ADSA-SAD UNDERGRADUATE ORIGINAL RESEARCH POSTER COMPETITION

0787 (M001) Characterization of serotonin (5-HT) and glucose patterns and their hepatic receptor profiles during the transition period in dairy cows.

M. Olsen*, J. Laporta, A. P. Prichard, S. A. E. Moore, B. P. Schnell, S. R. Weaver, C. R. Cronick, and L. L. Hernandez, *University of Wisconsin–Madison, Madison.*

The liver is crucial for metabolism and partitioning of nutrients to the mammary gland during lactation. Recent evidence suggests that non-neuronal serotonin (5-HT) participates in glucose metabolism, but little is known regarding 5-HT actions in the liver during the transition period in dairy cattle. Our objective was to explore glucose and 5-HT circulating patterns and to characterize the 5-HT and glucose receptor profiles in the liver during the transition from pregnancy to lactation in dairy cows. Multiparous pregnant Holstein cows (n = 6, avg. lactation = 3.5) were utilized to collect daily blood samples from 7-d pre-calving (−7 d) through 7d post-calving (+7 d), and liver biopsies were performed at −7 d, +1 d and +7 d. Total RNA was extracted and cDNA was synthetized to measure mRNA expression of 5-HT receptors (HTR, isoforms 1A, 1B, 1D, 1F, 2A, 2B, 2C, 5A, and 7) and glucose transporters (SGLT-1, Glut-1, -2, −5, −8, −9, and 10) by RT-PCR. Glucose concentrations decreased pre-calving (−7 to -1 d, 72 vs. 57 ± 3.5 mg/dl, P = 0.045), increased post-calving (+1 and +3 d, 74 ± 4.1 mg/dl, P = 0.008), decreasing again and reaching lowest concentrations at +7 d (50.2 ± 1.7 mg/dl, P = 0.0012). Serum 5-HT concentrations decreased abruptly pre-calving (−7 to −5 d, 916 vs. 90 ± 35 ng/ml, P = 0.001), remained low until +3d (160 ± 35 ng/ml, average for -3, -1, and +1 d), and increased again at +5 and +7 d (355 ± 27, average for +5 and +7 d). Hepatic mRNA expression of HTR-1D, -2D, and −7 were decreased, while HTR-2A was increased at +1 d compared to −7 d (P < 0.045). Only HTR-1F increased 2.5-fold at +7 d, compared to both −7 and +1 d (P < 0.048). HTR-4 mRNA expression was undetectable at +7 d, and HTR-2C was undetectable at +1 d. HTR-5A was not expressed at all in the liver. Hepatic expression of Glut-2, Glut-5, and SGLT1 were decreased on both +1 d and +7 compared to −7 d, while Glut-1 was increased twofold at +7 d compared to −7 d (P < 0.04). These results indicate that 5-HT can potentially play a role in liver glucose homeostasis during the transition period in dairy cows, possibly through the modulation of specific receptors. Additional research is needed to further explore the functional role of these HTRs in the liver during the transition from pregnancy to lactation.

Key Words: 5-hydroxytryptamine, liver, lactation

0788 (M002) Inhibitory factors of casein synthesis In mammary tissue of lactating dairy cows.

R. L. Garnett*, A. Felock, W. K. Ray, R. F. Helm, S. I. Arriola Apelo, and M. D. Hanigan, *Virginia Polytechnic Institute and State University, Blacksburg.*

Excess nitrogen waste excreted from dairy cows causes numerous harmful effects on the environment, such as air and water pollution. Nitrogen efficiency can be improved by feeding low protein diets and supplementing with select essential AA (EAA), as is practiced in the swine industry. However, AA metabolism within dairy animals must be further understood to achieve this goal. The objective of this study was to determine α-S1 casein synthesis responses to the cell signaling inhibitors rapamycin and AICAR and high and low concentrations of essential AA in mammary tissue. Three lactating Holstein cows from the Virginia Tech herd were slaughtered at a processing facility on campus. Mammary tissue from an uninfected rear quarter was collected, and tissue slices (120 ± 30 mg) were prepared and incubated 4 h at 37°C in 5ml of treatment media enriched with [$^2H_5$] Phe. Experiment 1 examined the interaction of 3 concentrations of rapamycin and EAA in a 2 × 3 factorial design. Essential AA were included at either 5 or 100% of normal Dulbecco's Modified Eagle Medium (DMEM) concentrations. Rapamycin was added to the medium at 0, 0.5, or 10 μM. Experiment 2 consisted of a 2 × 3 factorial design with the EAA at 5 and 100% of DMEM and AICAR at 0, 0.4, and 4.0 mM. Experiment 3 tested the interaction between six nonessential AA and protein synthesis rates. Following incubation, samples were homogenized, and a 4.6 pH precipitate was isolated. [$^2H_5$] Phe enrichment of the 34-NLLRFFVAPFPE α-S1 casein peptide was determined in the precipitate via MALDI-TOF-TOF, and α-S1 casein fractional synthesis rate (CFSR) was determined. Experiment 1 revealed no effect of rapamycin, EAA, or their interaction on CFSR. AICAR tended to reduce CFSR. There was no effect of EAA on synthesis rate, nor any interaction between the two factors. These responses were consistent with the marginal changes in mTOR signaling changes caused by these drugs. Experiment 3 revealed no interaction between non-essential AA supply and CFSR. Further study is needed to determine other possible factors regulating CFSR beyond cell signaling and amino acid substrate supply.

