decision making processes in ranch management. Mexican ranchers are welcoming through TRM a technology transfer mechanism that was not in place.

Key Words: Technology Transfer, Total Ranch Management, Mexico

836 Summary of the 2004 – 2005 University of Georgia Master Cattlemen's Programs. T. W. Wilson*[1], J. E. Rossi[1], R. C. Lacy[1], M. E. Pence[1], J. Andrea[2], R. E. Silcox[1], D. Ensley[1], R. L. Stewart[1], J. W. Worley[1], N. C. Hinkle[1], and J. C. McKissick[1], [1]*The University of Georgia*, *Tifton*, [2]*Clemson University*, *Clemson, SC*.

One hundred and seventy-six participants attended the four Master Cattlemen's programs offered during 2004 and 2005 by The University of Georgia's Beef Team. These programs incorporated speakers from six departments within two colleges. One multi-county program was offered during each six month period and was rotated within the four Extension Districts in Georgia. Each program met for a total of seven sessions that included either one or two speakers for a total of two hours. Program topics were customized by season and location. Participants received a notebook complete with materials from speakers, and those that attended five of the seven sessions received a program hat and a certificate of completion. Evaluations were collected after the completion of three of the four programs, and a one year post-meeting survey was conducted with all four programs to determine impact. Across the three that were evaluated, the overall program was rated 4.5 (scale 1 to 5; 5 = best; n=80) and the average speaker evaluation was rated 4.2. The one year post-meeting survey (n=60) indicated that 95% of the respondents were commercial, while 5% were purebred operators. Sixty-eight percent of participants surveyed indicated that they derived 0 to 25% of their gross income from their beef operations; 27% received 26 to 50%; the remaining 5% received between 51 to 100%. Fifty-two percent of participants indicated they had an impact in revenue ranging from $0 to $5,000; 5% indicated they received from $5,001 to $10,000; 17% indicated no change in revenue from this program. When asked which of the management strategies they incorporated or made improvements in, 42% indicated improvements in record-keeping; 12% EPDs; 27% vaccinations; 27% feeding options; 38% pasture management; 35% reproduction; 22% fly control; 17% facilities; 20% hay storage; and 60% general herd management. Of the participants that returned the survey, 98% indicated that the information they received from this program improved their ability to successfully raise beef cattle, and 100% indicated that they would recommend this program to other beef producers.

Key Words: Beef Cattle, Extension Programming

Forages and Pastures - Livestock and Poultry: Grazing

837 Copper and Cu/Zn superoxide dismutase status in steers grazing three fescue types. R. L. Stewart, Jr*, G. Scaglia, W. S. Swecker, Jr., J. P. Fontenot, A. O. Abaye, J. H. Fike, M. A. McCann, and E. A. Wong, *Virginia Polytechnic Institute and State University*, *Blacksburg*.

During two consecutive grazing seasons, a study was conducted to measure Cu status of steers grazing three tall fescue (*Festuca arundinacea*) types: 'Kentucky-31' endophyte-infected (E+) and endophyte free (E-) tall fescues, and Q4508-AR542 non-ergot alkaloid-producing endophyte-infected tall fescue (Q). In 2004, forage Cu concentration was greater ($P < 0.05$) in E-. No differences in forage Cu were observed among treatments in 2005 ($P = 0.19$). In 2004, Cu intake was highest ($P < 0.001$) for steers grazing E- and lowest for E+ but was similar across treatments in 2005. Serum Cu was not different among treatments in 2004 ($P = 0.81$), but in 2005, serum Cu of steers grazing E- and Q was higher than E+ ($P < 0.05$). In 2004, liver Cu levels of cattle grazing E- were higher ($P < 0.05$) than for those grazing E+, while liver Cu levels of steers grazing Q were intermediate. No differences were detected among treatments in 2005 ($P = 0.86$). Enzymatic activity of Cu/Zn superoxide dismutase (SOD) did not differ among treatments in 2004 or 2005 ($P = 0.79$ and 0.80, respectively). In 2004 and 2005, no difference in relative Cu/Zn SOD mRNA abundance was observed among treatments ($P = 0.33$ and 0.92, respectively). These results suggest that lower Cu intake of steers grazing E+ and Q was related to lower DMI on these pastures. The lower Cu intakes likely contributed to differences in liver Cu. Endophyte status of forage did not affect Cu/Zn SOD enzymatic activity or relative mRNA abundance.

