M155 A partial budget for change in milking frequency and cow numbers with constrained parlor use. B. Carr[1], M. McGilliard*[1], W. White[1], G. Bethard[2], and R. Pearson[1], [1]*Virginia Polytechnic Institute and State University*, *Blacksburg*, [2]*G&R Dairy Consulting, Inc.*, *Wytheville, VA*.

A computer spreadsheet was developed to determine the economic advantage of changing cow numbers and milking frequency while maintaining constant hours of parlor use. Input characteristics of the farm included number of milking stalls, employees, and hours of operation for each parlor. Cows in milk were described by number of groups of different sizes, milk yield, body weight, parlor turns per hour, and milking frequency per day. Economic parameters included prices for milk, feed, parlor labor, milking supplies, replacement cows, cull cows, dry cow care, and other marginal costs per cow. Investment costs were included for additional housing facilities and cows purchased for expansion, amortized over 5 and 3 yr (1/cull rate) respectively. A base herd situation can be entered and changes made to it, mostly in terms of number and sizes of cow groups, milking frequency, parlor throughput, and expected milk yield of each group. Scenarios were compared by expected change in net operating income, adjusted for amortized change in capital investment for cows and additional facilities. Expansion costs included cows, housing facilities (priced per cow), and a complement of dry cows. An example herd of 1200 cows in milk, grouped in 5 groups of 240 cows each, was milked twice daily with 4 turns/h in a D-20 parlor in 15 h. To evaluate the consequences of partial 3x milking, one group was reduced to 200 cows (to maintain 15 h/d parlor use) and milked three times daily (+10% milk) with 5 turns/h. Annual milk income decreased by $77,000 while operating expenses decreased by $50,000, replacement cost decreased by $20,000, and amortized cow sales increased by $32,000, for an annual increase of $25,000 in net cash income. Results were particularly sensitive to estimates of milk response and parlor turns per hour from an increase in milking frequency, and were sensitive to cow prices when herd size changed.

Key Words: Management, Milking Frequency, Parlor Throughput

Ruminant Nutrition: Beef Cattle

M156 Effects of replacing corn grain and urea with condensed corn distillers solubles in diets for finishing steers. D. Pingel* and A. Trenkle, *Iowa State University*, *Ames*.

Corn distillers solubles (CDS) a co-product from the dry mill corn ethanol plants is often available at a low cost. Two experiments were conducted to evaluate CDS when fed to finishing steers replacing a portion of the corn and urea. In Exp I, 96 steers (Angus and Charolais crossbred, 386 kg) were stratified by weight and randomly allotted to 16 pens. The steers were fed dry rolled corn and 5% silage and 5% hay with 0%, 4%, 8%, and 12% CDS (DM basis) for 109 d. Daily feed, gain and feed/gain were 9.1, 9.6, 9.7, and 9.4 (kg/d); 1.75, 1.78, 1.75, and 1.79 (kg/d); 5.21, 5.40, 5.51, and 5.27; for 0, 4, 8, and 12% CDS respectively, and were not statistically different (P>0.05). Carcass traits were not statically different (P>0.05). In Exp II ten beef steers were used in two simultaneous 5x5 Latin squares to evaluate replacing dry rolled corn and urea with 4 and 8% CDS, or 10 and 20% wet corn distillers grain with solubles (WDGS). The steers were placed in digestion crates for total collection of feces and urine during a 5 d period following 14 d of diet adaptation. Dry matter intake, DM digestibility, NDF digestibility, and ADF digestibility were 7.99, 8.73, 8.62 and 8.41, 7.96 (kg/d); 79, 78, 76 and 77, 76%; 53, 52, 44 and 52, 55%; 41, 44, 34, and 48, 48%; for 0, 4 and 8% CDS, and 10 and 20% WDGS, respectively. Replacing corn and urea with distillers co-products did not affect digestibility of the corn-based finishing diet (P>0.05). The results of these studies suggest that corn distillers solubles can replace a portion of the diet in finishing beef steers without affecting digestion, performance or carcass value.

