for operations not using a predip were single-use cloth/paper towel. Operations that used a teat wash method most frequently dried teats using a single-use cloth/paper towel (51.2% (S.E. 3.8) of operations that used a teat wash method). Neither a predip or teat wash method was used on 5.3% (S.E. 1.0). Automatic takeoffs were used on 36% (S.E. 1.8) of all operations with use increasing with increasing herd size. More than 94% (S.E. 1.0) of operations used a post-milking teat disinfectant (postdip). Iodophores and chlorhexidine were the most commonly used disinfectants in postdips. Most operations reported milking cows twice daily (93.6% (S.E. 0.8) of operations representing 78.6% (S.E. 1.7) of cows). Coliform mastitis vaccines were administered to the majority of cows on 35.8% (S.E. 2.0) of operations representing 57.1% (S.E. 1.8) of all cows. Intramammary dry cow therapy was administered to all cows at dry off on 75.2% (S.E. 1.9) of operations. The majority (42.1% (S.E. 1.8) of cows) was treated with a dry cow product containing cephapirin, followed by the combination of penicillin G/dihydrostreptomycin (31.7% (S.E. 2.0) of cows).

Ruminant Nutrition: Dairy calves and replacement heifers

82 Responses to feeding Apex plant extracts to neonatal calves via the milk replacer and starter. T. M. Hill*[1], J. M. Aldrich[1], and R. L. Schlotterbeck[1], [1]*Akey*.

Feeding Apex plant extracts improved 0 to 42-day gains by 8 percent when included in an all milk protein milk replacer (MR) and 17 percent when included in a milk plus soy protein MR (no Apex in the starter) in a previous trial. In this trial 48, approximately 3 day old calves (40 kg), were fed a milk plus soy protein MR (20 percent CP and 20 percent fat, 454 g per head daily) with and without .05 percent Apex and an 18 percent CP starter with and without .05 percent Apex. All MR and starters contained decoquinate. Starter and water was fed from 0 to 56 days and MR was fed from 0 to 42 days. Calves were housed in a naturally ventilated nursery with no heat in individual pens. Data were analyzed as a completely randomized block design with factors in the model of block (row in nursery), MR (Apex or no Apex), starter (Apex or no Apex), and MR by starter. There were no significant ($P > .1$) interactions of MR by starter. Calves fed Apex via the MR had higher rates of gain, consumed more starter, and had better feed efficiency ($P < .05$) from 0 to 42 days. They also had firmer fecal scores and required fewer medical treatments ($P < .05$) from 0 to 42 days. Calves fed Apex via the starter had higher rates of gain and better feed efficiency ($P < .1$) from 0 to 56 days. Calves fed Apex via the MR consumed more ($P < .1$) starter from 0 to 56 days. Calves fed Apex via the starter consumed more ($P < .1$) starter and had greater hip width changes post-weaning. Compared to calves not fed Apex from 0 to 56 days, gains were 4.9 kg, 5.4 kg, and 8.0 kg greater and starter intakes were 9.4 kg, 8.3 kg, and 11.3 kg greater when Apex was in the MR, starter, or both feeds, respectively. Apex is a trademarked product of Braes Feed Ingredients.

Key Words: Calf, Milk replacer, Plant extract

83 Effect of feeding neonatal calves milk replacers containing a blend of vegetable and animal fats. T. M. Hill*, J. M. Aldrich, and R. L. Schlotterbeck, *Akey*.

