increased insulin concentrations in lactating pregnant compared with non-lactating pregnant. Concentration of IGF-1 was lower ($P < 0.01$) for L compared with NL (135.2 vs. 203.4 ng/mL), and also different ($P = 0.01$) between cyclic and pregnant (144.5 vs. 194.1 ng/mL). Insulin was not correlated ($P > 0.10$) with any of the metabolites measured in both simple and partial correlations. Concentrations of IGF-1 had a +0.25 correlation ($P < 0.01$) with glucose, but this correlation was not significant when adjusted for lactation. A negative correlation ($P < 0.01$) between IGF-1 and NEFA (r = –0.33), and BUN (r = –0.25) was detected. Among metabolites, the highest correlation was between BHBA and BUN ($P < 0.01$; r = +0.586). In conclusion, lactation\diet and pregnancy status altered concentrations of IGF-1 in plasma, but insulin was not affected. Concentrations of IGF-1 in plasma were better predictors of metabolite concentrations than insulin.

Key Words: lactation, pregnancy, IGF-1

W273 Comparison of body condition score, body weight and milk yield and composition of Holstein and crossbred dairy cows. L. G. D. Mendonca*, C. C. Abade, E. M. da Silva, and R. C. Chebel, *Department of Veterinary Population Medicine, University of Minnesota*, *Saint Paul*.

Objectives were to compare body condition score (BCS) and body weight (BW) changes and milk yield and composition between Holstein and crossbred cows. Cows (Holstein = 45 and crossbred = 46) were enrolled in the study 45 d before expected calving date. Cows received a BCS and were weighed at 45 and 15 d before expected calving date, immediately after calving (0 days in milk, DIM), and at 28 and 56 DIM. Milk yield and composition during the first 3 mo postpartum were recorded and yield of energy corrected milk (ECM) was calculated. Holstein cows had smaller ($P < 0.01$) BCS than crossbred cows throughout the study (3.1 ± 0.1 vs. 3.4 ± 0.1) but there was no interaction between breed and study day ($P = 0.42$). Body weight was not affected by breed ($P = 0.63$) or by the interaction between breed and study day ($P = 0.16$). Average milk yield was ($P = 0.03$) greater for Holstein cows (38.9 ± 1.1 vs. 34.8 ± 1.5 Kg/d) and the interaction between breed and mo of lactation affected ($P < 0.01$) milk yield because milk yield of Holstein cows was only greater ($P < 0.01$) on the third mo of lactation (44.4 ± 1.3 vs. 37.6 ± 1.6 Kg/d). Milk fat concentration was not (P = 0.43) different between breeds (4.1 ± 0.1%), but Holstein cows had greater ($P < 0.01$) fat yield (1.5 ± 0.1 vs. 1.3 ± 0.1 Kg/d). Holstein cows had ($P < 0.01$) smaller milk protein concentration (3.1 ± 0.1 vs. 3.4 ± 0.1%) and protein yield was ($P < 0.01$) affected by the interaction between breed and study day because on the third mo of lactation Holstein cows had ($P < 0.01$) greater protein yield (1.3 ± 0.1 vs. 1.0 ± 0.1 Kg/d). Average ECM yield on the first 3 mo postpartum was greater ($P < 0.01$) for Holstein than crossbred cows (40.0 ± 1.0 vs. 35.6 ± 1.3 Kg/d) and there was a tendency ($P = 0.07$) for the interaction between breed and mo of lactation to affect ECM yield because Holstein cows had ($P < 0.01$) greater ECM yield on the third mo (42.5 ± 1.2 vs. 35.6 ± 1.6 Kg/d). Linear somatic cell count was not ($P = 0.33$) affected by breed. Although Holstein cows produced more milk in the first 3 mo of lactation, this does not appear to be in detriment of BCS or body weight.

Key Words: crossbred cow, milk yield, body condition score

W274 Association between peripartum cortisol, haptoglobin, non-esterifed fatty acid and milk yield in Holstein cows. J. M. Huzzey*[1], T. R. Overton[1], D. V. Nydam[1], and R. J. Grant[2], [1]*Cornell University*, *Ithaca, NY*, [2]*W.H. Miner Agricultural Research Institute*, *Chazy, NY*.

The objective of this study was to evaluate the relationship between peripartum indicators of stress, inflammation and energy status with milk yield. Blood and fecal samples from 414 Holstein dairy cows were collected weekly beginning 3 weeks before until 1 week after calving. Plasma was analyzed for cortisol, haptoglobin (Hp) and non-esterified fatty acid (NEFA) and fecal samples were analyzed for cortisol metabolites (11,17-dioxoandrostanes). A range of cut-points were evaluated for each metabolite and their relationship to milk yield [305 mature equivalent (305ME) predicted from the second test day (averaging 63 DIM)] was assessed using mixed models. Fecal cortisol metabolites (FCM) were not associated with 305ME in primiparous (PP) cows. Multiparous (MP) cows with FCM > 250 ng steroid/g fecal DM during wk −3 or −2 relative to calving had on average a 966 kg lower 305ME ($P \leq 0.05$) relative to cows below this cutpoint. Projected 305ME was 1162 kg lower among MP cows with FCM > 70 ng steroid/g fecal DM during wk +1 (P = 0.001). There was no association between plasma cortisol and milk yield at any period relative to calving for either MP or PP cows. Projected 305ME tended to be 1322 kg lower (P = 0.07) in PP cows with Hp > 1.1 g/L during wk −3. MP cows with Hp > 1.1 g/L during wk −2, −1 or +1 had on average a 1496 kg lower projected 305ME ($P \leq 0.05$). There was no association between prepartum NEFA and 305ME in PP cows, however, PP cows with NEFA > 600 mEq/L during wk +1 had a 851 kg greater projected 305ME (P = 0.02). MP cows with NEFA > 500 mEq/L during wk −3, −2, or −1 had on average a 1371 kg lower projected 305ME ($P \leq 0.01$). During wk +1, MP cows with NEFA > 600 mEq/L had a 517 kg lower projected 305ME (P = 0.05). High concentrations of these metabolites before or after calving, particularly among MP cows, may suggest that opportunities exist to improve milk yield.