Key Words: Cattle, Distiller's Co-products, Digestibility

M157 Effect of clinoptilolite zeolite on cattle performance and manure nitrogen. D. Sherwood*, G. Erickson, T. Klopfenstein, and D. Schulte, *University of Nebraska*, *Lincoln*.

Zeolite clay may be effective in reducing N losses from feedlots. A summer feedlot trial was conducted from May to September using 96 crossbred yearling steers (382 ± 7 kg) to evaluate effects of adding clinoptilolite zeolite at 1.2% of the diet on steer performance and N removed in manure. Steers were stratified by weight and assigned randomly to 12 pens and one of two treatments. Treatments were 1) control diet with 0% zeolite clay (CON) or 2) treatment diet with 1.2% clinoptilolite zeolite clay (CZ). Diets consisted of 62.5% dry rolled corn, 25% wet corn gluten feed, 7.5% alfalfa hay and 5% supplement. Nitrogen intake was calculated using analyzed dietary N concentration for each feedstuff and total DMI. Individual steer N retention was calculated using the NRC (1996) net protein and net energy equations. Nitrogen excretion was determined by the difference between N intake and individual steer N retention. Manure N was calculated from the weight of manure hauled and N composition. The percent N recovered was calculated by dividing manure by excreted N. Ammonia emissions were measured weekly during the last six weeks of the feeding period using wind tunnels and an acid trap for 30 minutes in each pen. There were no statistical differences in steer performance between CON and CZ. There was no difference (P=0.61) in ADG between the CON and CZ steers (1.82 vs. 1.79 kg). Gain to feed was not significant (P=0.33) with the CON and CZ steers at 0.145 and 0.138. Nitrogen in manure was not affected (P=0.62) by treatment with 18.2% recovered for CON and 17.2% recovered for CZ. Ammonia emissions were not different (P=0.58) between the CON and CZ pen treatments (53.7 and 59.3 g/hd/d). This trial indicates that feeding clinoptilolite zeolite does not have a negative effect on steer performance. However, N recovery in manure and ammonia emissions was not affected by feeding clinoptilolite zeolite.

Key Words: Cattle, Nitrogen, Emissions

M158 Variation in digestibility of undegradable intake protein among feedstuffs. J. MacDonald*, T. Klopfenstein, and G. Erickson, *University of Nebraska*, *Lincoln*.

Two ruminally and duodenally cannulated steers fed smooth bromegrass hay (IVDMD=58.4%) were used in a mobile bag analysis to determine undegradable intake protein (UIP), total tract indigestible protein (TTIDP) and UIP digestibility (UIPDIG) values for ingredients used in four growing trials. Three of the trials were grazing studies in which at least two ruminally cannulated heifers were used to collect diet samples of the grazed forage throughout the grazing season. Animals on these studies rotationally grazed smooth bromegrass pastures. Diet samples were collected at two times for trial 1 (T1), three times for trial 2 (T2) and eight times for trial 3 (T3). Other samples used in this analysis were: a commercially available methionine source (MET), corn cobs (COB), bloodmeal (BM), corn gluten meal (CGM), SoyPass® (SP), feathermeal (FM), two sources of dry distillers grains (DDGA and DDGB), sorghum silage (SS) and corn bran ruminally incubated for 21 or 30 hours (Bran21 and Bran30). Other samples were ruminally incubated for 16 hours except for forage samples (COB, SS, and grazed diet samples) which were ruminally incubated for 75% of their mean retention time (20 to 30 hours) as determined by their IVDMD. The UIP (% CP) content for grazed diet samples tended to be different (P=0.07) for samples collected in T1 (18.8 vs. 13.9 ± 1.00), increased quadratically (P=0.02) with time in T2 (8.10, 19.2, and 17.5 ± 1.11) and were not different across time (P=0.17) in T3 (mean=10.7 ± 0.94). The TTIDP (%CP) content of grazed diet samples were different (P=0.04) in T1 (9.05 vs. 6.02 ± 0.81) increased linearly with time (P=0.01) from 3.30 to 10.2 ± 0.94 in T2, and increased linearly with time (P<0.01) from 4.65 to 6.80 ± 0.65 in T3. The UIPDIG (%UIP) did not change with time in any of the three trials (P>0.18) and averaged 51.7 ± 1.82, 49.2 ± 5.40, and 45.1 ± 4.75 for T1, T2, and T3, respectively.