Milk replacers (MR) for herd replacement calves commonly contain all animal fat, which contain fatty acids with predominately 16 and 18 carbons. Shorter chain fatty acids may be more digestible and have antimicrobial properties, while C18:2 and C18:3 fatty acids might aid in immune function. In two trials, a MR formulated with a portion of the animal fat replaced with a blend of vegetable fats high in 8 to 14 carbon fatty acids, plus C18:1 and C18:2 fatty acids (MRV) was compared to a MR formulated with all animal fat (MRA). In each trial, 24 calves (approximately 3 days old and 43 kg) were fed 454 g per head daily of a 20 percent all milk protein and 20 percent fat MR from 0 to 42 days and an 18 percent CP starter and fresh water from 0 to 56 days. Both feeds contained decoquinate. Data were analyzed as a completely randomized design. In trial 1, daily gains and starter intakes for calves fed MRV were improved ($P < .05$) 7% from 0 to 42 days compared to calves fed MRA. Daily gains and starter intakes for calves fed MRV were improved ($P < .05$) 6 and 10 percent, respectively, from 0 to 56 days compared to calves fed MRA. There were 26 percent fewer total abnormal fecal score days (fecal scores >2 on a 1-5 system; 1 being normal, 5 being watery) for calves fed MRV vs. MRA. In trial 2, daily gains and feed efficiency for calves fed MRV were improved ($P < .05$) 6 and 7 percent, respectively, from 0 to 42 days, compared to calves fed MRA. Daily gains for calves fed MRV were improved ($P < .05$) 6 percent from 0 to 56 days compared to calves fed MRA. There were 21 percent fewer total abnormal fecal score days for calves fed MRV vs. MRA. Calves fed MRV were approximately 2 kg heavier after the 56-day trials and scoured less than calves fed MRA.

Key Words: Calf, Milk replacer, Fatty acids

84 Characterization of a colostrum replacer containing IgG concentrate and growth factors. C. J. Hammer*[1], J. D. Quigley[2], L. Ribeiro[2], and H. D. Tyler[1], [1]*Iowa State University, Ames*, [2]*APC, Inc., Ames, IA*.

Objective of this study was to characterize absorption of colostrum replacer (CR) or supplement (CS) containing fractions of bovine plasma. Immunoglobulin concentrate (IGC) was prepared from bovine abattoir blood to a final purity of approximately 90%. Bovine blood was also processed to produce a fraction containing elevated concentrations of IGF-1 and TGF-β (GF). Both IGC and GF were spray-dried and blended with other ingredients to produce CR (30% IgG) or CS (15% IgG) containing 0 or 5% GF. Holstein bull calves (n = 40) were removed from the dams immediately after birth and assigned to one of five treatments: 1.9 L of maternal colostrum at 1 and 8 h of age (MC); 1.9 L of CS at 1 and 8 h of age to provide 150 g of IgG (LC); 1.9 L of a CS with GF at 1 and 8 h of age to provide 150 g of IgG (LG); 1.9 L of CR at 1 h of age to provide 150 g of IgG and 1.9 L of a commercial milk replacer (MR) at 8 h of age (HC); and 1.9 L of a CR with GF at 1 h of age to provide 150 g of IgG and 1.9 L of a commercial MR at 8 h of age (HG). Blood was collected by jugular venipuncture at 0 and 24 h for determination of plasma IgG. Six calves fed HG, HC, and MC received an oral xylose solution (0.5% g/kg body weight) at 2 d of age. Jugular blood samples were obtained at 0 and 2 h after xylose ingestion. Apparent efficiency of IgG absorption (AEA) was higher ($p=.02$) for calves fed HC and HG compared to those fed LC and LG and was lower ($p=.03$) for calves fed LG and HG compared to those fed LC and HC. IgG concentrations at 24 h were highest ($p<.0001$) in calves fed MC compared to other calves and were higher ($p=.048$) in calves fed HC and HG compared to LC and LG. Calves fed LG and HG had lower ($p=.02$) IgG concentrations at 24 h of age compared to those fed LC and HC. Xylose absorption was not influenced by treatment. These results indicate that 150 g of IgG provided in one dose soon after birth is superior to 150 g of IgG fed in two doses 7 h apart.

Key Words: Colostrum, Calf, Xylose

85 Inclusion of vegetable fats in calf milk replacers. M. L. O'Brien, K. J. Touchette, J. A. Coalson, and R. M. Costello*, *Merrick's Inc. Union Center, WI USA*.

