were re-grazed a second time within a replicate. Full body weights were determined initially and every 2 wk until termination at 6 wk. The pen of 3 heifers was used as the experimental unit. Forage samples were collected initially and every 2 wk until termination for quality and yield determinations. Statistical analysis revealed no effect due to season. A treatment by week interaction was detected ($P < 0.05$). Average daily gains did not differ ($P > 0.05$) and were 1.06 and 1.13 ± 0.07 kg/d for the control and SBH treatment groups, respectively. Results indicate that soybean hulls, as an energy supplement, can support equal average daily gains as corn for growing dairy heifers under intensive rotational grazing management.

Key Words: Soybean Hulls, Grazing, Dairy Heifers

671 Effect of variety on chemical composition and ruminal nutrient degradability of forage soybean silage. A. Mustafa* and P. Seguin, *McGill University*, *Ste-Anne-De-Bellevue, QC, Canada*.

A study was conducted to determine the effects of of soybean variety on chemical composition and ruminal nutrient degradabiity of silage. Two varieties of forage soybean (i.e. Kodiak and Mammouth) were sown in a field in Southwestern Quebec on May 15 2004 and harvested on September 4 2004. Harvested forages were then ensiled in mini-silos for 45 d. Two ruminally fistulated Holstein cows, in a randomized complete block design, were used to determine in situ ruminal nutrient degradabilities of the two soybean silages. Chemical analysis showed Mammouth contained higher ($P < 0.05$) NDF (49.0 vs 44.4%), ADF (37.1 vs 35.3%), and ADL (8.1 vs 6.4%) levels than Kodiak. However, CP was higher ($P < 0.05$) for Kodiak than Mammouth (20.8 vs 14.9%). Distribution of protein fractions showed that Mammouth had lower ($P < 0.05$) soluble protein and higher ($P < 0.05$) neutral and acid detergent insoluble protein levels than Kodiak. Results of the in situ study indicated that Kodiak had higher ($P < 0.05$) ruminal DM (60.6 vs 54.9%), CP (82.8 vs 75.2%) and NDF (27.2 vs 22.7%) degradabilities. It was concluded that chemical composition and ruminal nutrient degradabilities of forage soybean silage are significantly affected by variety.

Key Words: Forage Soybean, Chemical Composition, Ruminal Degradability

672 Non-protein nitrogen formation in legume silages as influenced by condensed tannins, polyphenols, and harvesting methods. J. Grabber*, C. Davidson, and L. Massingill, *USDA-ARS, US Dairy Forage Research Center*, *Madison, Wisconsin*.

The inhibition of non-protein nitrogen (NPN) formation in legume silages by protein-binding tannins and polyphenols may be influenced by the degree of tissue disruption during harvest. In 2002 and 2003, first and second cuttings of alfalfa, birdsfoot trefoil, and red clover were conventionally conditioned, wilted, and chopped or severely macerated and wilted before ensiling in minisilos. Silages were analyzed for dry matter (DM), pH, total nitrogen (N), ammonia, free amino acids, free peptides, and NPN. Silage DM averaged 34.7% and pH averaged 4.5 with no biologically relevant differences noted between forages and harvest methods. The average N content of alfalfa (3.6% of DM) was slightly greater ($P < 0.05$) than that of other forages (3.3% of DM). Harvesting method did not affect the N content of silages. Non-protein nitrogen in alfalfa silage (free of both tannins and polyphenols) averaged 69% of total N. The formation of NPN was similar or up to 22% lower ($P < 0.05$) in low to high tannin populations of birdsfoot trefoil and 37% lower ($P < 0.05$) in polyphenol-containing red clover. The formation of NPN in silage was also less ($P < 0.05$) with macerated forage (51% of total N) than with conventionally harvested forage (66% of total N). The NPN fraction of alfalfa silage was composed of 9% ammonia, 46% free amino acids, and 45% free peptides. Tannins, polyphenols, and maceration reduced levels of all NPN components, particularly the peptide fraction. The inhibition of NPN formation by maceration was greater in tannin-containing birdsfoot trefoil than in alfalfa or polyphenol-containing red clover. The results of this study indicate that tannins, polyphenols, and maceration inhibit NPN formation in legume silages, particularly if tannin-containing forages are macerated during harvest.

