569 Optimizing barley grain feeding and processing for post-modern dairy cows. A. Nikkhah*, *University of Zanjan, Zanjan, Iran.*

Optimum dietary barley grain (BG) use and processing leads our efforts in improving starch utilization. Grinding is considered a risk to diet palatability and healthy rumen while is steam-processing rationalized to reduce BG fermentation rate and the risk of subacute rumen acidosis. The main objective of the first study was to determine effects of feeding either (1) finely ground, (2) steam-rolled, (3) finely dry-rolled, or (4) coarsely dry-rolled BG on rumen fermentation, digestibility and milk production. Eight multiparous Holsteins (85 ± 15 d in milk) were used in a replicated 4 × 4 Latin square design with 4 periods of 21-d. Diets contained 256 g BG/kg DM. Processing did not affect milk yield (28 kg/d) and composition, DMI (23.5 kg/d), rumen pH and volatile fatty acids (VFA), fecal and urine pH, and nutrient digestibility. Results established that finely ground BG was no different than dry-rolled and steam-rolled BG in stimulating DMI and productivity. The objective of another study was to compare grinding vs. steam-rolling of BG at 30% vs. 35% of diet DM on DMI, chewing time, rumen fermentation, and milk production. Eight multiparous Holstein cows (85 ± 9 d in milk) were used in a replicated 4 × 4 Latin square design with 4 21-d periods. Treatments included ground (GB) or steam-rolled (SB) BG fed at either 35% or 30% of diet DM. Diets were prepared as a mixed ration and fed twice daily at 0730 and 1600 h. Neither processing method nor dietary BG% affected DMI, daily eating, ruminating and chewing times, rumen pH and major VFA molar %, or milk % and yields of fat and protein. Energy-corrected milk yield increased for SB compared with GB at 35% (37.5 vs. 35 kg/d, $P < 0.05$) but not at 30% BG (37.8 vs. 37.3 kg/d). Feed efficiency was increased by SB vs. GB (1.54 vs. 1.46, $P < 0.01$), but was unaffected by dietary BG %. Therefore, at 30% grain, GB resulted in similar productivity as SB, and that SB did not affect productivity when BG rose from 30% to 35%. Regardless of BG level, GB vs. SB effectively maintained DMI (24.9 vs. 24.4 kg/d) and rumen pH (5.71 vs. 5.72) at 4 h post-feeding. Increasing dietary BG starch did not improve DMI and productivity.

Key words: barley, inclusion rate, processing

570 Potassium reduces the accumulation of trans-10, cis-12 conjugated linoleic acid and trans-18:1 in continuous cultures of mixed ruminal microorganisms regardless of dietary fat level. T. C. Jenkins*[1], E. Block[2], and P. H. Morris[1], *[1]Clemson University, Clemson, SC, [2]Arm & Hammer Animal Nutrition, Princeton, NJ.*

Previous studies demonstrated that K addition to continuous cultures of ruminal microorganisms caused shifts in conjugated linoleic acid (CLA) production that based on the biohydrogenation theory of milk fat depression, explained reports of increased fat percentages in milk of lactating dairy cattle fed potassium carbonate. This study was done to determine if level of dietary fat affected K effects on biohydrogenation pathways. Six dual-flow continuous fermenters were fed 60 g/d of 1:1 forage (10% alfalfa hay and 90% corn silage) to concentrate mix in 2 equal portions at 0800 and 1600 h. The study was done as a randomized block design consisting of 4 blocks (4 10 d periods) and 6 treatments arranged in a 2 × 3 factorial to examine 2 levels of soybean oil (0 and 4%, designated 0F and 4F) and 3 levels of added K (0, 1.5, and 3%). Culture pH was adjusted daily to maintain pH values above 6. Potassium was injected just before each feeding using a 10% (w/w) stock potassium carbonate solution to provide the equivalent of 0.9 (K1.5), and 1.8 (K3) g added K/d. Culture pH over the last 5 d of each period was held between 6.0 and 6.3 for all treatments. Addition of K to the cultures decreased ($P < 0.05$) propionate and increased ($P < 0.05$) acetate and acetate/propionate for 0F but K had no effect on volatile fatty acids for 4F. Adding K to the cultures had no effect on daily losses of unsaturated fatty acids from the cultures. Addition of K increased ($P < 0.05$) stearic acid and cis-9, trans-11 CLA but decreased ($P < 0.05$) daily production of trans-C18:1 and trans-10, cis-12 CLA biohydrogenation intermediates. This study showed that K addition to cultures of mixed ruminal microorganisms, regardless of dietary fat level, decreased production of trans-C18:1 and trans-10, cis-12 CLA that have been linked to milk fat depression.