Key Words: Beef Cattle, Copper, *Festuca arundinacea*

838 Effects of clipping and implants on rates of hair growth and sweating, and rectal temperature of steers grazing endophyte-infected tall fescue. L. K. McClanahan*[1] and G. E. Aiken[2], [1]*University of Kentucky*, *Lexington*, [2]*USDA-ARS, Forage-Animal Production Research Unit*, *Lexington, KY*.

The effects of hair coat clipping and steroidal implants on rectal temperatures, rates of sweating and hair growth of beef steers grazing endophyte infected tall fescue [Schedonorus arundinaceus (Schreb.) Dumort; Soreng et al., 2001] were determined. Steers were stratified by body weight and hair coat color before initiation of grazing on six, 3.0-ha pastures of endophyte-infected 'Kentucky 31' tall fescue on 3 May, 2006. Ten clipped and 10 unclipped steers were assigned to pastures as the two main plot treatments. Five steers in each pasture were implanted with Synovex-S (200 mg progesterone-20 mg estradiol) and five were implanted with Compudose (25 mg estradiol) and handled as sub-plots. Thirty to 40% of body surface of clipped steers was shaved with surgical clippers. A small area over the shoulder of all steers also was clipped to measure hair length growth rate and sweating rate (g/m2/h). These variables and rectal temperature were measured at 28, 56, 84, and 104 days of grazing. Rectal temperatures for clipped steers were not lower ($P > 0.10$) than for unclipped steers, except at 84 days when the highest mean ambient temperature (33°C) was recorded (clipped = 39.5°C, unclipped = 39.3°C; $P < 0.05$). Sweating rate declined ($P < 0.001$) as ambient temperatures increased. Sweating rates tended ($P > 0.10$) to be higher with the estradiol than the progesterone-estradiol implant. Hair growth rates averaged 0.28 mm/d and were unaffected ($P > 0.10$) by the treatments. Results indicated that retention of rough hair coats, continuous growth of hair, and a reduction in sweating rate at higher ambient temperatures are factors that contribute to the vulnerability of fescue cattle to heat stress during the summer.

Key Words: Tall Fescue, Fescue Toxicosis, Heat Stress

839 Comparison of novel endophyte tall fescues for stocker cattle in southern Arkansas. P. A. Beck*[1], C. B. Stewart[1], D. Singh[2], and S. A. Gunter[1], [1]*University of Arkansas SWREC*, *Hope*, [2]*Barenbrug USA*, *Tangent, OR*.

Calves grazing Kentucky-31 (KY-31) tall fescue often exhibit signs of fescue toxicosis caused by ergot alkaloids produced by fungal endophytes. These fungal ergot alkaloids enable the tall fescue to be highly persistent in harsh conditions. Performance of calves grazing Endophyte-free (EF) tall fescue is improved but plant persistence is reduced. Novel endophyte (NE) tall fescues combine the advantages of plant persistence with the increased animal performance of fescues not containing the endophytes. Eleven 0.81-ha pastures (Una silty clay loam) were sprayed with 4.7 L glyphosate/ha 2 times at a 6-wk interval and no-till seeded with EF (Barcel®, Barenbrug USA, Tangent, OR), NE (Jessup AR542, MaxQ®, Pennington Seed, Madison, GA; and BAR FA BE 9301A, Barenbrug USA), and KY-31 tall fescues in the fall of 2005 to evaluate plant persistence, forage production, and animal performance. Calves (BW = 227 ± 6.7 kg, n = 3/pasture) grazed pastures from 4 January 2005 until 24 May (EF) or 21 June (KY-31 and NE). Calf BW at the end of grazing was 14% greater ($P < 0.01$) EF or NE than KY-31. Average daily gains were least ($P < 0.01$) for KY-31 (0.59 kg). Daily gains of calves grazing EF were greater ($P = 0.05$) than Jessup AR542 and tended ($P= 0.07$) to be greater than BAR FA BE 9301A, averaging 1.05, 0.83, and 0.88 ± 0.06, respectively. Total BW gain per calf and gain per ha were 33 and 34%, respectively, less ($P \leq 0.02$) for KY-31 than EF or NE tall fescues which did not differ ($P \geq 0.62$). Stand counts conducted during the grazing study indicate stand losses were already occurring for EF (32%) and were heavily contaminated with annual ryegrass, but stand counts of Jessup AR542, BAR FA BE 9301A, and Kentucky-31 were 75, 69, and 86%, respectively. The results of this experiment indicate that NE tall fescue pastures can improve animal performance compared to toxic endophyte tall fescue without the reduction in persistence observed for EF.