Acknowledgements: The authors thank Glen Broderick and Richard Muck for assistance with NPN analyses.

Key Words: Silage, Tannins, Non-Protein Nitrogen

Growth and Development: Growth Factors and Growth

673 Small intestinal composition and hydrolytic activity in neonatal calves fed nucleotides. C. Oliver*[1], C. De Jesus Arias[2], W. Keller[1], M. Bauer[1], and C. Park[1], [1]*North Dakota State University*, *Fargo*, [2]*Instituto Superior de Agricultura*, *Santiago de los Caballeros, Dominican Republic*.

The aim of this study was to determine the impact of dietary nucleotides on the small intestine of neonatal calves. Nineteen newborn Holstein bull calves (41.9 ± 1.1 kg initial body weight [BW]) were assigned to one of two dietary treatments: standard milk replacer or milk replacer supplemented with purified nucleotides at 5 times the level found in normal cow milk(monophosphate form of adenosine = 0.04, cytidine = 1.14, guanosine = 0.48, inosine = 0.64, and uridine = 10.3 µmol/kg BW per d). Calves were housed indoors in individual pens with slatted floors. At about 4 wk of age calves were weighed and given a sodium pentobarbital overdose. Small intestine was removed; samples of duodenal, jejunal, and ileal segments were harvested, the mucosa removed and flash frozen. Remaining intestine was emptied, weighed, and the length measured. Mucosal homogenate was analyzed for DNA, RNA, protein, and activity of the intestinal enzymes lactase, maltase, alkaline phosphatase, aminopeptidase N, and dipeptidylpeptidase IV. There were no differences ($P \geq 0.51$) between treatments in final body or small intestinal weights; mucosal weight, protein or RNA content, or lactase, maltase, alkaline phosphatase, or dipeptidylpeptidase IV activity. Small intestine was numerically longer in nucleotide-fed calves ($P = 0.11$). There were site of intestine effects ($P \leq 0.01$) for RNA, protein, and all enzyme activities except dipeptidylpeptidase IV. Gut DNA was influenced by an interaction of site and treatment ($P < 0.01$): DNA content increased distally, levels were similar between treatments in the duodenum and jejunum, and higher for the nucleotide group in the ileum. Aminopeptidase N was lower ($P = 0.04$) in nucleotide-fed calves, which may indicate an increase in gut maturity. Dietary nucleotides may enhance small intestinal development. Further work is needed to determine optimal dose and timing of administration.

Key Words: Nucleotide, Small Intestine, Calf

674 Fibroblast growth factor receptor 1 regulates protein metabolism in atrophic muscle. J. K. Eash*, A. L. Grant, K. M. Hannon, and D. E. Gerrard, *Purdue University*, *West Lafayette, IN*.

Skeletal muscle disuse and subsequent loss of protein is attenuated by augmenting fibroblast growth factor (FGF) signaling. The exact mechanism for this blunted muscle wasting is not known. Therefore, the objective of this study was to determine how FGF signaling affects muscle protein metabolism during disuse atrophy. Mouse gastrocnemius and soleus muscles were injected with plasmid DNA encoding fibroblast growth factor receptor 1 (FGFR-1) or control plasmid DNA, and pulsed 8 times at 200V/cm using a pulse stimulator. Mice were randomly assigned to hindlimb suspension (10d) or control treatments. Protein synthesis was determined using a flooding dose of L-[4-^{3}H]phenylalanine. Muscle proteosome activity was evaluated using electroporation of plasmid DNA encoding for ubiquitinated luciferase. Sus-

pended limbs treated with FGFR-1 tended (P=0.11) to have 28% greater ^{3} H incorporated. A similar response was observed in non-suspended mice. Hindlimb suspension alone increased (P<0.01) proteosome activity 2.3 fold. Proteosome activity of suspended mice treated with FGFR-1 was not different from controls. Curiously, non-suspended mice treated with FGFR-1 had a 2.5 fold increase (P<0.01) in proteosome activity. These data show that injection of FGFR-1 expression plasmid increases protein synthesis and proteosome activity and suggest that FGF signaling may mediate muscle atrophy by modifying the balance between protein synthesis and degradation.