Key words: potassium, conjugated linoleic acid, continuous culture

571 Metabolic effects of feeding supplemental tallow to lactating Nili-Ravi buffalo. H. Nawaz[1], M. Yaqoob*[2], J. I. Sultan[1], M. Sarwar[1], and M. Younas[2], *[1]Institute of Animal Nutrition and Feed Technology, University of Agriculture, Faisalabad, Pakistan, Faisalabad, Punjab, Pakistan, [2]Faculty of Animal Husbandry, Dept. Livestock Management, University of Agriculture, Faisalabad, Pakistan, Faisalabad, Punjab, Pakistan.*

Four early lactating Nili-Ravi buffaloes were fed 4 experimental diets containing 0, 2, 4 and 6% tallow in an experiment conducted in a 4 × 4 Latin Square design to study the effect of feeding different levels of tallow on nutrient intake, digestibility, rumen fermentation and blood metabolites. The intakes of DM, OM, CP, ADF and NDF decreased ($P < 0.01$) but intakes of EE ($P < 0.01$) increased with increasing level of tallow in the diets. The intakes of NEL and DE did not decrease with the reduction of DM intake. Digestibility of DM, OM, ADF and NDF improved in buffaloes fed diets containing 2 and 4% tallow but beyond 4% it tended to decline significantly. Digestion coefficients of CP did not differ, while that of EE improved ($P < 0.01$) from 68.2 to 74.5%. Rumen pH did not differ significantly ($P > 0.05$) but acetate content decreased significantly ($P < 0.01$) as the level of dietary tallow increased, whereas, propionate molar percentages increased ($P < 0.01$) with increasing level of tallow in the diets. However, butyrate contents were not statistically different among different treatment groups. Acetate to propionate ratio decreased linearly ($P < 0.05$) with increasing level of tallow in the diets. Blood pH and concentration of glucose did not vary significantly but cholesterol, triglycerides and total lipids increased ($P < 0.01$) as the level of tallow increased in the diets. These results suggest that tallow up to 4% of diet dry matter is a suitable fat supplement as an energy source for lactating Pakistani Nili-Ravi buffaloes.

Key words: tallow levels, nutrient intake, digestibility, rumen fermentation, blood metabolites

572 Use of a mechanistic, dynamic model of metabolism to investigate the biological basis for variation in genetics of feed conversion efficiency in lactating dairy cattle. J. Onken[1], G. Hobgood[2], S. L. Sheilds*[1], and J. P. McNamara[1], *[1]Washington State University, Pullman, [2]North Carolina State University, Raleigh.*

In dairy cattle, efficiency of feed use must take into account metabolic flux in body tissues, primarily in visceral, muscle, and adipose tissues. These processes are affected by genotype, phenotype, and intake, and are under control of hormonal and neural systems. In continued work

with the objective of identifying the patterns of metabolic flux in the most efficient dairy cattle, an existing mechanistic metabolic model (Molly, UC Davis) was used, which explicitly includes elements of genetics, including metabolic interactions in the viscera and body. Data were collected from 2nd to 4th parity cows (n = 80) in the first 3 to 4 mo postpartum, from studies that measured nutrient intake, milk component output, changes in adipose tissue lipid, visceral and body protein and lipid, and metabolism rates and gene expression in adipose tissue. Explicit inputs into the model included nutrient intake, initial body fat and protein, milk production, fat, and protein output. Body fat, body protein and visceral protein all varied ($P < 0.05$) in daily flux and overall change in direct relation to their milk productive efficiency. Intake energy ranged from 89 to 139 Mcal/d; maintenance energy ranged from 20 to 42 Mcal/d and milk energy secretion ranged from 19 to 34 Mcal/d. Efficiency of milk synthesis varied in a narrow range (81 to 84%), while visceral energy use averaged 37% of intake energy (range 33 to 46%) and 68% of maintenance energy (range 63 to 73%). The variation in maintenance energy accounted for 37.6% of the variation in milk energy efficiency (milk energy/absorbed energy). Expression of several genes coding for metabolic enzymes in adipose tissue were also related to efficiency of milk production. The model identified visceral energy and body energy (muscle protein turnover) ($P < 0.05$) as the 2 major contributors to variation in milk production efficiency. Using a systems model at the metabolic level will increase understanding of the reasons for inefficiency and speed improvement of milk productive efficiency.