Key Words: Beef Cattle, Endophytes, Festuca arundinacea

840 Supplementation of digestible fiber and glucomannan to tall fescue pastures: performance, forage availability, and prolactin response. R. L. Mills*[1,2], C. J. Richards[2], F. N. Schrick[1], and J. C. Waller[1], [1]*The University of Tennessee*, *Knoxville*, [2]*Oklahoma State University*, *Stillwater*.

An 84 d randomized block design utilizing 96 weaned beef calves (238.8 ± 20.1 kg) in each of two consecutive years was used to assess the efficacy of digestible fiber and glucomannan (MTB-100®, Alltech, Nicholasville, KY) supplementation. Groups of four test calves were randomly assigned to 24 endophyte-infected tall fescue spring pastures (1.23 ± 0.06 ha) with additional grazer calves used in a put-and-take system. Pastures, blocked by previous productivity, were randomly assigned to one of five treatments: 1) no supplementation (CON); 2) supplemented with soybean hulls (SH) at 0.33% BW (DM basis; LO); 3) supplemented with SH at 0.66% BW (DM basis; HI); 4) LO plus 20 g•hd^{-1}•d^{-1} MTB-100®; and 5) HI plus 20 g•hd^{-1}•d^{-1} MTB-100®. Calves had free-choice access to water and a loose vitamin/mineral mix. Every 21 days, calves were weighed, serum was collected, and forage clip samples taken to estimate forage availability. Data were analyzed using the MIXED procedure in SAS with contrasts of main effects of SH level (LO vs. HI), MTB, SH level x MTB, and CON vs. supplemented (SUPP). No interaction between SH level and MTB was observed ($P > 0.10$). ADG increased by 0.24 kg/d with SUPP ($P < 0.01$). HI SH increased ADG by 0.13 kg/d ($P < 0.01$) over LO SH, but MTB had no effect ($P > 0.10$). Forage availability was only affected by day of collection ($P < 0.01$). HI SH had greater total gains per hectare than LO SH ($P < 0.01$). Serum prolactin differed on days 63 and 84 ($P < 0.01$) with concentration increasing by 52% due to SUPP ($P < 0.01$) and 34% by increasing from LO to HI SH ($P < 0.05$). Results indicate that digestible fiber supplementation can improve animal performance and endocrine function on endophyte-infected tall fescue. MTB showed no effect when included with SH supplementation.

Key Words: Tall Fescue, Soybean Hulls, Glucomannan

841 Performance of primiparous beef cows grazing bahiagrass pastures with three rates of soybean hull supplementation. J. M. B. Vendramini* and J. D. Arthington, *Range Cattle Research and Education Center - University of Florida*, *Ona*.

The objective of this study was to evaluate the performance and milk production of primiparous beef cows grazing bahiagrass (Paspalum notatum Flugge) pastures with three rates of soybean hull supplementation. The experiment was conducted at the Range Cattle Research and Education Center –Ona, FL from Aug. 14 2006 to Jan. 5 2007. The treatments were three rates of soybean hulls (0, 1.6, and 3.2 kg/head/d), in addition to a base supplement of 1.6 kg of molasses and 0.8 kg of cottonseed meal per head daily. Treatments were evaluated in a completely randomized design with four replications. Three Brangus-crossbred and one Braford cow were assigned to each experimental unit. The experimental units were 1.2 ha pastures. Heifer BW and body condition score (BCS) were recorded every 28-d. Calf BW and cow milk production were evaluated on Dec. 4 2006 and Jan. 1 2007. Milk production was measured using the weigh-suckle-weigh method. Herbage mass was measured every 14-d using the disk plate meter methodology. There was a treatment by time interaction on herbage mass ($P<0.05$). The control treatment had a greater decline in herbage mass (1400 to 950 kg DM/ha) than treatments receiving soybean hulls (1500 to 1200 kg DM/ha) from Aug. to Jan. Heifer ADG (-0.12 to 0.22 kg/d), BCS change (-0.65 to 0), milk production (4.2 to 6.6 kg/d), and calf ADG (0.60 to 0.88 kg/d) increased linearly ($P<0.05$) as rate of soybean hull supplementation increased. The Increased energy and protein supplementation of primiparous cows with soybean hulls increased BW of calves and BCS of cows; however, the economic feasibility of this management practice will depend upon soybean hull cost and calf prices.