Key Words: Muscle Atrophy, Fibroblast Growth Factor, Protein Metabolism

675 Effects of an intensified compared to a moderate feeding program during the pre-weaning period on body growth and pubertal age in Holstein heifers. L. Davis*, M. VandeHaar, J. Liesman, L. Chapin, and M. Weber Nielsen, *Michigan State University*, *East Lansing*.

Our objective was to determine if increasing energy and protein intake from 2 d to 6 wk of age would affect body growth, feed efficiency, and age and BW at puberty. Heifers born throughout the year at the MSU Dairy Teaching and Research Center were assigned randomly to 1 of 2 treatments with 40 heifers per treatment (moderate, M; high, H). The M diet consisted of a standard milk replacer (21.5% CP, 21.5% fat) fed at 1.2% of BW on a DM basis and a 19.9% CP starter grain fed to achieve 0.45 kg of average daily gain (ADG). The H diet consisted of a high-protein milk replacer (30.6% CP, 16.1% fat) fed at 2.1% of BW on a DM basis and a 24.3% CP starter grain fed to achieve 0.68 kg of ADG. Calves were gradually weaned at 6 wk of age. Serum concentrations of IgG taken at 48 to 60 h of age and daily rectal temperatures during the first 2 wk were not different between treatments (P > 0.3, P > 0.6, respectively), but daily fecal scores (1 to 5; 1 = firm) were higher for calves on the H diet (H = 3.28, M = 3.07; P = 0.03). Inital BW and withers height did not differ by treatment. Calves consuming the H diet had 15% greater gain:feed ratios than calves on the M diet (P < 0.01). Pre-weaning daily gain was greater for calves fed the H diet (0.64 kg/d) then those fed the M diet (0.45 kg/d; P < 0.01). At 6 wk of age, calves on the H diet were 15% heavier and 3% taller (P < 0.01, P < 0.01; respectively). Post-treatment ADG was not different (P > 0.9). Heifers fed the H diet during the pre-weaning period reached puberty earlier (M = 9.9 mo, H = 8.9 mo; P < 0.01) and at a lower BW (M = 307 kg, H = 287 kg; P < 0.02). Calves fed the H diet had greater milk replacer intake (71%), milk replacer cost (86%), and total feed cost per kg gain (25%; all P < 0.01), but calves fed the M diet had greater starter grain intake (95%) and starter grain cost (77%; both P < 0.01). We conclude that intensified feeding during the pre-weaning period increases body size and decreases age at puberty.

Key Words: Milk Replacer, Growth, Heifer

676 Developmental changes in expression of toll-like receptors in fetal porcine intestine. T. E. Burkey*, K. A. Skjolaas-Wilson, K. R. Lawrence, B. J. Johnson, and J. E. Minton, *Kansas State University*, *Manhattan*.

The intestinal epithelium and the underlying lamina propria cooperate in performing important barrier and mucosal immune surveillance functions. In addition to its role as a physical barrier containing the bacterial load within the gut lumen, the intestinal epithelium is paramount in evoking innate as well as adaptive immune responses in order to maintain gastrointestinal homeostasis. Key players in the microbial-epithelial crosstalk that directs subsequent innate and adaptive responses are a set of evolutionarily conserved pattern recognition receptors known as toll-like receptors (TLR)s. Pattern recognition receptor detection of pathogens and their cellular products initiate a signaling cascade that culminates in the release of pro-inflammatory cytokines. The objective of this experiment was to investigate the developmental changes in expression of TLRs in fetal pigs at different stages of gestation. Three fetal pigs were removed from three sows by cesarean at d 55 and d 70 of gestation (n = 9/gestational age). Intestinal tissues were collected from sterile fetuses, then rapidly frozen in liquid N2 and pulverized in a liquid N2-cooled mortar and pestle apparatus. The powdered tissue was then processed for isolation of total RNA, and quantitative real-time PCR was used to determine relative levels of expression of TLR2, 4, 5, and 9. The relative expression of all TLRs was greater (P < 0.05) at gestation d 55 than at d 70. In addition, it is also important to note that the expression of all TLRs at d 55 was similar to relative levels of TLR expression that we have observed from postnatal intestinal tissues in previous experiments. Taken together, the data indicate that the expression of fetal TLRs varies by gestational age and that substantial constitutive expression of TLRs occurs relatively early in gestation, and clearly prior to population of the pig gastrointestinal tract with commensal bacteria.