Key words: lactation, feed efficiency, systems model

573 Ruminal Mg transport and assessment of Mg intake in dairy cows: Two sides of one coin. H. Martens* and F. Stumpff, *Dept. of Veterinary Physiology/Freie Universitaet Berlin, Berlin-Germany.*

The objective of this compilation of published data was to combine knowledge about Mg transport mechanisms in the rumen with a recent meta-analysis about Mg absorption for a better understanding of Mg absorption in vivo and prediction of Mg intake in lactating cows for the daily requirement. Ruminal Mg absorption is mediated by 2 apical uptake mechanisms: A potential-dependent or K-sensitive (K-s) and a potential-independent or K-insensitive (K-ins) mechanism. The K-s mechanism is suggested to work at low and the K-ins one at high Mg concentrations. The negative effect of K on Mg absorption should be high at low Mg (uptake via K-s) and low at high Mg intake (uptake via K-ins). This suggestion was confirmed in a model study with sheep (Ram et al., J. Dairy Sci. 1997 [81]: 2485–2492). In a recent meta-analysis of Mg absorption in dairy cows Schonewille et al. (J. Dairy Sci. 2008 [91]: 271–278) demonstrated that the true Mg absorption depends on Mg intake and K concentration: True Mg absorption (g/d) = 3.6(g/d) + 0.2 x Mg intake(g/d) – 0.08(kg/d) x K(g/kg DM)[1]. An endogenous Mg secretion of 2.8 g/d has to be subtracted to yield the apparent Mg absorption (g/d) = 3.6(g/d) - 2.8(g/d) + 0.2 x Mg intake (g/d) – 0.08(kg/d) x K (g/kg DM)[2]. This equation clearly shows that the effect of K on Mg digestibility is high at low Mg intake and vice versa: Apparent Mg absorption and digestibility is 3 g/d and 20% at Mg intake of 15 g/d and a K content of 10/kg. An increase of K content to 40 g/kg reduces apparent Mg absorption and digestibility to 0.6 g/d and 4%, respectively. At Mg intake of 60 g/d the effect of K (40/kg) is much less pronounced and reduces apparent Mg absorption and digestibility from 12 g/d and 20% to 9.6 g/d and 16%, respectively. In lactating cows, apparent Mg absorption has to cover both the secretion in milk (M l/d x 0.12 g/l) and endogenous secretion (2.8 g/d). Entry of these values into equation [2] yields Mg intake (g/d) = M (l/d) x 0.6 (g/l) + 0.4(kg/d) x K (g/kg DM) + 10 (g/d)[3]. Equation [3] permits the quantitative calculation of Mg intake according requirement and dietary K concentration.

Key words: magnesium, dairy cow, rumen

574 Effects of direct-fed microbes and their combinations with yeast culture on in vitro rumen fermentation characteristics. S. P. Doto* and J. X. Liu, *Institute of Dairy Science, College of Animal Sciences, Zhejiang University, Hangzhou, P.R. China.*