Due to increased concern over feeding species to species feeds and to new manufacturing technology, the use of vegetable fats in milk replacers may be an alternative to feeding animal fats. Two studies were conducted to evaluate the performance of calves fed milk replacer containing vegetable fat. Both experiments utilized a randomized complete block design with initial weight as the blocking factor. Calves on Exp. 1 were assigned to a diet of all animal fat (**ANIMAL**), 100% vegetable fat containing Palm Oil as 85% of the fat and Coconut Oil as 15% of the fat (**PALM**), or a 100% vegetable fat diet containing Soy Oil as 85% of the fat and Coconut Oil as 15% of the fat (**SOY**). Calves on Exp. 2 were assigned to a diet of all animal fat (**ANIMAL**), as ANIMAL with 15% of the fat from Coconut Oil (**15%COCO**), or 100% vegetable oil containing 85% of the fat as Soy Oil and 15% of the fat as coconut oil (**SOY**). For both experiments, milk replacers were formulated to contain protein and fat levels at 20% of DM and were fed at 454 g/d reconstituted to 12% DM. Holstein bull calves (n=60 for Exp. 1, n=120 for Exp. 2) were purchased from an area sale barn. Calves were housed in individual hutches with water available free choice from d 0. A high quality, commercial calf starter was available free choice beginning on d 1. Feed intake, incidence of scours and antibiotic treatments were recorded daily. Calves were weighed weekly. Calves were

weaned at a minimum of 42 d with weaning dependent on the calf eating a minimum of 454 g of calf starter for 3 consecutive d. For Exp. 1, calves fed the PALM diet had greater average weekly weight gains, ADG, ADFI, and feed efficiencies (P<0.05) than calves fed ANIMAL. Calves fed SOY were intermediate for all performance characteristics. For Exp. 2, there were no significant differences in average weekly weight gains, ADG, ADFI or feed efficiency between calves fed ANIMAL, 15%COCO, or SOY. These results indicate that vegetable fats can be used as an effective alternative fat source in commercial calf milk replacers.

Key Words: Calves, Milk replacer, Fat

86 Effect of feeding a novel direct fed microbial in a calf milk replacer. M. L. OBrien[1], K. J. Touchette[1], J. A. Coalson[1], R. M. Costello*[1], T. Rehberger[2], and B. Galbraith[2], [1]*Merrick's Inc. Union Center, WI,* [2]*Agtech Products, Inc. Waukesha, WI.*

The objective of this study was to determine the effect of feeding a novel direct fed microbial (DFM) in a calf milk replacer (CMR). Holstein bull calves (n=120), less than 7 d of age were purchased from an area sale barn in two groups of 60 calves. Two experiments were conducted using a randomized complete block design. Calves were assigned by weight to either a control diet (**CON**) or a diet containing the novel DFM (**DFM**). All calves were fed a CMR formulated to contain protein and fat levels at 20% of DM and were fed 454g/d. Calves were housed in individual hutches with water available free choice from d 0. A commercial calf starter was available free choice beginning at d 1. Feed intake, scour scores and antibiotic treatments were recorded daily. Calves were weighed weekly. Calves were weaned at d 42 dependent on a minimum intake of 454 g of calf starter for 3 consecutive d. Experimental data were analyzed separately due to treatment by trial interactions. Initial serum IgG level for calves in Exp. 1 was 50% lower than that for calves in Exp. 2 (3.9 vs. 7.9 mg/ml, P<0.10). Calves fed the DFM in Exp.1 were significantly heavier than calves fed the CON diet beginning on d 7 and maintained the difference through d 42. Average daily gains were significantly greater for the first six weeks of the study for calves fed the DFM diet compared to those fed the CON diet (465g vs. 393g respectively). In Exp. 1, calves fed the DFM had a lower percent scouring than calves fed the CON diet (27.5% vs. 39.3%, respectively, P=0.35). In Exp. 2, there was no significant difference in average weekly weight gains, ADG, feed intake or gain:feed between calves fed the DFM or CON diet. For calves fed the DFM, the percentage of calves that scoured was significantly (P=0.05) less than calves fed the CON diet (17.9% vs. 41.4%, respectively). These results suggest that the novel DFM utilized in this study can be beneficial for the reduction in percentage of calves scouring when fed in a calf milk replacer and may improve calf performance.