Key Words: Toll-Like Receptors, Swine, Real-Tme PCR

677 Quantification of muscle regulatory factors and myostatin in callipyge sheep. J. N. Fleming*[1,2], C. A. Bidwell[2], S. P. Jackson[1], R. D. Allen[1], and J. R. Blanton, Jr.[1], [1]*Texas Tech University*, *Lubbock*, [2]*Purdue University*, *West Lafayette, IN*.

This study quantified the mRNA levels of the four muscle regulatory factors MyoD1, myf-5, myogenin, and MRF4, as well as myostatin in the *semimembranosus* muscle of normal lambs and those carrying the callipyge mutation. Callipyge is a mutation that causes muscle hypertrophy in the loin and hindquarters of domestic sheep. The muscle hypertrophy first manifests itself at 4 to 6 wks of age in the lamb, and is only expressed in paternal heterozygotes. This study involved lambs ranging from ages 2 wks prenatal to 8 wks postnatal and included callipyge ($+^{Mat}/CLPG^{Pat}$, n = 22), maternal heterozygous ($CLPG^{Mat}/+^{Pat}$, n = 19), homozygous ($CLPG^{Mat}/CLPG^{Pat}$, n = 18), and normal ($+^{Mat}/+^{Pat}$, n = 18) genotypes. Cultured myoblast samples from a subset of lambs (n=12) and fresh tissue samples from the *semimembranosus* of each lamb were used for total RNA isolation, random-primed cDNA synthesis, and quantitative PCR. Ribosomal RNA was quantified for each sample to use as an internal calibration for total cDNA quantity. Relative expression levels were calculated using the 18S values for each sample with the ddCt method. No significant effect of genotype was detected for MyoD, myogenin, MRF4, or myostatin (P > 0.05 for all) in muscle samples. A significant effect of genotype in muscle RNA was seen for Myf5 (P = 0.0402). Mean genotype expression levels for Myf5 were highest in the maternal heterozygotes (5.179 ± 1.015), followed by normals (2.636 ± 0.674) and homozygotes (2.436 ± 0.585), while the callipyge showed the lowest relative expression levels (1.727 ± 0.278). These values are expressed as fold increase over baseline expression. When comparing muscle data to cultured myoblast data, changes were noted in all genes measured. Specifically, culturing the myoblasts for 5 days changed the relative expression levels of Myf-5, especially in the two heterozygous genotypes when compared to tissue samples from the same animals. It was noted that overall Myf5 expression was greatly reduced in all cultured cells, making the magnitude of differences between genotypes less significant.

Key Words: Callipyge, Muscle Hypertrophy, Muscle Regulatory Factor

678 Regulation of muscle protein anabolism in growing steers by fatty acids in muscle membrane phospholipids is dose-dependent. M. C. Thivierge*[1], P. Y. Chouinard[1], Y. Couture[2], P. Julien[3], P. Dubreuil[2], T. A. Davis[4], and A. Myre[1], [1]*Université Laval*, *Quebec, QC, Canada*, [2]*Université de Montréal*, *St-Hyacinthe, QC, Canada*, [3]*Laval University Medical Ctr (CHUL)*, *Quebec, QC, Canada*, [4]*USDA/ARS Children's Nutr. Res. Ctr., Dept. Pediatr. Baylor Coll. Med*, *Houston, TX, USA*.