This experiment was conducted to determine the effects of different doses of *Bacillus licheniformis* (Bl) and *Clostridium butyricum* (Cb) (Zhejiang Future, Hangzhou, China) and their combinations with yeast culture, Diamond V Mills, Inc., Iowa, USA) on in vitro rumen fermentation characteristics. A 2-way factorial design was employed involving Bl or Cb at 0, 0.5, 1, 5 and 10 mg and yeast culture at 0, 18, 27, 36 and 60 mg per 200 mg substrate, respectively. The in vitro gas test based on syringes was conducted and gas volume was recorded at 2, 4, 6, 9, 12, 24, 36, 48 and 72 h incubation. The 24 h gas value was used to estimate the in vitro organic matter digestibility (IVOMD). Effects on pH, VFA, ammonia-N, microbial crude protein and populations of solid- and liquid-associated microbes were investigated after 24 h of incubation. The IVOMD was not influenced ($P > 0.05$) by addition with Bl or Cb alone, but was improved ($P < 0.05$) in the 60 mg yeast culture treatment, with the highest ($P < 0.05$) IVOMD observed when Bl or Cb was combined with a high dose of yeast culture, implying that Bl and Cb may have a synergistic effect with yeast culture. Potential gas production or gas production from the insoluble fraction was not influenced significantly ($P > 0.05$) by Bl or Cb alone, but increased ($P < 0.05$) by 60 mg of yeast culture. The rate constant of gas production was not influenced by Bl or Cb, but increased ($P < 0.05$) with inclusion of yeast culture. The pH was influenced by Bl and yeast culture ($P < 0.01$), but not by Cb ($P > 0.05$). However, all the pH values were in normal range. Significant interaction effect ($P < 0.05$) was observed on ammonia-N between Bl or Cb and yeast culture. Total VFA was affected by Bl and yeast culture ($P < 0.01$), but not by Cb ($P > 0.05$). Treatment did not have significant influence ($P > 0.05$) on microbial crude protein yield. Solid-associated microbes were not affected by any treatments, but liquid-associated *R. flavefaciens* populations were significantly influenced ($P < 0.05$) by combination treatment.

Key words: direct-fed microbes, rumen fermentation, yeast culture

575 Effects of grain, fructose and histidine on ruminal pH, fermentation products and histamine in an induced subacute acidosis protocol. H. M. Golder[1,2], P. Celi[1], A. R. Rabiee[1,2], C. Heuer[3], E. Bramley[4], D. W. Miller[4], R. King[5], and I. J. Lean*[1,2], *[1]University of Sydney, Faculty of Veterinary Science, Camden, New South Wales, Australia, [2]SBScibus, Camden, New South Wales, Australia, [3]Massey University, Epicentre, Institute of Veterinary, Animal and Biomedical Sciences, Palmerston North, New Zealand, [4]Murdoch University, School of Veterinary and Biomedical Sciences, Murdoch, Western Australia, Australia, [5]Dairy Australia, Southbank, Victoria, Australia.*

We investigated the effects of grain, fructose and histidine on ruminal pH and fermentation products. Holstein heifers (n = 30) were randomly allocated to 5 treatments; 1. Control (no grain), 2. Grain (1.2% liveweight (LW) rolled triticale)(GR), 3. Grain (0.8% LW) + fructose (0.4% LW)(FR), 4. GR + histidine (6g/head) (HIS) and 5. FR + HIS in an incomplete factorial design. Heifers were fed 1kg of grain daily with ad libitum access to mixed silage and alfalfa hay for 10 d. Feed

was withheld for 14 h before challenge day, on which heifers were fed 200g alfalfa hay, and immediately after their treatment diet. Rumen samples were collected 5 min after diet ingestion, 60 min later and at 3 further 50 min intervals. Samples were analyzed for ruminal pH immediately. Ruminal histamine, volatile fatty acids, ammonia and D- and L-lactate measures were made after storage at −20°C. The main effects and interactions of grain, fructose, histidine and time were examined using a PROC MIXED repeated measures model. Grain significantly reduced ruminal pH (6.70 ± 0.04), compared with control (7.14 ± 0.87) and increased ammonia, acetate, butyrate, propionate and valerate concentrations. The addition of grain had no effect on log-transformed ruminal D- and L-lactate concentrations. Fructose markedly decreased ruminal pH (6.49 ± 0.06), compared with the no fructose groups (6.92 ± 0.06) and markedly increased log-transformed D- and L-lactate concentrations (0.97 ± 0.35 and 0.23 ± 0.43 mM) compared with diets not containing fructose (−2.14 ± 0.35 mM and −2.87 ± 0.43 mM). Fructose increased butyrate and decreased valerate concentrations. While histidine did not have a marked effect on ruminal fermentation or histamine concentrations, the interactions between histidine, grain and fructose was significant ($P < 0.001$). The interactions between grain, fructose and histidine were significant for all ruminal parameters with the exception of log-transformed D- and L-lactate and caproate. This study demonstrates that the substitution of grain for fructose results in decreased ruminal pH and increased lactate concentrations.