Key Words: casein synthesis, rapamycin, AICAR

0789 (M003) Health of Holstein bull calves fed a fermentation extract of *Aspergillus oryzae*. R. M. Townsley*, T. T. Yohe, E. M. Dudash, Y. Roman Garcia, A. R. Gibson, K. M. O'Diam, and K. M. Daniels, *Dep. of Animal Sciences, Ohio State University, Wooster.*

The objective was to determine whether dietary inclusion of a fermentation extract of the fungus *Aspergillus oryzae*, commonly used as a direct fed microbial, would improve measures of health in Holstein bull calves (n = 52) from birth through 1wk post weaning. Calves were randomly assigned to a slaughter age, 4 wk (n = 16) or 8 wk (n = 36), and treatment, control (CON**;** n = 27), or direct fed microbial (DFM; n = 25). Calves averaged 43.2 ± 1.0 kg BW and 2.8 ± 0.3 d of age at the beginning of the experiment. Calves were housed and fed individually; no bedding was used. Calves assigned to DFM were fed 2 g of DFM daily. Liquid DFM was delivered in milk replacer for the first 4 wk of the trial; solid DFM was top-dressed on texturized grain thereafter. Calves were fed nonmedicated milk replacer twice daily (22.0% CP, 20.0% fat DM basis; 680 g/d) and were weaned on consumption of 0.91 kg of grain (20% CP, 2.0% fat; medicated with decoquinate) for 3 consecutive days or on d 45 of the study, whichever came first. Calves had ad libitum access to grain and water throughout the trial. Calf fecal scores were recorded daily, then averaged across treatment. On a weekly basis, DFM calves scoured more frequently than CON. All medical interventions (including oral electrolytes) were recorded. Treatment for respiratory ailments were more frequent in CON than DFM. Medical costs were calculated on a calf basis, then averaged by treatment. Medical costs for calves from 0 through 4 wk ($43.01 ± 2.40) and 5 through 8 wk ($11.18 ± 2.40) did not differ by treatment. For 8-wk calves, jejunal lymph nodes were collected on slaughter for flow cytometric analysis of CD4 and CD8 T cell populations as a measure of immune function. The CD4 cell population as a percentage of total observed cells was greater in DFM calves. Treatment did not affect CD8 cell population as a percentage of total observed cells. Flow cytometric results indicate that DFM may affect the adaptive immune system through effects mediated by CD4 positive cells. In conclusion, calves fed DFM scoured more frequently, but a lesser percentage of DFM calves were treated for respiratory ailments, leading to no effect on medical costs. Interestingly, CD4 cell population of jejunal lymph nodes was greater in DFM calves, which warrants further research.

Key Words: dairy calf, direct fed microbial, T cells

0790 (M004) Fecal score evaluation of pre-weaned dairy calves in group housing. M. Kittell*, J. Augustine, and S. I. Kehoe, *University of Wisconsin–River Falls, River Falls.*

Group housing for pre-weaned dairy calves has gained popularity among farmers because it reduces time and labor. Automatic calf feeders allow calves to receive increased milk intake multiple times a day. However, this increased milk consumption may cause an increase in fecal score, which is the common method for dairy calf managers to identify a sick calf. The purpose of this study was to evaluate whether increased fecal scores in group-housed calves were indicative of illness. A local calf raiser was used to evaluate a total of 61 calves from arrival at approximately 3 to 5 d of age through 3 wk of age. Once a week, a blood sample was analyzed for serum protein and hematocrit concentration to assess dehydration. A fecal sample was obtained and scored using a scale of 1 to 4 with 1 being solid and 4 being watery with little to no solids (Larson et al., 1977). Nasal and ocular discharge were recorded, and the skin tent test was performed. Rectal temperature was taken, and respiration, umbilical area, and overall attitude were evaluated. Weight data and medication records were obtained from the calf grower. Data was analyzed using a multiple logistic regression model in SAS 9.3 (2010). Variables were eliminated using backward stepwise regression to obtain a minimal model containing only significant variables ($P < 0.05$). All variables were eliminated from the model except nasal and ocular discharge and serum protein ($P < 0.001$). These results indicate that a higher fecal score is not a good diagnosing tool in group-housed calves receiving higher amounts of milk. Therefore, additional research is needed to distinguish effective methods for identifying sick calves in group housing with increased milk intake.

Key Words: calves, group housing, health