In a previous study with growing steers, we have found that n-3 long-chain polyunsaturated fatty acids (n-3LCPUFA) present in cell membrane phospholipids are involved in the muscular regulation of protein anabolism. A dose-response effect of n-3LCPUFA on muscle protein anabolism in growing steers was studied to determine the regulatory intermediates required to achieve a maximal anabolic response with n-3LCPUFA. Six steers were used in a double 3 X 3 Latin square design with 3 graded amounts of Menhaden oil randomized over 3 experimental periods of 5 wks. Four weeks were allocated to treatment

adaptation and the measurements were carried out in the 5th wk of each experimental period. Steers were fed a basal diet meeting 114% crude protein and 105% energy requirements. Oil treatments were administrated at the rate of 4% of DMI: 1) 0% Menhaden oil + 4% control oil (60% cotton:40% olive oil; 2) 2% Menhaden oil + 2% control oil; and 3) 4% Menhaden oil + 0% control oil. A dose-response curve to insulin was determined using the hyperinsulinemic-euglycemic-euaminoacidemic clamp technique (20, 40, 80 mU insulin/(kgjavascript:cdot()h)). Whole body irreversible loss rate of phenylalanine was determined using a continuous 9-h infusion of L-[1-13C]phenylalanine (2.0 javascript:lil_mu()mol/kgjavascript:cdot()h). Insulin-stimulated disposal rates of amino acids and glucose were linearly increased (P<0.05) with graded amounts of Menhaden oil at the intermediate insulin dose. Whole body flux of phenylalanine increased concomitantly with increasing amounts of Menhaden oil, but did not reach statistical significance. A linear reduction of dry matter intake expressed in %BW (tendency, P=0.15) and a linear decrease of feed conversion (tendency, P=0.17) were associated to the beneficial effects of n-3LCPUFA on protein anabolism. These results suggest that n-3LCPUFA are novel regulators of insulin sensitivity and anabolism in growing animals.

Acknowledgements: Supported by CORPAQ and Fédération des producteurs de bovins du Québec. Thanks to Omega Protein, Reedville, VA

Key Words: Omega-3 Polyunsaturated Fatty Acids, Insulin Sensitivity, Steers

679 Effects of serum from angus cattle divergently selected for serum IGF-I concentration on myoblast differentiation. M. Updike*, M. Davis, and M. Wick, *The Ohio State University*, *Columbus*.

Despite numerous studies indicating that increased concentrations of serum IGF-I are associated with increased growth in cattle, an opposite association was found in a group of Angus cattle divergently selected for serum IGF-I concentration. Cattle with increased serum IGF-I concentration exhibited lower body weights than did cattle with decreased serum IGF-I concentration. Serum IGF-I was found to have an average correlation of -0.38 with body weight at various ages. However, serum IGF-I was found to have a correlation of 0.19 with longissimus muscle area. To further study the effects of serum from the divergently selected lines of cattle on muscle growth and development, the effects of serum from the two lines on C2C12 proliferation and differentiation were determined. Serum was collected from yearling bulls (n=6; n=3/line). C2C12 myoblasts exhibited similar proliferation when incubated with sera from either line. Compared to the control consisting of fetal bovine serum, the lag phase was much longer when using sera from the IGF-I selection lines ($p \leq 0.05$). The effects of serum from the two lines on differentiation were significant at all times points except for 0 h. C2C12 myoblasts exhibited an increased rate of differentiation when incubated with serum from the high IGF-I line, as evidenced by an increased number of cells staining positive for myosin heavy chain ($P \leq 0.05$). Electrophoretic analyses of the liver and muscle showed no differences between the two lines of cattle. However, differences were found in the electrophoretic analysis of serum. These results suggest an association between the as yet undefined component(s) of serum and muscle cells, which may be a factor contributing to the longissimus muscle area variation in two IGF-I selection lines.

Key Words: IGF-I, Myoblast, Differentiation

680 Effect of melengestrol acetate (MGA) on bovine satellite cell β-adrenergic receptor (βAR) messenger RNA (mRNA) abundance. E. K. Sissom* and B. J. Johnson, *Kansas State University*, *Manhattan*.