Key words: fructose, histidine, subacute acidosis

576 Dry matter intake, ruminal pH and fermentation capacity of rumen fluid in heifers fed temperate pasture, total mixed rations or both. A. Santana*[1], J. Ubilla[1], M. Berrutti[1], T. Konrath[1], M. Aguerre[1], A. Britos[2], C. Cajarville[2], and J. L. Repetto[1], *[1]Facultad de Veterinaria, UdelaR, Depto. Bovinos, Montevideo, Uruguay, [2]Facultad de Veterinaria, UdelaR, Depto. Nutricion, Montevideo, Uruguay.*

The aim of this work was to evaluate dry matter intake, ruminal pH and fermentation capacity of rumen fluid in heifers fed total mixed rations (TMR), pasture as sole fed or a mix of both. Nine individually housed cross-breed heifers (214 ± 18kg BW) provided with permanent ruminal cannulas were fed total mixed rations (TMR), a temperate pasture ad libitum (*Trifolium repens* and *Lolium multiflorum*) (Pa) or TMR for 18h plus 6h of pasture (P6h) in a triplicated 3 × 3 latin-square design. Each experimental period consisted in 10 d of adaptation and 8 d for sampling and DMI when measured. On d 5, ruminal pH was determined hourly during 24 h. Fermentation capacity of ruminal microbiota was estimated through the in vitro gas production of at 12 h, using the inocula of each heifer and 3 different forages as substrates (*Digitaria sanguinalis*, *Medicago sativa*, and a mixture of *Trifolium repens*, and *Lolium multiflorum*). All data were analyzed with Proc Mixed of SAS. DMI of P6h was higher than TMR treatment (7.74 vs 6.37 kg DM/day; $P < 0.05$) and only pasture (7.74 vs 5.45 kg DM/day; $P < 0.01$). Ruminal pH for Pa group was higher than TMR and P6h group ($P < 0.01$). Mean daily pH values for pasture, TMR and P6h were 6.87, 6.51 and 6.46 respectively (SEM = 0.04). No differences on in vitro gas production were observed among groups for any substrate. The combination of pasture with TMR resulted in increased DMI, but not affected fermentation capacity of rumen microbiota.

Key words: feeding management, pasture, total-mixed ration

577 Protein and fertility in lactating dairy cattle: A meta-analysis and meta-regression. I. J. Lean*[1,2], P. Celi[1], J. McNamara[3], H. Raadsma[1], and A. Rabiee[1], *[1]Faculty of Veterinary Science, The University of Sydney, Camden, New South Wales, Australia, [2]SBScibus, Camden, New South Wales, Australia, [3]Department of Animal Sciences, Washington State University, Pullman.*

Treatment designs used to evaluate the effects of dietary intervention on fertility are subject to confounding, because modification of one nutritional input requires a change in at least one other input. Meta-analytical modeling allows an examination of a main intervention for a series of studies, but also an examination of a series of related effects through use of meta-regression. We examined the effects of dietary protein on fertility using this approach. Literature searches and contact with workers in the field produced 23 studies containing 36 comparisons that had fertility data and met the eligibility criteria for meta-analysis of randomized controlled trials providing information on diets used. The search strategy was to identify papers that contained data on prospective, examining the effects of dietary protein, either concentrations or degradability, or the effects of a specific feed ingredient intervention (e.g., fishmeal) on fertility. Data recorded included pregnancy or conception rates (n = 36 trials); milk production (n = 23 trials) and blood urea nitrogen (n = 24 trials). The most commonly reported fertility indicator was conception rate (CR) was used as the measurement of fertility. Details on dietary formulation and diet intake were extracted from papers, as were measures of urea in blood (BUN). Estimated fixed and random effects relative risks showed that risk of conception was lower in cows fed higher protein or more degradable protein diets (Fixed effect (M-H Relative Risk) = 0.91 (95% CI 0.84 to 0.98); $P = 0.040$). This effect was homogenous ($I^2 = 0\%$) and not influenced by difference in BUN, duration of intervention, breed, parity, milk production or type of diets (TMR vs. PMR). Significant associations among protein components of the diet and carbohydrate fractions supported the hypothesized potential for confounding. However, multivariate meta-regression to evaluate the effects of differences in dietary components between the treatment and control groups found that soluble protein eaten (kg) was a significant covariate. This work supports the concept that soluble protein eaten (kg) is a significant contributor to the biological action of protein on fertility.