Key Words: Milk Production, Soybean Hulls, Primiparous Cows

842 Grazing efficiency in free range Merino sheep. W. M. Rauw*[1], H. A. Glimp[1], W. Jesko[2], M. Sandstrom[1], and L. Gomez-Raya[1], [1]*Department of Animal Biotechnology, University of Nevada Reno*, *Reno*, [2]*Rafter 7 Ranch*, *Yerington, NV*.

Although the importance of grazing efficiency has been recognized, no practical method is available today to record grazing efficiency in grazing animals that can be used in a selection program. We propose a new method to measure grazing efficiency that can be selected for. Grazing efficiency as defined by our model is an estimate of the individual ability to graze at resource limiting rangelands and is

estimated from changes in body weight during a grazing period. The model was applied to a free range Merino and Merino × Rambouillet sheep herd with a total of 905 ewes. Body weights were measured before and after the ewes were allowed to graze freely on the rangelands for 75 days. The model is based on the expected metabolizable energy that they need for production, maintenance and reproduction in that period. The ewes grazed on average 2861 ME (kcal/d) with a standard deviation of 325 ME (kcal/d). Tests for normality (Shapiro-Wilk and Anderson-Darling) of the distribution of grazing efficiency indicated that this trait is normally distributed. The effect of the ewe's age was highly significant ($P < 0.001$) with younger ewes having the lowest grazing efficiency. Results showed that this is a size effect (older animals having higher requirements), but this may have a behavioral component as well with older animals having more grazing experience. The effect of sire was significant also ($P < 0.001$). Estimates of heritabilities for grazing efficiency and number of lambs were 0.340 (± 0.056) and 0.056 (± 0.046), respectively. The genetic and phenotypic correlations between grazing efficiency and number of lambs weaned were 0.168 (± 0.269) and 0.468 (± 0.027), respectively. Therefore, selection for grazing efficiency may result in a correlated response to number of lambs. The model of grazing efficiency may have a range of applications such as comparing grazing efficiency of different ruminant species, and providing information on the potential for grazing of different range ecosystems. It also has implications for animal welfare.

Key Words: Sheep, Grazing Efficiency, Selection

843 Glycerol as a supplemental energy source for meat goats.
K. R. Hampy*, K. P. Coffey, D. W. Kellogg, E. B. Kegley, J. D. Caldwell, M. S. Lee, M. S. Akins, J. L. Reynolds, J. C. Moore, and K. D. Southern, *University of Arkansas*, *Fayetteville*.

Glycerol, a by-product of the manufacture of bio-diesel, has potential for use as a feedstuff for cattle, sheep, and goats. Limited research reported that glycerol was fermented rapidly in the rumen and increased proportions of propionate, but decreased DM intake. Our objective was to determine the impact of adding different levels of glycerol on intake and digestibility of a medium quality crabgrass (Digitaria ciliaris (Retz.) Koel.)/ goosegrass (Eleusine indica (L.) Gaertn.) hay basal diet by meat goats. Twenty wether meat goats (23.5 ± 0.74 kg BW) were housed in individual pens (1.1 by 1.5 M) with expanded metal floors and offered one of four treatments (five goats each). Treatments consisted of a basal diet of medium quality crabgrass/goosegrass hay offered for free-choice consumption with no supplement (C), or with either 1) glycerol at 5% of the total diet (G5), 2) glycerol at 10% of the total diet (G10), or 3) liquid molasses at 10% of the total diet (M10). Diets were offered twice daily at 0800 and 1400h and liquid supplements were top-dressed onto the hay and mixed by hand at each feeding. Trace mineralized salt was provided at 0.5% of the total diet daily. Hay samples were collected at each feeding, and refused feed was removed daily at 0800h, weighed, and dried at 50 C for DM determination. Following a 10-d dietary adaptation period four goats per treatment were fitted with fecal collection bags and total feces were collected for 5 d. Feces were removed twice daily, weighed, then dried at 50 C. Total DM intake did not differ ($P > 0.33$) among treatments (11.5, 15.5, 11.4, and 12.6 g/kg BW for C, G5, G10, and M10, respectively). Digestibility of DM tended ($P = 0.10$) to be lower for C compared with G5, but other treatments did not differ (60.1, 66.2, 62.2, and 63.2% for C, G5, G10, and M10, respectively). Therefore, lower levels of glycerol may be used to increase digestibility of medium-quality forages without negatively impacting forage intake.