Melengestrol acetate (MGA) is a synthetic progestin administered to feedlot heifers to inhibit the estrous cycle. Previous research in our laboratory suggests MGA has an anti-proliferative effect on bovine muscle satellite cells. Research suggests steroids, such as progestins, can affect the levels of βAR in different tissue types. The purpose of these experiments was to investigate the effects of MGA on βAR mRNA levels in cultured, proliferating, bovine muscle satellite cells. Satellite cells were used to assess the effects of MGA (0 and 10 n*M*) on β1, β2, and β3AR mRNA levels. Cells were plated in Dulbecco's Modified Eagle Medium containing 10% fetal bovine serum on tissue culture plates coated with reduced growth factor matrigel. The MGA was added directly onto cell cultures at 0 and 48 h after plating. At 72 h, total RNA was isolated from the cells and reverse transcribed for complimentary DNA (cDNA) synthesis. Real-time quantitative-PCR was performed on the cDNA to measure βAR mRNA abundance. Melengestrol acetate addition (10 n*M*) increased (3.1-fold, $P = 0.01$) β1AR mRNA abundance. There was also a tendency (3.2 fold, $P = 0.06$) for MGA addition to increase β2AR mRNA; however, there was no significant effect ($P > 0.10$) on the level of β3AR mRNA. These results indicate MGA can increase the expression of β1AR mRNA in bovine muscle satellite cell cultures. There was also a tendency for MGA to increase β2AR levels in cell cultures. These data may aid in our understanding of potential effects of MGA in bovine skeletal muscle growth and development, as well as provide some insight into some possible responses when utilizing βAR agonists in combination with MGA in feedlot heifers.

Key Words: β-Adrenergic Receptor, Melengestrol Acetate, Skeletal Muscle

681 Myostatin prodomain transgene significantly improves dietary fat utilization for animal muscle growth. J. Yang*[1], B. Zhao[1], and R. Wall[2], [1]*University of Hawaii*, *Honolulu*, [2]*Animal and Natural Resources Institute, USDA-ARS*, *Beltsville, MD*.

Myostatin (MSTN), a member of TGF-β family, negatively regulates animal growth and muscle mass. Previously, mouse myostatin function was interrupted by transgenic over-expression of its prodomain in skeletal muscle, resulting in a significant increase in growth performance and muscle mass (Yang, et al., 2001. Mol. Rep. Dev 60: 351-61). It has been well documented that high-fat diets induce obesity in rodents. The skeletal muscle becomes a dominant metabolic focus of nutrient utilization in the prodomain transgenic mice. We hypothesized that the transgenic mice would have the capability to prevent high-fat diet induced adipose tissue overgrowth by partitioning dietary fat to skeletal muscles. Nine-week-old MSTN prodomain transgenic (TG) and littermate wild-type (WT) male mice were randomly assigned to receive high-fat diet (45% kcal% fat and 23% CP) and normal fat diet (10% kcal % fat and 23% CP) for nine weeks. At 18 weeks of age, animals were sacrificed for muscle and adipose tissue evaluation. TG mice grew much faster than WT controls as the weekly body weight of TG were 20-46% heavier than the controls in both high-fat and normal fat diet feeding experiments. In high fat diet experiment, TG mice showed enhanced muscle mass with individual muscle mass increased by 47% to 100% than WT mice. The weights of major white adipose tissue pad mass (epididymal fat, subcutaneous fat and retroperitoneal fat) were also significantly different between TG and WT mice (P<0.001). High-fat diet induced 170-220% more adipose tissue pad mass in WT than transgenic mice. The adipose tissue pad mass of transgenic mice fed with high-fat diet were not significantly different from transgenic mice fed with normal diet (P>0.05). These results demonstrate that animals carrying MSTN prodomain transgene not only have dramatic growth performance and enhanced muscle mass, but also are resistant to high-fat induced adipose tissue deposition. Thus, the data provide evidence that genetically enhanced lean-type animals are more effective in dietary fat utilization for muscle growth.

Key Words: Skeletal Muscle, Transgenic, Epididymal Fat

682 The effect of rumen fluid supplementation on neonatal dairy calf performance and the incidence of diarrhea. C. Todd*[1], D. McKnight[2], T. Godfrey[2], A. Keokkoek[2], P. Sharpe[2], L. Gooijer[1], R. Rana[2], J. Pitty Del Cid[2], and K. Leslie[1], [1]*University of Guelph*, *Guelph, ON, Canada*, [2]*University of Guelph*, *Kemptville, ON, Canada*.