Results for other samples are in table 1. There is large variation in UIPDIG that should be considered when calculating metabolizable protein balances.

Table 1. Protein Digistibility Values for Selected Feedstuffs

Sample	CP (%DM)	UIP (%CP)	TTIDP (%CP)	UIPDIG (%UIP)
MET	47.4	101[a]	34.5[a]	65.9[a]
COB	3.78	91.1[b]	44.1[b]	51.6[b]
BM	84.7	89.5[b]	11.8[cd]	89.6[c]
CGM	70.1	69.7[c]	3.55[e]	94.9[c]
SP	49.7	65.3[d]	2.20[e]	96.6[c]
FM	85.8	60.4[e]	16.4[d]	72.9[d]
DDGA	29.7	55.7[f]	5.52[ef]	90.0[c]
DDGB	31.0	51.3[f]	5.70[ef]	88.9[c]
SS	8.89	19.9[g]	12.6[cd]	36.3[e]
Bran21	14.4	18.6[g]	12.7[cd]	31.3[e]
Bran30	14.4	16.6[g]	10.6[cf]	35.4[e]
SE	—	1.98	1.84	3.38

[abcdefg]Superscripts within column differ (P<0.05).

Key Words: Undegradable Intake Protein, Digestibility, Metabolizable Protein

M159 Starch digestion by feedlot cattle: Predictions from analysis of feed and feces for N and starch. R. Zinn*, L. Corona, F. Owens, and R. Ware, *University of California*, *El Centro*.

Data from 32 metabolism trials involving 147 steers and 639 individual starch digestibility measurements were compiled to evaluate the utility of N as a digestion marker to predict total tract starch digestion. All trials were conducted at the University of California Desert Research and Extension Center. Starch digestibility was determined using chromic oxide as an indigestible marker. Animal observations consisted of 10-d for diet adjustment followed by 4-d for collection. During collection, fecal samples (approximately 200 g wet basis) were taken twice daily. Samples from each steer and within each collection period were composited for analysis. Diets contained 46.5 ± 7.4% starch and 1.85 ± 0.20% N. Dietary N concentration explained 14.5% of the variation (P < 0.0001) in apparently digestible N as a percentage of N intake (averaging 67.7%), and 72% of the variation (P < 0.0001) in apparently digestible N as a percentage of diet DM (averaging 1.26%). For calculation purposes, total tract N digestion was estimated using the equation of Holter and Reid (1959; digN, % diet DM = 0.929 diet N, % - 0.5568). Fecal starch concentration (FS, %) alone explained 94.7% of the variation (P < 0.0001) in total tract starch digestibility (TSD, %): TSD = 100.5 - 0.651 FS. Total tract starch digestion (ETSDN, %) was calculated from dietary N (DN, %), fecal N (FN, %), dietary starch (DS, %), and FS as follows: ETSDN =100*(DS - (((DN - ((0.929*DN) - .00557))/FN)*FS))/DS. These values explained 97.1% of the variation in TSD (TSD = 1.029 ETSDN - 2.59, P < 0.0001). Omitting cases where TSD was less than 95% so that data was restricted to steam flaked grain, FS explained 82.0% of the variation (P < 0.0001) in TSD (TSD = 99.9 - 0.463 FS) whereas ETSDN explained 91.8% of the variation (P < 0.0001) in TSD. Based simply on dietary and fecal concentrations of starch and N, starch digestibility was reliably determined. This procedure can markedly simplify field measurements of total tract starch digestion to assess grain quality and efficacy of processing (e.g., steam flaking; silage processing).

Key Words: Starch, Digestion, Cattle

M160 Influence of corn vitreousness and processing on site and extent of digestion by feedlot cattle. L. Corona* and R. Zinn, *University of California*, *El Centro*.