Key Words: Calves, Direct fed microbials

87 Performance of Holstein and Holstein-Jersey crossbred heifer calves from birth to 84 days of age. M. L. Raeth-Knight*[1], J. G. Linn[1], D. G. Johnson[2], L. B. Hansen[1], A. J. Seykora[1], B. J. Heins[1], and R. M. Templeton[1], [1]*University of Minnesota, St. Paul, MN, USA,* [2]*West Central Research and Outreach Center, Morris, MN, USA.*

Forty-two Holstein and forty-four Holstein-Jersey crossbred heifer calves were included from studies conducted at the University of Minnesota, St. Paul (Site A) and the West Central Research and Outreach Center, Morris, Minnesota (Site B). All crossbred calves had Holstein dams and Jersey sires. Calves were fed colostrum twice daily the first three days after birth and then milk replacer (22% CP, 20% fat) at approximately 10% of birth weight until weaning at day 42. Calf starter was offered ad libitum from day 3 to day 84. Calves at Site A were housed individually in hutches while calves at Site B were housed individually and in groups. Housing at Site B did not affect performance measures or feed intake of Holstein or crossbred calves. All calves at both sites were grouped on day 57. Body weights and hip heights were recorded at birth, day 28, 56 and 84. At both sites, Holstein calves consumed significantly ($P < 0.01$) more total kg of milk replacer dry matter from day 3 to 42 (Site A (18.3) Site B (17.24)) as compared to crossbred calves (Site A (14.7) Site B (13.5)). At Site A, Holstein calves numerically consumed more total kg of starter from day 3 to 56 (76.4 vs. 70.2) compared to crossbred calves. At site B, crossbred calves (n=8) numerically consumed more total kg of starter from day 3 to 56 (63.1 vs. 55.1) compared to Holstein calves (n=4). At both sites, Holstein calves weighed significantly ($P < 0.01$) more at birth than crossbred calves, (41.6 kg vs. 34.4 kg). The average body weights at day 84, for Holstein and crossbred calves, were 109.5 kg and 91.2 kg ($P < 0.01$) for Site A and 91.4 kg and 82.3 kg ($P < 0.01$) for Site B. In summary, there was no difference in the feed efficiency or comparative performance (weight gain expressed as a percentage of birth weight) of Holstein or crossbred calves.

Key Words: Crossbreeding, Calf, Growth

88 Effect of feeding fatty acids to prepubertal heifers on first lactation milk production. J. M. Smith*[1] and M. E. Van Amburgh[2], [1]*University of Vermont,* [2]*Cornell University.*

We previously observed a reduction in pubertal mammary DNA content in Holstein heifers that had been fed a Ca salt of CLA. In this study, first lactation milk yields and components were compared among Holstein cattle that had been fed diets containing either a Ca salt of CLA (CaCLA), a Ca salt of palm fatty acids (CaPalm), sunflower oil (SUN), or no supplemental fatty acids (control; CTRL) between weaning and puberty. Treatments were randomly assigned to pens of 10 heifers as they were weaned. There were two replicate pens per treatment. Treatment diets began at about 3 mo of age. Heifers were limit-fed total mixed rations (TMR) composed of haylage, corn silage, and concentrate formulated using the Cornell Net Carbohydrate and Protein System to provide 1.01 ME- and 1.07 MP-allowable gain (kg/d). Fatty acid supplemented diets averaged 5% total fat. Heifers were weighed weekly and blood was collected twice weekly if over 250 kg to determine onset of puberty by measuring plasma progesterone. Of the 80 heifers enrolled in the study, 67 were followed through 280 d in milk. Heifers were housed together, milked 3x/d, and given bST per label. Monthly milk samples were analyzed for fat, protein, and urea nitrogen. Daily milk weights were used to calculate actual 280-d production. Means of the data were analyzed by ANOVA. Average daily gains between the start of treatment diets and puberty (0.99 ± 0.03 kg/d), ages at puberty (9.2 ± 1.3 mo) and first calving (22.1 ± 1.9 mo), and hip height (144 ± 3.5 cm) were not different, but body weight (BW) at the start of treatment, puberty, and conception differed ($P = 0.001$, $P = 0.01$, and $P = 0.1$, respectively). The BW at the beginning of the treatment period were 95, 101, 95, and 113 (± 1.7) kg for CTRL, CaCLA, CaPalm, and SUN, respectively. Puberty was attained at 286, 280, 269, and 305 (± 4.0) kg and heifers conceived at 377, 386, 363, and 392 (± 4.6) kg for CTRL, CaCLA, CaPalm, and SUN, respectively. Actual 280-d milk production (10720 kg ± 135), percentages of milk fat (3.6 ± 0.42), protein (2.8 ± 0.20), and urea nitrogen (13.0 ± 1.5 mg/dl) were not different among treatments. Fatty acids supplemented at 1% of ration DM to prepubertal heifers did not affect first lactation milk yield.