578 Effect of increasing proportions of energy concentrates on in vitro gas production estimates. A. Britos*[1], J. L. Repetto[2], and C. Cajarville[1], *[1]Departmento de Nutrición Animal, Facultad de Veterinaria, UdelaR, Montevideo, Uruguay, [2]Departmento de Bovinos, Facultad de Veterinaria, UdelaR, Montevideo, Uruguay.*

The aim of the study was to evaluate the effect of energy supplementation of pasture silage on in vitro gas production. Mixtures of pasture silage with soyhulls (SH), corn (C) or barley (B) from 0 to 100% (by 10% steps) were used as substrates. 0.5g of each substrate (n = 31) was weighed in triplicate into 125mL fermentation flasks and 38.5mL of N-free media was added before inoculum addition (10mL). Inoculum was collected from a lactating cow after 15d eating pasture silage. Gas measures were made at 2, 4, 6, 8, 10, 12, 18, 24, 48, 72 and 96h. Data were fitted to a simple exponential model with lag time. Linear (L) and quadratic (Q) regression analysis were performed according to level of each concentrate included and linear equations were compared between concentrates by making dummy variables that combine concentrate*level. Potential gas production (a) of SH (L: $P < 0.001$, $R^2 = 0.953$; Q: $P < 0.001$, $R^2 = 0.873$), C (L: $P < 0.001$, $R^2 = 0.973$; Q: $P < 0.001$, $R^2 = 0.656$) and B (L: $P < 0.001$, $R^2 = 0.965$; Q: $P < 0.001$, $R^2 = 0.714$) increased; while fractional rate of gas production (kd) of SH (L: $P < 0.001$, $R^2 = 0.920$; Q: $P < 0.001$, $R^2 = 0.658$), C (L: $P < 0.001$, $R^2 = 0.980$; Q: $P < 0.001$, $R^2 = 0.902$) and B (L: $P < 0.001$, R^2

= 0.944; Q: $P < 0.001$, $R^2 = 0.521$) decreased as inclusion level raised. Lag time (l) was extended as inclusion levels of C (L: $P < 0.001$, $R^2 = 0.708$; Q: $P < 0.001$, $R^2 = 0.621$) and B (L: $P < 0.001$, $R^2 = 0.$ 0.628; Q: $P < 0.001$, $R^2 = 0.762$) increased, when SH only had Q effect ($P = 0.022$, $R^2 = 0.336$). Responses to concentrate level increases differed between concentrates for 'a', 'kd' and 'l'. Regression coefficients for 'a' differed among concentrates ($P = 0.007$), slopes decreased as SH > C > B. Slopes of the curves for 'kd' were different ($P < 0.001$), B showed the lowest regression coefficient, followed by SH and finally C. Regression coefficient of B tended to be lower than that of C ($P = 0.052$) for 'l'. Effects on 'kd' and 'l' as concentrate inclusion increased could be due to use a donor fed only forage, with a microbiota adapted to fiber degradation. Reduction of 'kd' as SH proportion raised suggests that its fiber is degraded by microbiota in a different manner than forage fiber. Funded by PEDECIBA and ANII.

Key words: carbohydrates, silage, fermentation

579 Hypophagic effects of propionate are greater for cows with elevated hepatic acetyl CoA concentration. S. E. Stocks* and M. S. Allen, *Michigan State University, East Lansing.*