Prevention of neonatal calf diarrhea complex is a priority for the dairy industry. A recent study has suggested that oral administration of rumen fluid to young calves may be a natural and effective way of reducing diarrhea and improving calf health. In the present trial, 30 neonatal Holstein bull calves were used to

examine the effect of oral rumen fluid supplements on calf performance and the incidence of diarrhea. The calves for this study were purchased at d 1 of age from commercial dairy farms and then transported to a calf research facility. Each calf was systematically allocated to a non-treated control group or a rumen fluid treatment group, in which 8 mL of rumen fluid was added to the milk of the afternoon feeding until d 28. Milk intake, starter intake, water intake, and fecal scores were determined daily for all experimental calves. The calves were weighed weekly and average daily gain was determined. Between d 3 and d 23, three weekly fecal samples were collected from each experimental calf. The occurrence of Cryptosporidium parvum was determined by a sucrose flotation and microscopic examination method, and fecal pH was measured. Control and rumen fluid treatment calves were not significantly different with respect to milk intake (p=0.82), feed intake (p=0.95), water intake (p=0.16), average daily gain (p=0.18), and days to weaning (p=0.96). Rumen fluid supplementation did not significantly affect the fluidity or form of calf fecal stools (p=0.83). The occurrence of C. parvum on each weekly sample did not differ between experimental groups (p=0.68, p=0.44, p=0.20, respectively). In addition, fecal pH was not significantly affected by rumen fluid supplementation (p=0.28). The present study differed from the recently published study, in that rumen fluid supplementation did not improve young calf performance or reduce the incidence of diarrhea.

Key Words: Rumen fluid, Performance, Diarrhea

683 Effects of colostrum (C) and dexamethasone (DEXA) treatment on insulin (I)-dependent glucose (G) metabolism in neonatal calves. B. Scheuer[1], L. Tappy[2], J. W. Blum[1], and H. M. Hammon*[3,1], [1]*University of Berne, Berne, Switzerland*, [2]*University of Lausanne, Lausanne, Switzerland*, [3]*Research Institute for Biology of Farm Animals (FBN), Dummerstorf, Germany*.

Feeding of C and glucocorticoid (DEXA) treatment affect G metabolism and I release in neonatal calves. We have tested whether at a high glucocorticoid status after birth and C feeding influence I-dependent G utilization. Neonatal calves were randomly separated into 4 groups of 7 calves, resp. Calves were fed C or a milk-based formula and in each feeding group, calves were either treated with DEXA (30 µg/kg BW per d) or 0.9% NaCl for the first 4 d of life. On d 5 euglycemic-hyperinsulinemic clamps were performed after an overnight period of 16 h without food. Blood samples were taken before and during the clamp for determination of plasma G and I. I [1mU/(kg BW×min)] was infused for 3 h and plasma G concentrations were kept at 5 mmol/L ±10%. Clamp studies were combined with [13C]-bicarbonate (2.82 µmol/(kg BW×min) and [6,6-2H]-G (40 µg/(kg BW×min) infusions for 5.5 h (i.e., from -150 min to 180 min, relative to the start of I infusion) to determine G flux (GFx), endogenous G production (eGP), and gluconeogenesis (GNG) before and at the end of the clamp. Data were analyzed by the Mixed Model with feeding, DEXA treatment and time as fixed effects. In the pre-clamp period plasma concentrations of G and I were higher in DEXA-treated than in non-treated calves. G infusion rates were lower ($P < 0.05$) in DEXA-treated than in non-treated calves during the whole clamp study. GFx increased ($P < 0.05$) during the clamp and was higher ($P < 0.05$) at the end of the clamp in non-treated than in DEXA-treated calves. GNG did not differ between groups, but eGP tended to be lower ($P = 0.1$) in DEXA-treated than non-treated calves at the end of the clamp study. In conclusion, I alone increased G utilization, but GNG and eGP were not affected. The high glucocorticoid status impaired I-dependent G utilization, but did not influence GNG, whereas the eGP seems to be reduced during I infusion.