Key Words: Heifers, Fatty acids, Milk production

89 Altering protein degradability and solubility on rumen fermentation, blood urea nitrogen, and nitrogen balance in 16-18 month-old heifers. G. I. Zanton* and A. J. Heinrichs, *The Pennsylvania State University.*

The objective of this study was to assess the effects of varying protein fractions, fed in diets containing two forage levels (medium, 72.3% and high, 91.7%), to 16-18 month-old dairy heifers, on rumen fermentation, blood urea nitrogen (BUN), nitrogen (N) and phosphorus (P) balance. Diets were formulated to deliver equal ratios of crude protein to metabolizable energy and arranged in a 2 × 2 factorial with high or low levels of soluble (HSP or LSP) and rumen undegradable protein (HRUP or LRUP). Soluble protein was increased by the inclusion of urea to the appropriate rations, while RUP was increased by the inclusion of fish meal, each to rations in which soybean meal or Soy-Plus comprised the main source of protein concentrate. Treatments were administered in two 4 × 4 Latin squares to eight rumen-cannulated, Holstein heifers over four, 21-d periods (417.6 ± 24.0 kg. initial body weight). When fed in the medium forage diet, there were no treatment effects on mean daily rumen pH or VFA molar proportions ($P > 0.05$). The mean concentration of rumen NH_3 was significantly increased ($P = 0.04$) by HSP, however there were no significant differences in BUN for any treatment. Apparent digestibility of N ($P = 0.02$) and P ($P = 0.05$) was improved by the inclusion of HSP, although organic matter (OM) apparent digestibility was unaltered by treatment. A treatment interaction improved apparent digestibility of N in the HSP and HRUP ration ($P = 0.04$). When fed in a high forage diet, no significant differences were detected in the molar proportions of VFA, NH_3, or BUN ($P > 0.05$), while peak NH_3 was highest for HSP and HRUP rations ($P < 0.05$). The highest level of

apparent N and OM digestibility occurred with the diet that contained the HSP and HRUP, leading to a significant interaction between SP and RUP (P = 0.05), while P was apparently more digestible for HRUP (P = 0.02). Diets that are balanced to contain high SP and RUP appear to improve the apparent N digestibility when fed to 16-18 month-old Holstein heifers in both medium and high forage diets.