Key Words: Glycerol, Meat Goats, Crabgrass

844 Effects of level of concentrate supplementation on nutrient digestion of lactating dairy cows grazing at two pasture allowances.
T. H. Garmo, H. Volden, S. J. Krizsan*, and S. K. Nes, *Norwegian University of Life Sciences*, *Ås, Norway*.

The impact of low vs. high pasture allowance (PA) (12 vs. 24 kg DM/cow per d) within 2 levels of concentrate supplementation (C), 3 vs. 7 kg/d (C3 vs. C7) on digestion and rumen fermentation was evaluated in lactating cows grazing a white clover dominated pasture (percent coverage>60%). Four ruminally cannulated cows averaging 107±51 DIM and producing 36±10 kg milk/d pretrial were used in a change over experiment with four 15-d periods. The concentrate mix provided 190 g NDF and 334 g starch per kg of DM. Pasture CP and NDF were: 193 and 345 g/kg of DM. During the last 5 days of each period fecal, omasal digesta, rumen fluid and rumen evacuation samples were collected. Additionally, ruminal pH was measured continuously for 24 h. Pasture DMI was calculated from C31 and C32 alkane content. No significant interactions between PA and C were detected for any trait. Apparent digestibility of CP and NDF was higher for cows on low PA and cows fed C3, respectively. Ruminal NDF digestibility (RNDFD) decreased and ruminal K_pNDF, omasal OM and AA flow to the small intestine increased for cows fed C7 compared with C3. There were no treatment effects on total or individual VFA concentrations, but rumen NH_3 was lower for cows fed C7 than for cows fed C3. Ruminal pH was below 6 for 11 h compared to 1 h for cows fed C7 and C3 diets, respectively. Results indicate that energy is the first limiting nutrient for lactating cows grazing high quality pasture.

Table 1.

Item	PA		C (kg/d)		SEM
	Low	High	3	7	
DMI, kg/d	18.9	20.6	18.1	21.4	0.8
Pasture DMI, kg/d	14.5	16.2	15.6	15.1	0.7
App. dig. %					
OM	73.1	72.3	73.7	71.8	0.6
CP	74.0[a]	71.6[b]	73.8	71.8	0.8
NDF	54.0	53.5	57.6[a]	49.9[b]	1.5
K_pNDF, %/h	2.8	3.1	2.7[a]	3.2[b]	0.2
$K_d$pdNDF, %/h	4.5	4.6	4.8	4.3	0.3
RNDFD, %	50.0	49.6	52.1[a]	47.4[b]	1.7
Omasal OM flow, g/d	12840	13149	12455[a]	13534[b]	580
Omasal AA flow, g/d	2651	2801	2350[a]	3101[b]	170
Rumen NH_3, m*M*	7.6	9.4	11.3[a]	5.6[b]	2.0
Rumen total VFA, m*M*	110	117	112	115	11.8

[a,b]Means within a row with different superscripts differ ($P<0.05$)

Key Words: Concentrate Level, Nutrient Digestion, Pasture Allowance

845 Effect of daily herbage allowance and concentrate level, offered at different stages of lactation, on milk production, dry matter intake, blood metabolites, bodyweight and body condition score. E. Kennedy*[1,2], M. O'Donovan[1], F. O'Mara[2], and L. Delaby[3], [1]*Teagasc, Dairy Production Research Centre, Moorepark, Fermoy, Co. Cork, Ireland*, [2]*School of Agriculture, Food Science and Veterinary Medicine, UCD, Belfield, Dublin 4, Ireland*, [3]*INRA, UMR, Production du Lait 35590 St. Gilles, France*.