Eight cannulated Holstein steers (251 kg) were used in a split plot design involving two 4 x 4 Latin squares to test effects of processing method [dry rolled (DR) vs steam flaked (SF); main plot], and vitreousness (V, %; sub-plot) of yellow dent corn (V55, V61, V63 and V65) on site of digestion of diets containing 73.2% grain. No V by processing method interactions on ruminal digestion were detected, but ruminal starch digestion was less (14.4%, P < 0.01) while ADF digestion was greater (77%, P < 0.05) for DR than SF. Interactions (P < 0.10) between V and processing method on post-ruminal and total tract digestion were detected. Post-ruminal digestion of OM and starch digestion was greater for the least vitreous DR (V55) sample but no impact of V on digestion was detected with SF corn. Averaged across V, post-ruminal digestion of OM (25.7%, P < 0.05) starch (94.3%, P < 0.10) and N (10.7%, P < 0.01) were greater for SF than for DR corn. Steam flaking increased total tract digestion of OM (11%, P < 0.05), starch (16%, P < 0.01), N (8.4%, P < 0.05), and energy (13.8%, P < 0.05), but decreased total tract ADF digestion (26.7%, P < 0.01). With DR, total tract starch digestion was lower for V65 than for V55 (6.2%) and V63 (5.6%). With SF, total tract starch digestion was not affect by V. Fecal starch (FS) and total tract starch digestion were inversely related (starch digestion, % = 101 - 0.65 FS; $r^2 = 0.94$, P < 0.01). Ruminal pH was greater for steers fed DR than for steers fed SF (7.3%, P < 0.05). Steam flaking decreased (P < 0.01) the acetate:propionate ratio (55%), and estimated methane production (37.5%). Differences in corn vitreousness can impact site of digestion of corn components, but the impact of vitreousness was minimized or even reversed when corn was flaked.

Key Words: Corn, Vitreous, Digestion

M161 Corn or soybean hull incorporation into haylage-based backgrounding diets; effect on growth and efficiency during the backgrounding and finishing phases. M. Ko*, C. J. Mader, and K. C. Swanson, *University of Guelph*, *Guelph, Ontario, Canada.*

This experiment was conducted to evaluate the effects of corn or soybean hull incorporation into haylage-based diets on backgrounding calf performance and subsequent feedlot performance. Cross-bred steers (n=48, initial BW=302.5±3.4 kg) were individually fed for ad libitum intake using Calan gates. Dietary treatments included: 1) haylage (17.4% CP, DM basis; control), 2) haylage+20% (DM basis) cracked corn (CC), and 3) haylage+20% (DM basis) soybean hulls (SBH) during a 112-d backgrounding phase. Feed refusals were collected weekly and BW were recorded every 28 d throughout the experiment. During the backgrounding phase, blood samples were obtained every 28 d and analysed for plasma urea nitrogen (PUN). After the backgrounding phase, all steers were adapted to a common high moisture corn-based finishing diet. Steers were slaughtered when ultrasound estimated backfat thickness reached 7 mm. Means were compared using contrast statements (conrtol vs. CC+SBH, CC vs. SBH). During the backgrounding phase, steers fed CC or SBH had greater (P<0.01) average daily gain (ADG), dry matter intake (DMI) and gain:feed (G:F) as compared to controls (0.96, 0.91 vs. 0.55 kg/d; 7.02, 6.95 vs. 6.14 kg/d; 0.13, 0.13 vs. 0.08, respectively). Steers fed CC or SBH had lower (P<0.01) PUN concentration as compared to controls (12.8, 12.8 vs. 13.7 g/dl). ADG, DMI and G:F did not differ between steers fed CC or SBH. During the finishing phase, steers fed SBH had lower (P<0.07) ADG and finished BW than steers fed CC (1.59 vs. 1.76 kg/d; 617.9 vs. 648.7 kg). DMI (10.9 kg/d), G:F (0.16) and days required to finish (139 d) did not differ between steers fed CC or SBH. Including CC or SBH at 20% of the diet in haylage-based backgrounding diets improved growth performance suggesting that either CC or SBH could be included to improve growth and efficiency. However, when finished on a common high-concentrate diet, steers previously fed CC had greater ADG than those fed SBH suggesting that source of supplemental energy during the backgrounding phase may influence subsequent feedlot performance.

Key Words: Beef Cattle, Growth Performance, Energy Supplementation

M162 Withdrawn.