Key Words: Protein, Heifers, N digestibility

Ruminant Nutrition: Growing cattle

90 Influence of energy source and RDP on intake and digestion in beef steers fed grass hay based diets.

T. A. Baumann*, G. P. Lardy, J. S. Caton, W. W. Dvorak, and V. L. Anderson, *North Dakota State University, Fargo ND.*

A 5 x 5 Latin square was used to determine effects of supplemental energy source (ENG; corn vs soyhulls) and rumen degradable protein (RDP) addition on intake and digestion in steers fed grass hay. Steers (686.2 ± 51.4 kg BW) were housed in individual pens during each 14 d adaptation period and individual stalls during each 7 d collection period. Treatments were arranged as a 2 x 2 factorial plus one and consisted of control (CON; grass hay, 7% CP); grass hay plus 0.4% BW soyhulls (SH; 13.5% CP); grass hay plus 0.4% BW SH and 0.15% BW sunflower meal (35% CP); grass hay plus 0.4% BW corn (9.5% CP); and grass hay plus 0.4% BW corn and 0.2% BW sunflower meal. Diets supplemented with RDP were formulated to have a 0 RDP balance with the NRC model. Preplanned contrasts included main effects of ENG and RDP, ENG x RDP interaction, and CON vs supplemented (SUP) treatments. Supplementation increased total DMI compared to CON (1.67 vs 1.45% BW; $P < 0.001$), but forage DMI was greater ($P < 0.001$) for CON compared to SUP (1.45 vs 1.25% BW). Addition of RDP to SH increased ($P = 0.02$) forage DMI, while addition to corn decreased ($P = 0.02$) forage DMI. No time x treatment interaction was present for ruminal pH ($P = 0.79$). Ruminal pH was higher ($P < 0.001$) for CON vs SUP (6.69 vs 6.56). There was an ENG x RDP interaction ($P < 0.001$) for ruminal pH; pH increased with RDP addition to SH (6.58 vs 6.63), but decreased with RDP addition to corn (6.60 vs 6.46). Supplementation increased ammonia compared with CON ($P < 0.001$; 0.46 vs 1.46 mM). Likewise, addition of RDP increased ruminal ammonia ($P < 0.001$; 2.46 vs 0.35 mM). Total tract DM digestibility (TTDMD) was higher ($P = 0.01$) for SUP compared to CON (55.4 vs 50.7%). Addition of RDP to SH decreased TTDMD ($P = 0.04$; 57.86 vs 55.11%), while RDP addition to corn increased DM digestion ($P = 0.04$; 52.56 vs 56.14%). An ENG x RDP interaction occurred ($P = 0.03$) for total tract NDF disappearance that was similar to DMD. Rates of in situ DM disappearance were not different ($P = 0.34$). For moderate quality forages, intake and digestion appear to respond differently to RDP addition depending on energy source. Additional research is needed to determine RDP level and responses in diets using SH as the supplemental energy source.

Key Words: Soybean hulls, Protein supplementation, Digestion

91 Protein utilization of pearl millet grain supplements by growing steers.

G. M. Hill*[1], W. W. Hanna[2], A. C. Coy[1], B. C. Hand[1], W. B. Forlow[1], and B. G. Mullinix, Jr.[1], [1]*University of Georgia, Tifton, GA/USA,* [2]*USDA-ARS, Tifton, GA/USA.*

Bermudagrass hay (H; 'Tifton 85') was fed with supplement treatments (TRT) to steers to determine effects of corn-soybean meal or hybrid pearl millet grain (PM; 'TifGrain 102') on post-weaning transition performance and protein utilization. Supplements (SUP) contained rolled corn, soybean meal, PM (90.9% DM, 15.2% CP; finely ground), and vitamin/mineral premix, respectively (%): SCS = 87.8, 10.0, 0.0, 2.2; SPM = 0.0, 0.0, 97.8, 2.2. The DM, CP, and TDN (% DM), respectively, of SUP were: SCS = 88.0, 15.3, 84.5; SPM=88.8, 15.2, 82.5. Each SUP had salt (0.75%), $CaCO_3$ (0.75%), and provided premix vitamins A, D and E (24,000, 8,000, and 400 IU/d, respectively), lasalocid (150 mg/d) and Se (2.0 mg/d). Steers were randomly assigned to TRT, and initial (IBW) and final BW were means of two daily unshrunk weights. Steers (n = 42; 3 pens of 7 steers/TRT; age 11 mo; BW 310.6 ± 33.8 kg) of British (BR), Charolais × BR, Brahman × BR breeding were fed each SUP (1.945 kg DM/d) with free-choice H (91.5% DM; 10.3% CP) in a feedlot. Steer performance was unaffected (P > 0.10) by TRT (Table). Plasma urea nitrogen (PUN, mg/100ml; 4 steers/pen), plasma amino acids (PAA) and total essential amino acids (TEAA, umol/100ml; 3 steers/pen) were determined at 4h and 8h after SUP feeding. Both PUN and PAA were unaffected ($P > 0.10$) by sampling time and TRT × time interactions. Similar performance, higher PUN, and similar PAA for SPM indicate that PM was comparable to corn-soybean meal as a SUP for transition steers fed hay as the basal diet.