The objective of this study was to establish the influence of daily herbage allowance (DHA) and concentrate supplementation on milk production, dry matter intake (DMI), blood metabolites, bodyweight and body condition score (BCS) of spring calving dairy cows at approximately 40, 80 and 120 days in milk (DIM). Sixty-six (30 primiparous and 36 multiparous) Holstein Friesian dairy cows (mean calving date – 7 Feb) were randomly assigned to a 6 treatment (n=11) grazing study. Animals were offered one of 3 DHA′s (13, 16 and 19kg DM/cow/day >4cm; *Lolium perenne*) and either 0 or 4kg DM/day concentrate supplementation at 40 and 80 DIM. All animals were offered 20kg DM/cow/day of herbage and no concentrate at 120 DIM. Milk yield was recorded daily; milk composition, BW and BCS were determined weekly. Blood metabolites and DMI were measured at 40, 80 and 120 DIM. The experiment was a randomised block design and was analysed using covariate analysis. There was no effect of DHA on milk production at 40 DIM, however BW (P<0.01) and DMI (P<0.05) were lower when a low DHA was offered while plasma NEFA, BHB and urea concentrations were higher. DHA tended to influence animal performance at 80 DIM. A low DHA reduced BW (-21 kg) when compared to a medium and high DHA at 80 DIM but there was no effect of treatment at 120 DIM. Concentrate significantly increased milk production at 40, 80 and 120 DIM (+ 4.1, 5.9 and 1.2 kg/cow, respectively). It also increased total DMI but decreased grass DMI and plasma NEFA at 40 and 80 DIM. These results indicate that a low DHA in early lactation does not adversely affect animal performance however DHA needs to be increased as lactation progresses. Including concentrate in the diet increased animal performance throughout early lactation.

Key Words: Daily Herbage Allowance, Concentrate, Days in milk

846 Timing of herbage and fasting allocation in strip grazed cattle: Effects on patterns of ingestive behavior, herbage intake, and nutrient supply. P. Gregorini*[1], S. A. Gunter[2], and P. A. Beck[2], [1]*USDA–ARS, University Park, PA*, [2]*University of Arkansas SWREC, Hope*.

Afternoon herbage allocations have shown to improve animal performance due to an increase in intake at dusk, when herbage quality is higher. However, this trend might not yet be maximized. This work aimed to assess the impact of timing of herbage and fasting allocations on patterns of ingestive behavior, herbage intake, and ruminal fermentation, plus nutrient flow to the duodenum. Treatments were daily herbage allocation in the afternoon (1500, AHA), morning (0800, MHA), AHA plus 20 h of previous fasting (AHAF), and MHA plus 20 h of previous fasting (MHAF). Four ruminal and duodenal fistulated heifers (279 kg ± 99 kg BW) individually strip-grazed wheat (Ttriticum aestivum L.) pastures in a 4 × 4 Latin square design. Eating behavior was recorded every 2 min, and bite rate was measured every hour while heifers were in the strips (12 h MHA and AHA; 4 h MHAF and AHAF). Ruminal DM pools were measured 4 times daily (0800, 1200, 1500, and 1900) to determine daily herbage DMI and its pattern. Ruminal fluid was sampled at the same times plus at 2300. Duodenal digesta was sampled over 2 d. Samples were collected at intervals of 4 h for the first 24 hr. The second day collection times were advanced 2 h. Treatments did not affect daily herbage DMI (16.5 g/kg BW, SE 0.0025; P > 0.05). However, eating pattern was altered; evening grazing bout of AHA and AHAF was longer (P < 0.05) and more intense (P < 0.05; bite rate, bite mass and intake rate). Ruminal fermentation patterns followed the pattern of herbage intake. Non-glucogenic/glucogenic VFA ratio and ruminal pH were lower (P < 0.05) for AHA and AHAF during the evening. The flow of OM, N, microbial protein and non-microbial OM to the duodenum did not vary (P >0.05) among MHA, MHAF and AHAF; however, it was in average 970, 40, 300 and 540 g/d respectively greater (P < 0.05) for AHA. These results demonstrate that at the same level of resource allocation and herbage intake, nutrient supply to grazing cattle can be modified through simple grazing management.

Key Words: Eating Pattern of Cattle, Fasting and Herbage Allocation, Nutrient Supply

847 Frequent reallocation of strip grazing cows improves productivity. P. A. Abrahamse*, J. Dijkstra, and S. Tamminga, *Animal Nutrition Group, Wageningen University, Wageningen, The Netherlands*.