Key Words: milk yield, haptoglobin, cortisol

W275 Relationship between IGF-I polymorphism and metabolic and endocrine profiles of dairy cows on grazing conditions during the transition period. G. Ruprechter*[1], A. Meikle[1], P. Nicolini[1], and

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Primiparous Holstein cows (n=42) of a Uruguayan commercial farm, blocked by calving date, were used to evaluate the effect of a IGF-I polymorphism (C/T position 512) located in the promoter region of the gene (variant A/B), on metabolic and endocrine profiles during the transition period. Cows were distributed as follows: AA (n=15), AB (n=15) and BB (n=12). Cows grazed a mixture of ryegrass (*Lolium multiflorum*) and alfalfa (*Medicago sativa*) and were supplemented with a ration including corn silage, high moisture corn grain, and sunflower meal (12, 5 and 2 kg DM, respectively). The diet offered had 17% crude protein and 1.7 Mcal/kg DM of net energy of lactation. Blood samples and BCS data (scale 1-5) collected at −7, 30, and 60 days of lactation. Genotyping of IGF–I was performed using PCR–RFLP. Nonesterified fatty acids (NEFA) and β-hydroxybutyrate (BHB) concentrations were determined spectrophotometrically and IGF-I and insulin concentrations by RIA. Means from repeated measure analyses were considered to differ when $P < 0.05$. There were no differences in BCS among IGF–I genotypes. However, plasma levels of NEFA, BHB, and insulin were affected ($P < 0.04$) by IGF–I genotype. Concentrations of NEFA and BHB were greater in AA than BB cows, being levels intermediate in heterozygous cows (0.44, 0.41, and 0.33 ± 0.03 mmol/L and 0.30, 0.26, and 0.23±0.02 mmol/L for NEFA and BHB of AA, AB, and BB cows, respectively). Insulin concentrations were less in AA than BB cows, and intermediate in AB cows (2.77, 3.21, and 3.98 ± 0.33 μUI/mL, for AA, AB, and BB, respectively). The IGF-I genotype did not affect ($P = 0.39$) differentially circulating IGF-I in blood (86.4, 97.7, and 94.6 ± 7.3 ng/mL, for AA, AB, and BB, respectively). There was no interaction ($P > 0.12$) between IGF-I genotype and day of lactation for any of the variables studied. Although plasma concentrations of IGF-I were not affected by IGF-I genotype, energy status of BB genotype cows appeared to be improved during early lactation.

Key Words: SNP, energy balance, dairy cattle

W276 Effects of intravenous glucose infusion and nutritional balance on serum concentrations of NEFA, glucose, insulin, and progesterone in non-lactating dairy cows. F. Vieira*[1], C. Lopes[1], B. Cappellozza[1], A. Scarpa[1], R. Cooke[2], and J. L. Vasconcelos[1], [1]*FMVZ - UNESP*, *Botucatu, SP, Brazil*, [2]*Oregon State University*, *Burns*.

The objective of this study was to evaluate serum concentrations of non-esterified fatty acids, glucose, insulin, and progesterone in non-lactating dairy cows according to nutritional balance and glucose infusion. Ten non-lactating, ovariectomized Gir × Holstein cows were stratified by body weight (BW) and body condition score (BCS) on d −28 of the study, and randomly assigned to: 1) negative nutrient balance (NB) and 2) positive nutrient balance (PB). All cows were inserted with an intravaginal progesterone releasing device on d −14, which remained in cows until the end of the study. Cow BW and BCS were assessed again on d 0. On d 0, cows within nutritional treatment were randomly assigned to receive, in a crossover design containing 2 periods of 24 h each: 1) intravenous glucose infusion (GLUC; 0.5 g of glucose/kg of BW, over a 3 h period), or 2) intravenous saline infusion (SAL; 0.9% solution over a 3 h period). Prior to the beginning of each period, all cows were fasted for 12 h. Blood samples were collected, relative to the beginning of the infusion, at −12 and −11.5 (beginning of fasting), and at −0.5, 0, 0.5, 1, 2, 3, 4, 5, and 6 h. Following the last blood collection of period 1, cows received (PB) or not (NB) concentrate and returned to respective pastures. Changes in BCS and BW were greater in NB cows compared to PB cows (−0.60 and −0.25 ± 0.090 for BCS, respectively; −22.4 and 1.2 ± 6.58 kg for BW, respectively). Cows receiving GLUC had greater glucose concentrations from 0.5 to 3 h relative to infusion compared to SAL cows. Insulin concentrations were greater in PB cows assigned to GLUC compared to SAL cohorts at 0.5 and 3 h following infusion, whereas NB cows assigned to GLUC had greater insulin concentrations compared to SAL cohorts at 0.5, 1, 2, and 3 h. Progesterone concentrations were greater in PB cows assigned to GLUC at 2, 3, and 4 h following infusion compared to SAL cohorts. In conclusion, the effects of glucose infusion on serum concentrations of insulin and progesterone in non-lactating dairy cows were dependent on cow nutritional status.

Key Words: glucose infusion, insulin, progesterone