	Steer	performance	(34-d)	
Item	SCS	SPM	SE	$P <$
IBW, kg	309	311	7.37	ns
ADG, kg	0.95	0.96	0.08	ns
DMI, kg	7.40	7.33	0.22	ns
DM/gain	7.90	7.68	0.71	ns
Plasma	PUN and	PAA	(D 28)	
Item	SCS	SPM	SE	$P <$
PUN	3.54	5.92	0.26	0.01
LYS	17.31	16.65	0.71	ns
MET	6.24	5.20	0.45	ns
THR	21.75	19.24	0.96	ns
TEAA	218.1	215.67	4.91	ns

Key Words: Steer, Millet, Hay

92 Use of rice mill feed and soyhulls in backgrounding diets for beef calves.

W. N. Stacey* and D. L. Rankins, Jr., *Auburn University.*

Rice mill feed compared favorably with broiler litter for producing economical gains when blended with corn and fed to stocker calves. Two trials were conducted to evaluate the use of soyhulls in broiler litter and rice mill feed (RMF)-based diets. Trial 1. Forty continental cross steers (initial BW = 257 kg) were fed one of four diets over a 112-day period (five steers/pen; two pens/diet). On a dry matter basis, diets were as follows: 1) 47% broiler litter:53% soyhulls, 2) 70% RMF:30% soyhulls, 3) 60% RMF:40% soyhulls and 4) 50% RMF:50% soyhulls.All diets were fed free-choice, and bermudagrass hay also was offered free-choice. Daily gains were higher (P<.05) for diet 4 than for the other 3 diets (1.1, 1.0, 1.2 and 1.5 kg/d, respectively). Trial 2. Sixteen Angus x Charolais steers (initial BW = 292 kg) were fed the same four diets while housed in individual metabolism stalls for a 10-day period. Nutrient digestibilities for the four diets were determined. Daily dry matter intake was lower (P<.01) for diet 1 (5.0 kg/d) than for diets 2, 3 and 4 (7.8, 7.9 and 7.9 kg/d, respectively). Nutrient digestibilities for the four diets were as follows: DM; 72.8, 64.2, 73.2, 69.2, OM; 74.3, 67.8, 75.6, 71.0, CP; 73.0, 72.6, 81.6, 70.8, NDF; 71.7, 55.8, 66.6, 63.6 and ADF; 66.2, 51.3, 62.0, 63.6. Digestibilities for DM, OM and ADF did not differ among diets (P.>10). However, CP digestibility was greatest (P<.10) for diet 3 and NDF digestibility was lowest (P<.10) for diet 2. Soyhulls can be blended with rice mill feed to produce acceptable backgrounding diets for growing beef calves.

Key Words: Beef cattle, Rice mill feed, Soyhulls

93 Effects of supplementing corn or soybean hulls to steers consuming bermudagrass hay on intake and apparent nutrient digestibilities.

A. I. Orr*, B. J. Rude, D. G. St. Louis, and V. T. Nguyen, *Mississippi State University, Starkville.*

Effects of supplementing bermudagrass hay with corn or soybean hulls (SBH) on nutrient digestibility was evaluated using six crossbred steers (initial BW 182 ± 24.8 kg) fitted with rumen cannulae. Steers were placed in a latin rectangle arrangement and allowed ad libitum access to bermudagrass hay and assigned to one of three treatments: no supplement; supplemented with SBH; or supplemented with corn. Corn and SBH were fed to provide 161% of the maintenance energy requirement. In addition, soybean meal was added to the ration to meet National Research Council protein requirements because of the increased energy intake due to supplementation. For each of the three periods, steers were acclimated to their respective treatments for 14 days; after which, they were placed into individual stalls for 14 days. Steers were given