Twenty Holstein cows were split into two equal groups to test the effect of allocation frequency to new strip grazing plots on dry matter intake (DMI), grazing behaviour, rumen characteristics and milk production using a repeated measurements design with two periods of 12d. Treatments were daily allocation to 0.125 ha plots (1D) and every four days allocation to 0.5 ha plots (4D) of Lolium perenne L. Cows were fed 2.7 kg DM/d concentrates as a supplement. There were no differences in chemical composition of grass between 1D and 4D, but between offer and turnout leaf fractions decreased from 70.7% to 53.0% of grass DM, causing decreased CP and increased NDF grass contents. DMI determined using the n-alkane technique did not differ (p>0.05) between 1D and 4D but there was a significant (p=0.0253) treatment*period interaction (period 1: 1D 18.3 vs. 4D 16.5; period 2: 1D 14.7 vs. 4D 15.0 kg DM grass/cow/day), due to limited DM on offer in period 2. Grazing behaviour, observed using IGER graze recorders, showed no difference in eating time per day (561.8 min/day, p=0.5834), but bite mass was numerically higher in 1D than in 4D (490.7 vs. 440.2 mg/bite, p=0.2601). Between offer and turnout in 4D, eating time increased (548.2 to 572.3 min/d) and rumination time decreased (468.5 to 452.4 min/d). Ruminal ammonia concentration (NH_3) was significantly lower in 1D than in 4D (93.7 vs. 120.1 mg/L, p=0.0256), NH_3 decreased from 171.5 to 77.5 mg/L from d1 to d4 in 4D. There was no difference in milk urea between treatments, but milk urea decreased from 26.5 to 20.6 mg/dL from d1 to d4 in 4D. Fat and protein corrected milk (FPCM) was significantly higher in 1D than in 4D (24.0 vs. 21.9 kg/cow/day, p=0.0068), mainly due to a difference in milk production (25.0 vs. 23.0 kg/cow/day). The results show that more frequent reallocation of cows increases FPCM. DMI was higher in 1D when grass DM on offer was high, probably due to less variation in grazing behaviour between days. The difference in grass composition between days in 4D had major effects on NH_3 in rumen fluid and excretion of N with milk urea.

Key Words: Grazing Behaviour, Rumen Fermentation, Milk Production

848 Effect of sulphite salts on the aerobic stability and intake levels of whole crop wheat by grazing of dairy cattle. J. K. Margerison*[1] and R. R. Edwards[2], [1]*Massey University*, *Palmerston North, New Zealand*, [2]*University of Plymouth*, *Plymouth, UK*.

Two experiments were completed to measure the effect sulphite salts on the aerobic stability and intake levels of whole crop wheat (WSW) offered to grazing dairy cattle. In experiment 1: 40 cows (60 days postpartum), were allocated into matched pairs according to milk yield and composition: 20 received WSW with no additive (NoSS), 20 received WSW with added sulphite salts (SS) for 42 days, with a 28 day measurement period using pre-treatment milk yield and composition as covariates. In experiment 2: 1.5 kg of WSW from each treatment in experiment 1 was used for laboratory aerobic stability studies and plate yeast culture. WSW intake levels (kg DM/d) were significantly lower in SS 6.9, NoSS 5.9 (SE 0.19), grazing time (min/d) SS - 263.5, NoSS 296.0 (SE 6.911), ruminating time (min /d), SS 546.6, NoSS 530.8, 3.353 was significantly greater with NoSS. Diet had no significant effect on milk yield (kg/d), SS 33.3, NoSS 32.9, (SE 0.52), milk fat (g/kg), SS 40.5, NoSS 42.1, 0.07 or protein (g/kg), SS 33.6, NoSS 33.6 (SE 0.03) content. Mean live weight (kg) was significantly greater in SS cows, SS 666.81, NoSS 660.14 (0.823). Time to peak temperature (h), SS 128.64, NoSS 82.89 (SE 1.547), maximum temperature (°C), SS 6.76, NoSS 10.90 (0.372) heat generated (°C), SS 39744.0, NoSS 54938.0 (1171.00) and yeast numbers (NoSS 4.951, NSS 4.156 (SE 0.62) log cfu/ml) were greater with NoSS. In conclusion, silage quality, live weight gain and aerobic stability of WCW was increased by the addition of sulphite salts, but had no significant effect on milk yield.