Acknowledgements: Supported by Swiss National Foundation and H. Wilhelm Schaumann Stiftung, Germany

Key Words: Neonate, Glucose, Insulin

684 Nutrient restriction in cows alters the number and volume of fetal myofibers. M. Du*, M. J. Zhu, G. A. Olson, B. W. Hess, W. J. Means, and S. P. Ford, *University of Wyoming*, *Laramie*.

Twenty Angus x Gelbvieh rotationally crossed cows carrying female fetuses were blocked by BW and were fed in equal numbers to either meet NRC requirements to gain weight (average = + 4.25% of BW, Control, C) or fed below NRC (nutrient restricted, NR) to lose weight (average = - 6.8% of BW) from d 30 to d 125 of gestation. On d 125, five C and NR cows were necropsied, and the remaining 5 NR cows were realimented to achieve similar BW to C cows when necropsied on d 250 of gestation. The LD muscle of fetuses at 12th rib was removed, fixed and embedded in paraffin for histochemical examination. At d 125 gestation, maternal nutrient restriction reduced the average number of myofibers in muscle bundles of fetal LD muscle; the average number of myofibers from C cows was 12.2 ± 0.34 while that of NR cows was 10.2 ± 0.53 ($P<0.05$). Comparing to the LD muscle of fetuses from C cows at d 250 gestation, maternal nutrient restriction significantly increased the volume of myofibers and reduced the number of myofibers per square area in the fetuses from NR cows; the ratio of the average cross-section area of fetal myofibers from C cows versus NR cows was 1 ± 0.07 to 1.29 ± 0.14 ($P<0.05$). The result showed that nutrient restriction during the early gestation (d 31 to d 125) significantly affected fetal muscle development by reducing the number of myofibers in each muscle bundle. This reduction in the number of muscle fibers due to maternal nutrient restriction at early gestation could not be recovered by realimentation during the late stage of gestation (d 125 to d 250), which resulted in a muscle with reduced numbers of myofibers of larger volume. The reduced number and increased volume of myofibers in fetal muscle due to maternal nutrient restriction during early stage of gestation is expected to impact the physiological function of skeletal muscle and affect meat quality of offspring, which needs further investigation.

Acknowledgements: This work was supported by National Research Initiative Competitive Grant 2003-35206-12814 from the USDA Cooperative State Research, Education, and Extension Service.

Key Words: Maternal Nutrient Restriction, Cow, Fetal Skeletal Muscle

Nonruminant Nutrition: Enzyme Supplementation

685 Fate of supplemental Escherichia coli phytase in the digestive tract of young pigs. A. R. Pagano*, K. R. Roneker, and X. G. Lei, *Cornell University*, *Ithaca, NY*.

The objective of this study was to determine the functional site of a supplemental E. coli phytase and its impact on phosphorus contents of digesta in different segments of the gastrointestinal tract of pigs. A total of 18 weanling pigs (8.3 ± 0.9 kg BW) were allotted to three groups (n = 6) and were fed a low-P (0.4%) corn-soy basal diet (BD), BD + E. coli AppA2 phytase (500 U/kg), or BD + inorganic P (0.2%) for 4 wk. Individual growth performance and plasma inorganic P concentration were measured weekly. At the end of the study, all pigs were euthanized to collect digesta samples from stomach, duodenum, upper and lower jejunum, ileum, and colon. After freeze-drying, the samples were assayed for phytase activity and soluble P content. Pigs fed BD had lower ($P < 0.05$) daily weight gain, feed use efficiency, and plasma inorganic P concentrations than the other two groups. Phytase activities were similar in the digesta of stomach, duodenum, and upper jejunum, but diminished in the digesta of lower jejunum and ileum of pigs fed BD + phytase. While little phytase activity was detected in the digesta of all these segments from the other two groups, all groups had relatively high phytase activity in the colon digesta (128-267 U/kg). There was a gradual decrease in soluble P of digesta from the stomach to lower jejunum in pigs fed BD + phytase or inorganic P. Digesta soluble P in pigs fed BD was lower ($P < 0.05$) in stomach, but higher ($P < 0.05$) in upper jejunum