We previously showed that propionate (PR) was more hypophagic than acetate (AC) when infused intraruminally in cows in the postpartum period and that the degree of hypophagia from short-term infusion (18 h) was related to hepatic acetyl CoA concentration. The objective of this experiment was to evaluate adaptation to treatment with longer-term (3 d) infusions. Twelve multiparous cows (2–13 d postpartum) were blocked by calving date and randomly assigned to treatment sequence in a crossover design experiment with a covariate period. Treatments were 1.0 M propionic acid or 1.0 M acetic acid, infused intraruminally at 0.5 mol VFA/h beginning 6 h before feeding and continuing for 78 h with 3 d between infusions. PR decreased DMI relative to AC (15.9 vs. 17.0 kg/d; $P < 0.05$) by decreasing DM consumed in the first 4 h after feeding (DMI-4h; 6.95 vs. 7.87 kg; $P = 0.004$). No interactions were detected between day within period and treatment for DMI and DMI-4h indicating a sustained effect of treatment across the 3-d infusion periods. PR decreased hepatic acetyl CoA concentration (2.74 vs. 5.78 nm/g; $P < 0.01$) and plasma concentrations of NEFA (640 vs. 800 μEq/L; $P = 0.08$) and BHBA (5.6 vs. 15.8 mg/dl; $P < 0.001$) and increased plasma concentration of glucose (53.2 vs. 48.7 mg/dl; $P < 0.01$) relative to AC. However, a period by treatment interaction was detected for DMI ($P = 0.07$). During period 1, PR decreased DMI relative to AC (14.3 vs. 17.5 kg/d; $P < 0.01$) because of a reduction in meal size (1.30 vs. 1.65 kg; $P < 0.05$) with no effect on intermeal interval ($P = 0.72$). PR decreased DMI-4h (5.82 vs. 8.15 kg; $P < 0.01$) but did not affect DMI 4 h to 24 h after feeding ($P = 0.25$). The depression in DMI in period 1 was positively related to covariate hepatic acetyl CoA concentration. PR was increasingly more hypophagic than AC when hepatic acetyl CoA concentration was high (interaction $P = 0.07$ for daily DMI and $P < 0.01$ for DMI-4h). These results suggest that propionate is more hypophagic when hepatic acetyl CoA concentrations are elevated such as when cows are in a lipolytic state.

Key words: propionic acid, feeding behavior, lipolytic state

580 Effects of added direct-fed microbials on rumen microbial fermentation in continuous culture. W. L. Braman* and I. Knap, *Chr. Hansen Animal Health and Nutrition, Milwaukee, WI, and Horsholm, Denmark.*

The purpose of this trial was to determine the benefits of *Enterococcus faecium* bacteria (EF) and live cell yeast *Saccharomyces cerevisiae* (Y) on in vitro ruminal fermentation when added to a lactating dairy TMR diet. The experiment using continuous culture of rumen contents (Hoover et al., 1976) compared a control (C), the control with a commercial product Probios TC (TC), and the control with a product containing 2 proprietary strains of EF (CH212 and CH273) and Y (EF+Y). Direct-fed microbial additions were based on a predicted intake of 24.5 kg cow/day and microbials were added at the rate of 2.0g/head/day. All diets were incubated in 1164 mL fermenters in triplicate for 8 d in continuous cultures, with effluent samples for analysis composited over the last 3 d. Experimental diet (DM basis) consisted of 22% alfalfa hay, 34% corn silage, 23% ground corn, 17% soybean meal, and 6% concentrate mix. Major diet components measured 18.2% crude protein, 29.7% NDF, 20.8% ADF, 34.9% NSC, 30.4% starch and 42.6% NFC. Results were analyzed using ANOVA with treatment sum of squares partitioned into orthogonal comparisons. The addition of EF+Y resulted in increases ($P < 0.05$) in NDF digestion (69.2 vs. 56.4%), and decreases ($P < 0.05$) in rumen ammonia (8.68 vs.14.26 mg/dl) and D-lactic acid production (0.67 vs 1.09 mmoles/day) compared with C. The addition of EF+Y resulted in significant increases ($P < 0.05$) in NDF digestion (69.2 vs. 54.8%) compared with TC. Except for reduced ($P < 0.05$) ammonia (mg/dl) and increased ($P < 0.05$) calculated by-pass N (g/day), there were no differences between TC and C. There was a tendency ($P < 0.10$) for TC and EF+Y to increase L-lactic acid production (mmoles/day). These data indicate that EF CH212 and CH273 +Y increased fiber digestibility, increased L-lactic acid and decreased D-lactic acid accumulation in this in vitro model suggesting this combination could improve rumen health in lactating dairy cows fed high starch and high NSC diets which requires further research.

Key words: direct fed microbials, yeast, rumen