Key Words: Aerobic Stability, Whole Crop, Wheat

Growth and Development - Livestock and Poultry: Transcriptional Factors and Cell Mechanisms for Regulation of Growth and Development with Application to Animal Agriculture

849 Defining the transcriptional signature of skeletal muscle stem cells. Z. Yablonka-Reuveni*, I. Kirillova, G. Shefer, K. Rider, R. Almuly, A. Vine, B. Kwiatkowski, and K. Day, *University of Washington*.

Skeletal muscle myofibers are supplied with new nuclei by satellite cells, myogenic progenitors located between the plasma membrane and the basal lamina of the myofiber. During postnatal growth, satellite cells proliferate and contribute myoblasts that fuse with the enlarging myofibers. In mature muscles, satellite cells are mitotically quiescent, but they can enter the cell cycle and produce myoblasts in response to stimuli generated by muscle damage. Quiescent satellite cells commonly express the paired-homeobox transcription factor Pax7, while their proliferating progeny co-express Pax7 and the muscle-specific transcription factor MyoD. Upregulation of FGFR4, along with the induction of the muscle-specific transcription factor myogenin and a concomitant decline in Pax7, marks the transition of satellite cell progeny into the differentiation phase. These cells rapidly withdraw from the cell cycle, terminally differentiate and fuse into myotubes. We identified expression of green fluorescent protein (GFP) driven by regulatory elements of the nestin gene within satellite cells of different muscles in mice. This GFP expression establishes a novel means for characterizing satellite cells in their niche. Sorted GFP+ cells exclusively acquired a myogenic fate, even when supplemented with media supporting non-myogenic development. Common and unique gene expression patterns were identified in satellite cells from different muscle groups. GFP+ sorted cells from hindlimb, diaphragm and extraocular muscles expressed relatively high levels of Pax7 and Myf5. Only the diaphragm cells exhibited a distinctly greater expression of Pax3. GFP expression declined following satellite cell activation and was reacquired in late stage myogenic cultures by non-proliferating Pax7+ progeny. The dynamics of this expression pattern reflect the cycle of satellite cell self-renewal. The nestin-GFP model reveals unique transcriptional activity within quiescent satellite cells and permits novel insight into the heterogeneity of their molecular signatures. Supported by USDA and NIH.

Key Words: Satellite Cells, Pax7, Skeletal Muscle

850 The role of microRNAs in muscle development. T. P. L. Smith*[1], T. G. McDaneld[1], M. E. Doumit[2], L. K. Matukumalli[3], T. S. Sonstegard[3], L. L. Coutinho[4], and R. T. Wiedmann[1], [1]*USDA, ARS, U.S. Meat Animal Research Center*, *Clay Center, NE*, [2]*Michigan State University*, *East Lansing*, [3]*USDA, ARS, Bovine Functional Genomics Laboratory*, *Beltsville, MD*, [4]*University of Sao Paulo*, *Brazil*.

The genomes of multicellular eukaryotic organisms encode numerous non-coding RNA (ncRNA) species with a variety of known functions, as well as many whose functions are currently unknown. One class of ncRNA genes produce transcripts that are processed by specific cellular machinery to result in small ~18-22 nucleotide-long micro-RNAs (miRs) that provide a targeting mechanism to direct RNA-protein complexes (RISC) to cognate mRNAs. Association of the RISC complex with mRNA has been shown to control gene expression by inhibiting translation or targeting messenger RNA for degradation. The data on miR expression and activity suggests that a major role for this level of regulation is to provide a mechanism for switching the physiological state of the cell in a rapid fashion, as a single miR may have numerous target genes and may act more rapidly than transcriptional control by silencing mRNA already present in the cell. Tissue-specific miRs have been implicated in control of development, homeostasis, and immune response. Studies in mouse myoblast cell lines have defined significant responses of miR populations during differentiation. Our studies of miR profiles in porcine and bovine satellite cell and fetal muscle samples demonstrate marked similarity, but also significant differences, to the murine system. In addition, miR profiles in fast-growing neonatal muscle and fully mature muscle indicate potential roles for regulation of gene expression throughout the life cycle. Analysis of mRNA coexpression through these developmental stages of muscle growth and maturity begins to provide a picture of the interplay between protein-coding gene expression and regulation at the post-transcriptional level via miRs. The data suggest potentially critical roles for miRs in the switch from proliferation to differentiation, in regulating muscle growth in early life, and in maintaining tissue homeostasis in mature muscle.

Key Words: Muscle Development, Non-coding RNA, Gene Regulation